DECISION-MAKING AND SUPPORT FOR METHOD ADAPTATION

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DISSERTATION

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by

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Summary

Information systems development (ISD), as a change process in a target organisation to achieve objectives, includes well-known phases such as analysis, design and implementation of an information system. ISD methods have been of interest to IS scholars and practitioners for a long time since they are essential to structuring method users' thinking and actions for ISD and achievement of desired information systems.

This research is concerned with *situated method development* which is about how to achieve a method that fits a project situation. It has been acknowledged as a promising research endeavor to overcome a long-standing problem with information systems development (ISD) methods. That is, as methods are not used as prescribed in practice, they fall short in supporting practitioners in the development of information systems for, for instance, a globally networked organisation using new development approaches such as agile systems development.

While new methods are promoted as a panacea for well-publicized ISD failures, old ones have been criticized that they are rigid, comprehensive and are built upon the idea that a method can be used for all projects which brings on a "one size fits all" issue. In fact a fundamental problem still remains that methods, irrespective to their preferred features (agility, state-of-the art knowledge foundations), by nature involve certain thinking and often prescribe certain actions for ISD. The subject matter at hand addresses this "one-size-fits-all" issue and aims to deal with how an ISD method is developed and can be supported so that the resulting method, so-called situated method, fits a project situation. The idea behind a situated method is that any prospective method to be used for a development project is subject to certain adjustments because of the fact that the method is limited to its preferred thinking and prescribed actions for ISD which cannot fully accommodate the uniqueness of a project situation. In this regard, such adjustments are needed for the method along with a premise that the resulting method can provide a well-suited means for ISD and in turn reduce the risk of its failures. The goal of this research is to support situated method development, or in a practical sense, to help one aiming to achieve a situated method. In conjunction with this goal, this research seeks answers to: what does situated method development and support mean in relevant literature and practice? How to achieve such support? The basic tenet in the logic of connecting these questions is that to provide viable support for situated method development one needs to understand its underpinnings in terms of notions and approaches of the subject and how it is realized in

practice. In this respect, this research presents two key outcomes: *foundation of* and *support for* situated method development.

Regarding foundation of situated method development, we start reviewing the relevant studies in the schools of thought referred as Information Systems Research, Method Engineering, and Implementation Research. Upon critical examination of the relevant studies via certain taxonomic dimensions and observed practice we claim that basic models proposed for situated method development provide partial, yet alternative approaches to situated method development. Thus we regard situated method development as a phenomenon for which an examination should be done at a fundamental level where its key underlying notions are naturally revealed and articulated. We call this phenomenon method adaptation and establish its foundation through the articulation of four key notions (situation, context, agency, and method fragment). To achieve such a foundation, certain accounts in the reference (human-decision making and support literature) and supportive (sociology, cognitive psychology, philosophy of mind and linguistics) clusters have been employed. The foundation of method adaptation manifests the idea of modifications, changes on, and interplays among the key underlying notions. As such, we conjecture that the 'Method Adaptation Process', in short 'MAP', is a capability in which an *agent* holding intentions through responsive changes in, and dynamic interplay between, *context*, and *method fragment* develops a situated method fragment for a specific project *situation*.

We employ the notion of situation as a binding and composite construct for the other three notions. With certain accounts in the referenced disciplines, we conceptualize situation as a limited portion of the world – partial reality– as emerging over location, time, and agent. Three other essential notions (context, agency, and method fragment) are examined carefully and extensively to pave the way for further development and illumination of method adaptation. In particular, we argue that a naturalistic decision-making approach among others (prescriptive and normative) provides promising ideas to reveal the decision-making processes underlying method adaptation. We remark that the prevailing models proposed for situated method development, as they adopt normative or prescriptive views of method adaptation, consider context as static and reduce its meaning to a number of characteristics. By adopting the naturalistic decision making model, we adopt the idea of characterizing to explain how the context takes place in method adaptation. In a similar vein, we provide extended meanings of method fragment and agency. Together with an extension of the meanings of context, agency, and method fragment, we produce a generic model for MAP. With this model we are able to

demonstrate intriguing interplays between the agency, context, and method fragment defined as essential constructs.

Having presented the foundation of MAP and proposing a generic model for MAP, we explicate and evaluate the generic model for MAP in two different ways. By using basic models proposed for method adaptation in the literature, we hypothesize that the generic model 'accommodates' these models as specific MAP patterns. By accommodate we mean that MAP incorporates the underlying reasoning for relationships among key constructs embedded in the basic models. In this regard, the generic model is evaluated analytically as it serves as a kind of a meta-model for basic models. Second, we explicate and evaluate MAP on an empirical basis by using the case study conducted for this work. Explication is done by showing the existence of two forms of MAP identified in the ISD department of the leading financial organisation in Europe: static and dynamic method adaptation. The first form considers MAP in a static manner (i.e., the characterization processes of MAP are based on a "prescribed situation"), whereas the dynamic method adaptation employs these processes for "the situation on the move" throughout the project execution. We provide some insight plus an instrument used that the organisation dealt with the dynamic method adaptation. We conclude that these forms of method adaptation reflect a complementary aspect of the engineering and socio-organisational perspectives as they correspond to certain patterns of the generic model of MAP.

Regarding decision-making support for situated method development – or in short MAP support, drawing upon state-of-the-art knowledge in the decision making and decision support systems (DSS) literature, we describe MAP support in terms of what it is, why it is useful, and how to achieve it. To establish a basis for MAP support we review basic elements of decision-making support which are grouped into three dimensions: *decision support orientation* (referring to value orientation, decision-making support paradigm, effect, and effectiveness), *focus of decision support* (referring to MAP layers and levels), *existing means* (types of DSS, techniques, and tools). In this way we complement the idea of method adaptation by proposing a novel approach for MAP support called Naturalistic Decision Support (NDS), and suggest it as an appropriate way to truly achieve MAP support. Further, we examine the viability of NDS for MAP in the case organisation and discuss it using relevant elements for MAP support.

In our case organisation we have identified three distinguishing stages relevant to MAP support. These three stages have provided an illustration of how MAP support was experienced over ten years in an ISD organisation. In particular, we show "evolving MAP support" by which

"appropriate delivery of advice and guidance" on MAP has been achieved after a certain time period. As the three stages indicate, this study shows that agility of the method used, the degree of consensus of the meaning of method adaptation held by involved parties, the appropriateness of the approach to method adaptation (top-down, bottom-up, or middle-out reflecting dominations of involved parties), and the combination of human- and technology-based means are essential to a suitable delivery of decision support on method adaptation. We believe that this empirical investigation of MAP support explicates the often-cited suggestion in the decision support literature that before providing tool-based decision support to practitioners we should first understand how the decision is made. We conclude that such an understanding would take several years, as was the case for the organisation investigated, depending on the explicitness and complexity of discourses embedded in a decision-making process.

In the final chapter we discuss implications of the research in relation to possible research avenues such as experience-based method adaptation (referring to a novel way of capturing, organizing, disseminating, and maintaining experience about method adaptation), MAP patterns (referring to the effect of industry, organisation and systems-related characteristics on MAP patterns), Naturalistic MAP Support (referring to viability of MAP support in empirical setting), method adaptation in globally distributed systems development, and method adaptation for agile methods.

As concluding remarks, we emphasize that naturally and essentially, the foundation of method adaptation is established by extending existing literature and the case study conducted. It is *natural* that such an extension was needed because the very notion of agency deserves more attention as the heart of method adaptation. It is *essentially* needed because without this notion, method adaptation lacks its essential feature referring to how the agent in some way adapts her knowledge (either through her own or method fragments proposed) to the context or the other way around. One can argue about where her adaptive capability comes from. We all have this capability, which goes beyond the basic discussion of survivability. Whether it is granted or learned it is this capability that makes the agent aware about what is going on around her and helps the agent involved in method adaptation in particular to manage intriguing interplays among herself, the context, and the method fragment.

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This book would not have been possible without contributions of many people. A few words would not surely be enough to show my gratitude to those people involved in this research process. When I reflect on the five-year timeline that I spent for this research, I recall several episodes relating to my happiness, challenges, passions, and frustrations. It was all about being part of a journey that required self-determination, curiosity, trial and error; it was all about playing a game along with ground rules needed to manage this process, and of course, it was all about being critical, skeptic, reflective on what I have investigated. In this respect, I would like to thank my promotor Robert A. Stegwee who provided me with the opportunity to experience this process; to Kees van Slooten and Frank Harmsen who have been Assistant Promoters and supported me content wise. I am especially grateful to Frank and the DSDM coaches at the bank who helped me to conduct a case study and who were available any time needed. I should also acknowledge numerous valuable comments that the committee members have provided me.

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My words are inadequate to express how grateful I am to my parents, brothers, sisters and their families. I am indebted to them, as they have raised me and given me the strength for this achievement. “Annecim, babacım, abilerim, ablalarım ve aileleri size minnetarım bana yardımlarınız için; bana güvendiniz, güç verdiniz, dualarınızı hep yanımda hissettim”.

I wrote many parts of this book in Minneapolis (the USA) while spending special time with my beloved wife. I show all my gratitude to her as she is the most important person in my life and as none of this would be possible without her love and endless support.

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CHAPTER 1: INTRODUCTION

"There were doors all round the hall, but they were all locked; and when Alice had been all the way down one side and up the other, trying every door, she walked sadly down the middle, wondering how she was ever to get out again"

- Lewis Carroll, Alice's Adventures in Wonderland

This chapter presents basic information about the subject matter investigated (situated method development), the motivations behind the research, and a brief explanation of the research context in relation to existing studies. It also includes the research objective, questions, and a short description of the overall research design together with the structure of this work. To avoid from a terminology discussion, most terms in this chapter are used intuitively even though they may have different connotations or reserved meanings in particular information systems research schools of thought. In chapter three, we provide our understandings and definitions of these terms along with relevant references.

1.1 Topic Orientation

Where to Start?

Information systems[i] (IS) have played various roles in daily life, organisations, and in society for a long time. For instance, they may act as an enabler for the achievement of what humans desire, or constrain our ways of thinking, working, and living.

An information system, as one of many aspects of an organisation, may contain various related components, including people, processes, information, software, hardware and other information technologies (IT) (Jayaratna, 1994). Despite many countervailing arguments about the functioning of IS in organisations, information systems are involved as enablers to change business processes, organisational structures, and even strategies to sustain competitive advantages in typical IT-enabled business change projects (Gibson, 2003). This research is interested in those information systems that support business processes within or across organisational boundaries. A business process can be seen as a chain of activities delivering valuable results for a particular customer or market (Davenport, 1993). Applications that support business processes are referred to as *B*usiness *P*rocess *A*pplications (*BPA*). BPA can be a custom-made or

packaged enterprise wide system[ii], best-of-breed application (e.g., customer relationships management application, supply chain management application), or e-commerce application running across organisational boundaries.

Methods, Techniques and Tools for Information Systems Development (ISD)

We consider BPA tightly coupled with other components of information systems rather than merely technical artefacts. This work is concerned with the development of a BPA in organisational settings. Usually, the BPA development as IT is usually set up as an IT-enabled Information Systems Development (ISD) project. Given that an ISD project is itself a complex socio-technical change process, actors involved demand some methodical means such as *M*ethods, *T*ools, and *T*echniques (shortly, *MTTs*, or methodical means). Our main interest is how to support the development of IS via the *appropriate use* of MTTs.

Jayaratna's study (1994) suggests that there are over one thousand brand-name MTTs. Avison and Fitzgerald (2002) comment "(…) by 1995, the 'methodology jungle' had worsened in the sense that there were so many developments and different directions in which methodologies were going."

Some MTTs (e.g., Method/I, RUP, DSDM as methods) are often considered to be comprehensive enough to include all aspects of information systems (Zachman, 1987; Slooten, 1995) such as a problem aspect, an information aspect, and a process aspect; others are limited to certain ways of information system development such as way of thinking, working, controlling (Wijers, 1991) (e.g., as PRINCE II puts more emphasis on project management, it is aimed at a way of controlling). Certain MTTs are specifically aimed at, for instance, custom-made applications (e.g., DSDM-Dynamic Systems Development Method) or packaged applications for enterprise systems (ES) (e.g., ASAP-Accelerated SAP for SAP). Last but not the least one, there are MTTs proposed for modelling aspects of information systems. Known as modelling MTTs, these are different in that they often embed a formal modelling language, procedures, and usually support tools to help their users in executing modelling activities.

Given the overwhelming number of MTTs and their various functions, we use certain taxonomic dimensions (introduced in chapter three) to show what kinds and aspects of MTTs are of interest to this research[iii].

Depending on the aim, scope, and form of methodical support, MTTs can help practitioners at least in two ways: 1) assist in efficient and effective task executions throughout an ISD project, 2) play a crucial role in the

establishment of practitioners' viewpoints on what and how they are supposed to think, work, or model during an ISD project. The former role is more likely geared to practical contributions of MTTs, whereas the latter is aimed at the formation of practitioners' intellectual basis upon which practitioners reason and enact in the development projects. These roles, articulated in chapter four, are not mutually exclusive; they are intertwined and influence each other.

Now we shall briefly discuss how the IS research endeavours have attempted to solve the 'methodology jungle' issue mentioned above.

The Endeavours in IS Literature

From an academic perspective, information system research is a unique research field and was officially named as one of the technical committees of the IFIP (International Federation for Information Processing), a non-governmental, non-profit umbrella organisation under the auspices of UNESCO, working in the field of information processing. Declared in 1966 and revised in 1990, the aim of this research field is "to promote and encourage interactions among professionals from practice and research and advancement of investigation of concepts, methods, techniques, tools, and issues related to information systems in organisations" (IFIP 2004) [iv].

This field has received many contributions from natural and social sciences and has adopted their theories and ideas as well as accumulating a substantial amount of knowledge concerning various aspects of IS. One particular domain, often called information system development (ISD) research, focuses specifically on the development of IS and possible ways to support it during a project execution. ISD research has contributed to understanding what problems occur and how practitioners solve these problems during ISD. Special attention is drawn to MTTs as privileged elements or topics in ISD; it is argued that the history of ISD is typically interpreted as the history of MTTs (see, for instance, (Lyytinen and Hirschheim, 1987) (Truex, Baskerville, and Travis, 2000)). Such an essential role of MTTs in ISD and IS research is already recognized by the two oldest working groups (WG 8.1 and 8.2) of the IS technical committee of the IFIP. These two groups have been working on a better use of MTTs in the area of IS and have formed their own dedicated research literature that we call Method Engineering and Information System Development literature. One of common interests for both literatures is, 'a better use of MTTs'. As elaborated later, this should not be confused with the means-ends relation –that is, the use of means necessarily results in an ends, which is often cited as one of the traps in practical IS development projects (Fitzgerald, Russo, and O'Kane,

2000). The phrase, a better use of MTTs, may be best understood in light of an extent to which MTTs provide truly adequate support for the actors involved in an ISD project to achieve the desired goals.

Among all the cited problems and issues hindering a better use of MTTs, it is argued by many scholars that MTTs by nature have their own limited views on the reality of IS development and may often fall short in accommodating the uniqueness of a (ISD) project situation. Simply said, there is no MTT that fits all project situations. This particular limitation of MTTs is usually referred as a 'one-size-fits-all' issue in the ISD research literature. (Truex et al., 2000) assert that:

> By adopting a single engineering concept of method all of our thinking about information systems development becomes imprisoned by this one concept. The method is not only our way of thinking about systems development; it is our way of thinking about "thinking about systems development".

Scholars in both the ISD research literature (see for instance (Iivari and Linger 1999; Olle, Sol, and Verrijn-Stuart, 1982) and method engineering (ME) (see, for example, (Brinkkemper 1996; Fitzgerald 1997)) address this issue from their own perspectives. Empirical evidence also shows that method users in practice comment that existing MTTs are monolithic, difficult to adapt, or modify only a specific project situation (Hidding 1997). Hidding concludes that, "traditionally, methods advocate a single path, which is often perceived as one-size-fits-all. To support practitioners in the new, more complex environment, methods must change from this as-is paradigm" (Hidding, 1997).

In fact, the reactions of scholars in method engineering to problems concerning MTTs are set forth along with the call for 'methodology[v] engineering' in (Welke, Kumar, and Dissel, 1991; Kumar and Welke, 1992), 'method engineering' by Brinkkemper and his colleagues ((Brinkkemper, 1996); (Slooten and Brinkkemper, 1993; Harmsen, Brinkkemper, and Oei, 1994). Kumar and Welke (1992) propose that,

> …we need a formal (as opposed to ad-hoc) and efficient (as opposed to time and money wasting) methodology for developing ISDMs which are situation appropriate (as opposed to universal) and complete (an opposite to partial), and at the same time rely on the accumulated experience and wisdom of the past (as opposed to built from scratch) (p. 322).

Situation appropriateness of MTTs has been studied specifically by a number of researchers in both the ISD and ME research literature. The premise behind the idea, often implicitly stated, is that the better MTTs are

suited to the project situation at hand, the better use of MTTs is most likely possible and in turn significantly contributes to the success of an IS development.

A Shared Premise in ISD and Method Engineering Research Domains

This work shares this premise, but with a reservation regarding the idea of 'contribution to the success', as follows. The discussions of the notion of ISD success and its measurement in IS research show that it is still problematic to find an agreed definition of ISD success and a way to measure it (Yang, 1998). This suggests that the aforementioned idea is considered warranted. On the other hand, a large number of ISD project outright failures are known (Lyytinen and Hirschheim, 1987) and it has been shown that inappropriate use of MTTs is one of the causes of these failures (Schmidt et al., 2001). Instead of claiming the contribution of a better use of MTTs to success, we prefer to consider its contribution as a mitigation of the risk of failure.

Our research also assumes the essentiality of situation appropriateness for better MTT use, but our orientation to the subject and way of conducting this subject is different from existing studies. The differences will become clear to the reader in the course of the book, but one essential difference is that we treat the way in which MTTs are aimed to be situation appropriate as an agent's (human or non-human) decision-making process. Our emphasis is then to study how to support the decision-making process leading to situated MTTs. This point of departure in the research opens a new avenue where we employ the body of knowledge in the decision-making and support literature.

Introducing Method Adaptation as a Phenomenon

With the acquisition of the decision-making and support literature, and as new findings are gathered in the field study of this research it appears that the situation appropriateness of MTTs is more complex than just modifying MTTs for a project context. It seems that, when possible and necessary, the context may be subject to further modification to fit MTTs, or both (MTTs and the context) could be modified simultaneously. Additionally, the preferences, motives, or intentions of the agent involved in this modification, form another critical parameter to study this subject thoroughly. The subject matter here looks at supporting the agent's decision-making process that leads to achievement of the situation appropriateness of MTTs, the context, and the agent. We consider such a decision making process as a phenomenon[vi] and call it *method adaptation*. This work deals with theorizing method adaptation by elaborating the idea, developing its foundation, and

proposing a generic model as a mechanism for the decision-making process embedded in the development of an (ISD) method specific to a project situation, the so-called situated method (see chapter three for the conception of this term).

1.2 Research Objectives and Questions

In a practical sense, the subject of this work is about supporting an agent[vii] for situated method development[viii]. Such a development activity is often considered a task for a project manager or other actor responsible for the project. But usually there is more than one actor involved in this task and surely more actors have stakes in the outcome of this task –a situated method. This task is usually performed at the early stages of a project and can result in, for instance, a project plan, project proposal, or system development plan.

The practical goal of this research is then to support those agents involved in situated method development, by which the situated method user would be able to reduce risks of failure in ISD projects. For the sake of simplicity we use the term agent as the one involved in situated method development. An agent can be a human actor or inanimate object and has different degrees of involvement in the development of a situated method. By term involvement we mean the degree of affinity with the method and the amount of decision-making power that an agent holds throughout this development process. In practice, an agent can have various roles. We also provide an elaborate discussion of key roles, but for a sense how an agent's role is entitled, consider a program manager, a project manager, a quality assurance manager, or a method engineer specialized in situated method-related activities, as a human agent. For examples of inanimate agents think about instruments such as project configuration tools, project management tools, and scenario configuration instruments.

The practical goal of this research is inherently linked to the academic objective explained below. Briefly, the emphasis is on the support aspect for situated method development. We focus on the way to support such a decision-making process rather than the content of this process though we do need adequate knowledge about its content. Consequently, the main objective in this research is then stated as follows:

To support the decision-making process leading to a situated method for ISD.

This objective implicitly implies that method adaptation can be regarded as a (human) decision-making process. Again, one should notice that the development of a situated method as a process is our primary interest.

To achieve this, a number of general research questions need to be answered. We present these general research questions below, but refinements are contained in chapter three. These lead to further demarcations of the scope of the research subject. For instance, having faced the complexity of taking all aspects of situated method into account, we have had to narrow our scope and focus only on certain aspects. These refinements and demarcations will be clear to the reader after reading the theoretical basis and empirical findings in the remaining chapters. A close examination of the research objective leads to two key research issues:

(1) An understanding of a situated method and its development process in both (1a) relevant literature and (1b) practice. The term understanding means a description of situated method development, its underlying decision-making process, and a theoretical ground that establishes such a decision–making process. Relevant literature here refers to ISD research, Implementation research, and ME research.

(2) An understanding of decision-making support for the development of a situated method in (2a) relevant literature, (2b) and in practice. Similarly, by the term understanding, we intend to say the meaning of decision support for situated method development, approaches, and kinds of support and mechanisms to achieve such support. Relevant literature refers to ISD research, ME research, and decision-making and support research.

It should be noted that few studies include empirical findings related to the subject matter with regard to (1a) and (2a). We will show and argue that most of these studies, with some exceptions, do not provide a detailed picture of how situated method development is realized in practice. This motivates us to conduct a field study to understand how it is practiced and supported in an empirical setting, which necessitates (1b) and (2b).

These two research issues raise the following general research questions:

- What does situated method development mean in relevant literature and in practice?
- What does the decision support for situated method development mean in relevant literature and in practice?
- How can one support the decision-making process leading to a situated method?

These three research questions are logically dependent on each other. The linkage lies in the basic assumption that to provide appropriate decision support for method adaptation we should first have an adequate understanding of how method adaptation is seen, proposed, and realized in literature and practice. Thus, the answers of the first and second questions

are essential for the third. The answers of the three questions eventually lead to the research objective.

These general questions give a sense of research orientation and require various related sub-questions to make them more concrete. For instance, with the first research question we consider several sub-questions such as what approaches or theoretical accounts for method adaptation prevail in the relevant literature? What underpins approaches to, and models for method adaptation? What similarities and differences exist among these studies in terms of models and constructs? Is it possible to achieve a generic model for method adaptation? If so, what are the essentials of such a model? What specific models can be generated and realized in practice?

For the second and third research questions, one might face several sub-questions such as how is the notion of decision-making support treated in relevant literature and in practice? What views on decision support for method adaptation are possible and can be realized? And, what ways and means of delivering decision support from different perspectives are possible and can be realized?

1.3 Research Design

In this section, we give an overview of the research approach and the method used in this work; we reserve the next chapter for an in-depth analysis of the ontological and epistemological stance that the work holds. This research has evolved through interactions of three worlds: the *material world* referring to objectivity and observation of information providers and any artefacts relevant to this work including relevant literature and sources of information in the field study; the *social world* referring to those actors influential in development of the work; and finally the *primary investigator world* solely accountable and responsible for the establishment of this work.

Relevant literature is structured in a framework and embodies three interrelated sciences, fields, or domains. Cluster number one, the *core cluster*, includes studies in ISD literature, ME literature, and implementation literature. Cluster number two, the *supportive cluster*, includes a number of studies in human decision-making processes and decision support systems. The third cluster, the *reference cluster*, includes reference sciences or disciplines for the other two clusters and contains studies in sociology, cognitive psychology and philosophy, and linguistics. These clusters and their contents are not mutually exclusive. Since they borrow many ideas, theories, and concepts from each other, they intertwine in some interdisciplinary studies such as artificial intelligence and social cognition (Kunda, 1996), and e-commerce, which is considered a dynamic,

integrative, and multi-disciplinary research topic (Elliot et al., 2001). This work belongs to the core cluster and has strong linkages to the method engineering domain and ISD literature.

The field study was conducted at the ISD department of a financial organisation. The department has had substantial MTT experience over the last two decades. Recently, they adopted an agile method for all projects. In the field study, several methods and techniques were used for data collection, analysis, interactions between the researchers and the researched, as well as for validation of the findings.

Relevant literature and the field study have been used for *development* and *illumination* of the theoretical foundation, a generic model, and decision-making support for method adaptation. In the development sense, relevant literature provides a solid ground to build up the theoretical account at the conceptual level and the field study triggered us to challenge existing approaches and models concerning method adaptation found in relevant literature. In the illumination sense, relevant literature gives us opportunity to compare our generic model at the conceptual level, whereas the field study explicates the suggested generic model with the empirical findings derived from the case. Consequently, the researchers have had critical and reflective thinking attitudes while developing the thesis as a co-evolving account between the literature and the field study.

1.4 The Structure of This Work

This book contains seven chapters and presents a thesis about method adaptation and its decision support for ISD (see Figure 1.1). An introduction chapter provides information on the background of the research and orientation on the subject, and a clear-cut description of initial research objectives and questions.

The introduction also includes the overall research design and the structure of the work at a high level. In this sense, it provides basic information about the work and makes the reader ready to follow up the other chapters.

The second chapter is an in-depth study of what epistemological and ontological preoccupations underpin this study, how the knowledge of this work has evolved, and why/what/how specific research techniques were used throughout this thesis and in the field study in particular.

Other chapters are logically related to each other, so the reader is encouraged, though it is not mandatory, to read previous chapters before reading a particular chapter (see Figure 1.2).

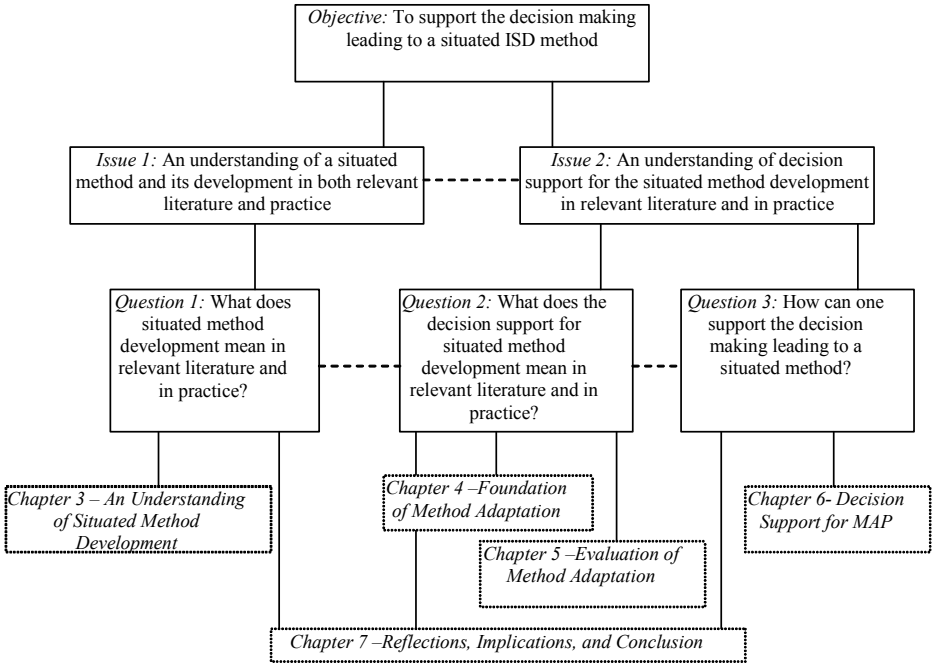


Figure 1.1 The structure of the book and the relations among research objective and questions and related chapters

The third chapter includes framing and discussion of relevant literature in terms of the existing approaches, models, concepts, etc. in detail. It also clarifies and puts the research subject within a clear boundary. This chapter serves as theoretical ground upon which one can get a more concise understanding of situated method development.

Chapter four serves as the foundation of the thesis. It introduces and elaborates an approach to method adaptation by distinguishing itself from other approaches and models in terms of many features. Some features are related to the orientation on the subject investigated, the applicability of the model in an empirical setting, and the research method approach adopted. It is suggested that the proposed approach constitutes three constructs upon which a viable generic model for method adaptation is possible. This model generates a number of patterns, each of which can be considered a particular model for method adaptation.

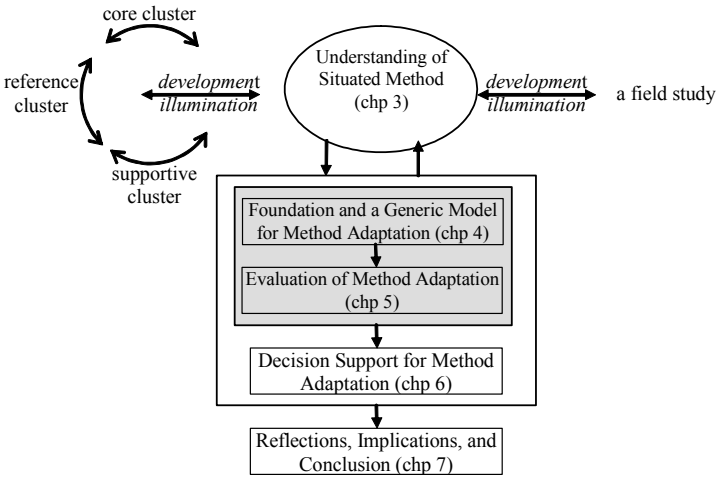


Figure 1.2 The visualization of chapters and related themes

Chapter five argues that existing models proposed for method adaptation correspond to one of these patterns. We also discuss the applicability of the generic model and some of its specific models by employing the findings derived from the field study. The field study has a dual role and contributes to the development and illumination of the theoretical account, a generic model, and decision-making support for method adaptation.

Chapter six discusses the central research objective and related questions – how to support method adaptation process. We start with possible meanings of decision-making support and corresponding ways of providing decision-making support. Specifically, the three views on decision-making support for method adaptation are discussed. In the chapter, we propose *naturalistic decision-making support* for method adaptation as an appropriate approach for achieving effective decision-making support for method adaptation.

The last chapter includes a confrontation about premises and questions about method adaptation and what has been achieved so far. By reflecting and critically examining the contributions of this work, we present the implications of the thesis in academia and in practice. This work can be seen as a natural evolution of our scientific knowledge on the phenomenon we call method adaptation. It clearly distinguishes itself from companion studies, but has many affinities with the studies conducted in method engineering and information systems development literature. It challenges and enhances the existing approaches and opens a new gateway through

which one can find new challenges to and opportunities for our understanding of method adaptation.

CHAPTER 2: THE RESEARCH METHOD

"Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve"
- Karl Popper, Objective Knowledge: An Evolutionary Approach (1972)

This chapter considers two basic aspects of the research method: the way of thinking and the way of working. As articulated in Section 2.2, the former refers to what rationales are held and assumptions made in relation to the ontological (the existing of the material worlds or resources employed) and epistemological (primacy of our knowing and research inquiry) basis of the research. As examined in Section 2.3, the latter refers to what has been carried out in terms of activities, techniques, and other means used in this work. As researchers often turn their attention to the way of working rather than the way of thinking, the latter is usually underestimated in many studies. However, we believe that the way of thinking deserves more attention for the following reasons.

First, it helps the reader to get a rich picture of how this work has been conducted. Technically speaking, this detailed picture includes the epistemological and ontological dimensions of this work[ix]. The idea behind examining these dimensions is that through the details the researcher and reader will have a shared understanding of the basis of the research.

Second, it helps academics position this work more objectively, and examine and compare this research with relevant studies from the design and content points of view. This will help fellow researchers to adopt the design of this work and replicate the investigation in future studies.

Third, it is needed to discuss the issue of rigour in an objective manner. It should be noted that throughout this research we have had a balanced view of rigour and relevance as explained later in this chapter.

There are two remarks worth mentioning before we begin our discussion. The presentation of the research method in this chapter is done in a retrospective manner so that we can describe what has been thought and done rather than planned. For this research, instead of being tied to a particular research method exposed in the literature, we crafted and used our own method to achieve the research goal. In this respect, we briefly discuss how we treat and characterize our research method in relation to other exposed methods in Section 2.1. Second, the discussion of research activities

in this chapter remains at a high level. That is, we describe what strategies were applied while performing certain research activities (for instance, the conduct of the case study and the inquiry model concerning the literature review). For details of certain research activities, we reserve remaining chapters (see for instance chapter three for the inquiry model applied for the literature review and chapter five for the conduct of the case). Third, some artefacts created or used in this research (such as interview transcripts and certain documents and tools belonging to the case organisation) are not included due to a confidentiality agreement with the organisation. We address this last remark in chapters five and seven.

We now begin with an introduction that addresses how the research method has been employed and what affinities it has with other exposed methods. The two aspects of the research method (ways of thinking and working) are then examined.

2.1 Introduction

The Research Method Employed

We treat the research method as the means rather than the end, to achieve two primary goals in this work: contributing to the growth of scientific knowledge on situated method development and supporting the agents (practitioners) during situated method development in organisations. It is usually acknowledged that rigour is necessary to achieve the former, whereas relevance is more especially essential to the latter. Keen (1991) asserts that relevance is an important measure of the significance of IS research. It has also been commented on by many studies, including (Benbasat and Zmud, 1999), that academics should strive for both relevance and rigour, exactly what we want to achieve with this work. We see ourselves as the sort of academic characterized by (Benbasat and Zmud, 1999),

> … committed to both applying rigorously the methodology best suited to their research goals and better accommodating practical relevance with their research endeavours (p. 85).

Affinity with Other Prospective Methods

One of the difficulties a researcher might face when describing the realized research methodology is to relate it to the methodology exposed in literature prescribed for a certain type of research. Depending on the match between

what has been realized and prescribed, the researcher may stick to one particular methodology and present the realized methodology from a prescribed methodology perspective to be on the safe side. The problem might be that the research is pigeonholed and captured by an exposed methodology along with its assumptions, philosophical view, and other aspects. Many limitations of this approach are mentioned (Mingers, 2001) and it is strongly recommended that especially philosophical presuppositions behind the prescribed methodology should be examined carefully and critically before the researcher is committed to an exposed methodology.

An alternative approach for the presentation of the realized research method is to describe the method with its own perspective and adopt the relevant features of appropriate methods.

This approach is usually suggested when the researcher does not feel comfortable being pigeonholed with a particular type of method. We share this feeling because we did not find a particular method that accommodates all the features of the method realized in this work. However, we should note that our research method has certain commonalities with what are generally known as 'qualitative research' (Strauss and Corbin, 1998) and the 'phenomenology approach' (Remenyi, Williams, Money, and Swartz, 2000) but again we suggest caution when treating this research as a typical qualitative or phenomenology type. We discuss the affinities with qualitative research in this section, and with the 'phenomenology approach' in the next section.

Researchers have different understandings of qualitative research and its definitions vary. (Lipshitz and Strauss, 1997) definition is broad enough to accommodate different understandings of this term; it simply refers to "…any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification."

Some of the salient features of qualitative research (Miles and Huberman, 1994; Jonker and Pennink, 2000), reflected in this work, are:

- The qualitative researcher is the primary instrument for data collection and analysis.
- Empirical materials, considered data, are mediated through this human instrument, rather than through inventories or questionnaires.
- Qualitative research involves fieldwork. The researcher physically goes to people and sites to observe or record, and analyse artefacts in their natural settings.
- Qualitative research can be descriptive in that the researcher is interested in process, meaning, and understanding gained through any artefacts and structures enacted in work practices.

- The process of qualitative research is inductive in that the researcher builds, constructs, and develops hypotheses and models.

Qualitative research can be designed and realized as one or a combination of the two, three, or four paradigms. For instance, it can be designed with the positivist paradigm (e.g., (Yin 1994)), interpretive paradigm (Walsham, (1993)), critical research ((Hischheim and Klein, 1994)), or dialogic (Orlikowski and Baroudi, 1991)[x].

Researchers distinguish different paradigms for the classification of research methods. There are positivist and interpretive or phenomenological, (Lee, 1989), positivist, interpretive, critical or pragmatism (Orlikowski and Baroudi, 1991) and functionalist, interpretive, radical humanist, and radical structuralism (Burrel and Morgan, 1979). There is also normative, interpretive, critical, and dialogic (Deetz, 1996)), or more than four paradigms, such as critical realism, conventionalism, postmodernism, neopositivism, and positivism in Johnson and Duberley (2000) characterized by the epistemology and ontology dimensions

We believe that 'phenomenology paradigm', or 'interpretative paradigm' together with conventionalism best reflects the ontological and epistemological basis of the realized research method. In the following section we refer to the adopted paradigm while discussing the way of thinking.

2.2 The Way of Thinking: Ontological and Epistemological Basis

We consider two dimensions[xi] essential to the way of thinking: the ontological and epistemological.

The Ontological Dimension

This dimension refers to whether the object of investigation is independent from us or the product of our consciousness. In other words, the ontological dimension has to do with: (i) the possibility of a singular, verifiable truth vs. the inevitability of socially constructed reality, and (ii) the origin of concepts and problems. We then need to answer 'what do we believe about the nature of reality?' and 'Where and how do research concepts arise?' for (i) and (ii) respectively.

What do we believe about the nature of reality?

We believe that social and natural reality are neither constructed via human cognition nor are fully independent from the cognition. Rather, the conventions shared among people at the individual, group, and/or social levels, are structured and internalized in the course of action. The next chapter reveals corresponding research groups or schools of thought. In line

with what (Johnson and Duberly, 2000) refer to as the "conventionalist paradigm" for which Kant is considered representative (see Box 2.1), the ontological commitment in this work oscillates between objectivist and subjectivist views. More specifically, as (Johnson and Duberly, 2000) state,

> Scientific statements are not seen as true or false descriptions of some external reality, but rather as creation of the scientist which are taken to be true. The acceptability of a scientific statement is not the product of the application by scientist of some universally valid criteria or set of 'objective' standards of evaluation. Rather, such acceptability is constructed by conventionalists as the product of the scientists' 'subjective' apprehension of reality which is usually derived from, or indeed determined by, the socially sanctioned conventions that dominate the scientific communities to which they belong (p. 120).

The beliefs mentioned above have affinities with the phenomenological paradigm where the focus of the research is on understanding the phenomenon of what we call method adaptation. As will be explained later, we developed our ideas through induction from the material words. Instead of taking into account large samples, we have used small samples to do in-depth investigation over time.

Where and how do research concepts arise?

To explain the sources of knowledge through which we induce concepts, we consider three worlds relevant to the research as mentioned in (Mingers, 2001) (see Figure 2.1). Mingers adopts the theory of communicative action in Habermas(1984) and suggests three relevant worlds for research method[xii]. We also consider these three worlds equally important for the ontological basis of this research.

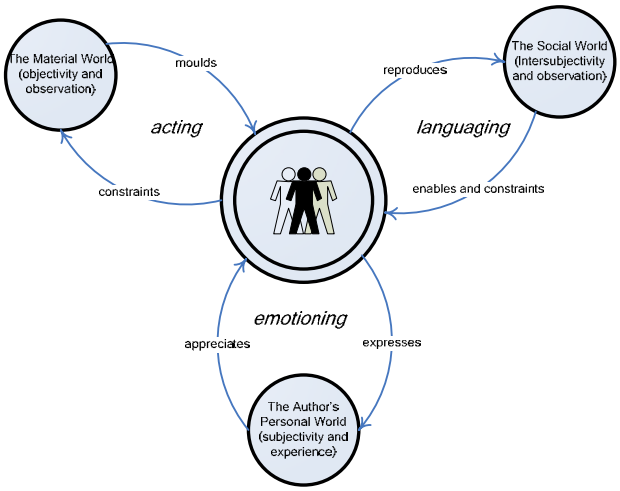


Figure 2.1 Three Worlds Relevant Contributing to Ontological Basis of this Research (after (Mingers, 2001)) and (Habermas, 1984))

The material world refers to any sources of data that are independent and can be observed and acted by the researchers. In this work, this world includes two key sources of data: relevant literature where concepts, models, or any other intellectual artefacts are developed, and the practice in which an organisation has been investigated. Mingers (2001) explains how the three worlds interact and in particular illuminates the relation between the material world and the social and personal worlds. He states: "From this material world, through processes of evolution, linguistically endowed humans have developed, capable of communication and self-reflection".

Regarding the social world, the core research team in this work consists of people with engineering backgrounds coupled with a substantial amount of academic and practical experience. They have offered opinions on the developing ideas on the subject matter. Van Slooten (1995) and Harmsen et al. (1994) have contributed to the method-engineering domain. In addition to the core team, few practitioners in the observed organisation were actively involved in the research. In this sense the various views of the involved people on the subject matter can be enablers or constraints and eventually inter-subjectivity needs to be achieved.

Regarding the author's (a primary investigator) personal world, his thoughts, experience, and emotions have been expressed in the regular meetings and discussed with other core research team members.

Epistemological Dimension[xiii]

This dimension refers to the grounds of knowledge in this research (Remenyi, Williams, Money, and Swartz, 1998). We need to answer 'How do we know what we know?' In this respect, we examine the role of researcher in knowledge (i.e., understanding the phenomenon), logic of inquiry for overall research and case study, and evaluation criteria for the research.

Role of the Researcher in Knowing

In line with the adopted paradigm mentioned, the researcher adopted a mixture of scepticism, objectivity, and a critical thinking attitude towards his knowledge. At the beginning of the research, the researcher spent substantial time in making sense of existing endeavours in the academic world. Having basic models of situated method development in mind, the researcher conducted the case sceptically to find out the extent to which his knowledge of the theory matched his observations in the organisation. In this respect, the researchers were participants in the case study as observers and mediators in transferring ideas from academia to the organisation and vice versa.

Logic of inquiry for overall research

Figure 2.2 depicts a static view of the logical linkages between the goal of this work, the research objective, and other essentials of this research. The work has been carried out in a goal-oriented manner. As such, all the research activities and produced intellects are targeted for and evaluated against the achievement of the goal.

The goal of this research is to aim to contribute to the growth of scientific knowledge and help practitioners on situated method development. This inspires us and yields a "call for" the research objective: to support situated method development. The objective concerns two key research issues that lead to a number of key research questions and related detailed questions. The three worlds of this research were employed to answer key research questions and to achieve certain results (e.g., understanding situated method development, and theorizing method adaptation along with a generic model,). Several evaluations were done concerning the goal of the work, the research objective, the research issues, and the key research questions. Finally, reflections on the outcome of this project were based on three worlds of this research.

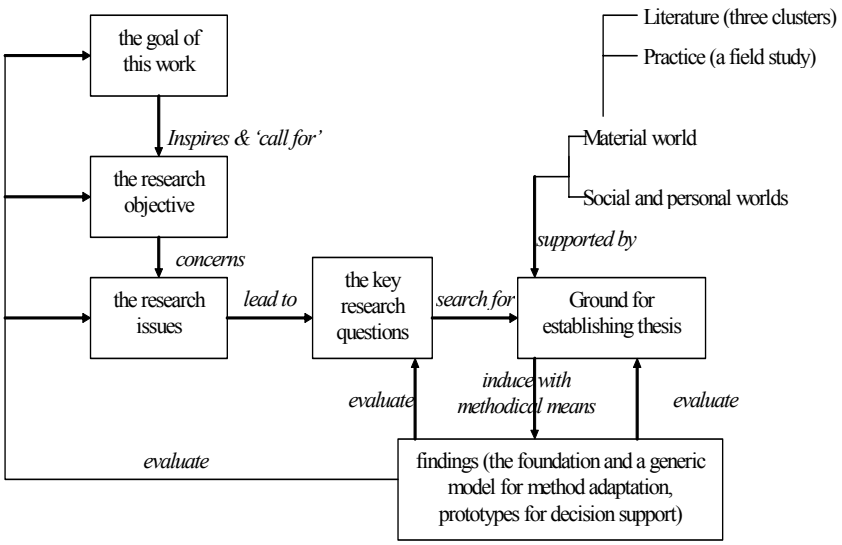


Figure 2.2 A static view on the applied overall logic of inquiry

In addition to the static view, a dynamic view shows interactions among the elements depicted in Figure 2.2 along a timeline. We provide details of interactions in following sections, but one thing important to mention is that the goal of this work and the research objective remained the same throughout the research. Related detailed research questions however, were refined and revised as the research progressed. The three worlds interacted and evolved to a maturity level at which the phenomenon studied was conceptually uncovered and the findings were established.

Logic of inquiry for the field study

The field study is considered part of the material world. The selection of the organisation was done carefully to meet requirements determined in advance. In particular, we applied strategic (theoretical) sampling technique to select the organisation (Lipzshitz and Strauss, 1997). In this sense, we needed to conduct research in an organisation which:

- must posses some practice concerning situated method development,
- must use a kind of standard ISD method in several projects (especially BPA type projects) and have some method use experience,
- should have implementation of various applications (preferably implementations of BPA)

- should be willing to cooperate with the researchers

An organisation that met these criteria would help us investigate situated method development in its full complexity. Consequently, an organisation was selected that would provide adequate empirical findings. The field study was conducted in a longitudinal basis and several research methods were used. Namely, the research methods were chosen according to their adherence to the overall epistemological basis of the research.

Evaluation Criteria for the Research

The criteria for the assessment of the research and applied strategy to meet them were: validity, transparency, reliability, triangulation, saturation, and theoretical and practical contribution (rigour & relevance)

Validity

Validity concerns with the truth or falsehood of statements in relation to a good fit between theory and 'reality'. Two central statements can be distinguished at a high level: theorizing situated method (that is, the foundation of method adaptation and a generic model for it) and the way to support method adaptation. Notice that quality of researcher as sensing instrument plays a critical role in evaluating such a fit. To sharpen this sensing skill, the researcher used several feedback mechanisms and adopted a triangulation strategy. For the proposed generic model, we provide it's analytical (i.e., using basic models in the literature) and empirical evaluations (i.e., using the case study). The reader may find details of this evaluation in chapter five, but especially for analytical evaluation, the authors of two basic models were asked to comment on the quality of sensing in this work while discussing their models in relation to the proposed generic model.

Reliability

This criterion concerns how replicable the study is (Remenyi et al., 1998). As Marshall and Rosman point out (1995), in the research where the phenomenological paradigm is adopted, research conditions are unique and occur at only a single point at a time. This means that by nature the research conditions cannot be replicable. Rather than pretend that the research can be conducted in a similar manner, it is important to establish a good audit mechanism to achieve transparency for the study. We aim for this by providing details of for instance, how we theorized situated method development and how we conducted the case. However, replication can be

achieved in terms of logic of inquiry mentioned above. In this respect, one can use the three empirical worlds the way we employed them. In particular, one can use both the literature and the case study to develop and illuminate the outcome of the research.

Transferability

Transferability addresses how well the research outcome can be transferable to or viable for the target audience. As noted, there are two types of target audience for this research objective: an academic community and practitioners. For the academic community we provide and discuss the research outcome in publications and several communities. For practitioners, the posterior study indicates that the research outcome was appreciated and employed by the case study organisation.

2.3 The Way of Working

This aspect concerns what steps were taken, activities were performed, and what means and techniques were used in this work.

The Research Process and Activities

Our intention with describing the research process and activities is not to provide full–fledged descriptions of how and what has been done, but rather to indicate how the interactions took place between the three material worlds. Figure 2.3 illuminates such interactions and key activities or outputs achieved along with the timeline between 2001 and 2005. The arrows and thick bar in the middle show material worlds. The arrows in the upper side and bottom sides of the figure show the material world of theory (that is, three clusters: cluster one referring to core cluster containing (Information Systems Development, Implementation), cluster two referring to supportive cluster containing decision-making and support, and cluster three referring to reference cluster containing sociology, philosophy of mind and linguistics) and the material world of practice. The bar in the middle indicates the social world and primary investigator's world.

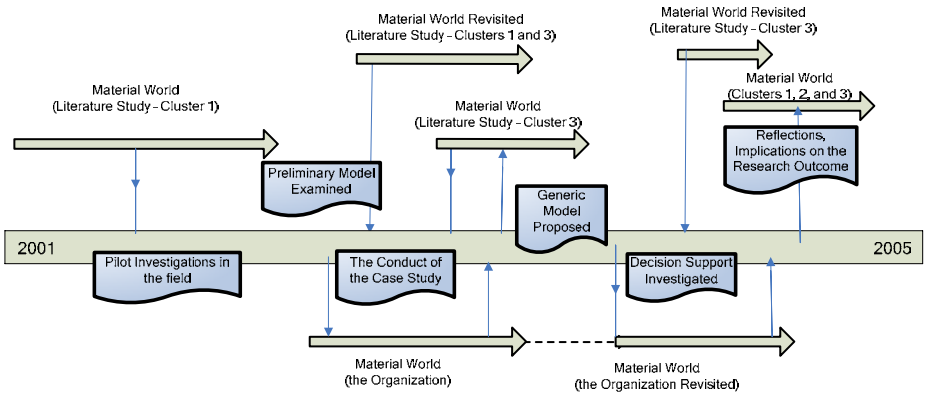


Figure 2.3 Overall research activities and interactions between theory and practice

As we began our investigation in the material world of theory, we tried to make sense of the existing body of relevant research. Formulation of the research questions, the identification of relevant studies, and gaining some practical insights via pilot investigations in the field were some of the activities performed at an early stage. As time passed, our theoretical knowledge was refined and became focused on certain dimensions of the subject matter (in chapter three, we explain these taxonomic dimensions). The conduct of the case enabled the primary investigator to mediate between theory and practice (see the vertical thick arrows connecting the material worlds). The researcher was actively involved in the practice concerning how situated method development was performed. The generic model was then induced based on interaction with theory and practice. Once this was done, we continued our investigation of how to support situated method development. We visited the other material world (cluster two) and observed rather than participated in the practice. Several revisits were done in the three material worlds. Finally, we stepped back from the practice and reflected on the research outcome.

The Techniques and Means Used

In this final section, we go into details of other research activities related to the case study. We provide certain insights into how the organisational settings during the case study affected the process of conducting the case study and selection of means for data collection, codification, and analysis and feedback mechanisms.

Organisational characteristics are important to understand the context of the research. They provide background information about the environment that might influence the study. In the field study the active involvement of the practitioners on the organisation side was appreciated, employed, and controlled. This characteristic had some effect on the research activities in the field. For instance, it was essential to determine an approach for the collection, analysis, and empirical materials.

This organisation implemented different kinds of applications in various project settings (e.g., customized and off-the-shelf enterprise systems, and large and small projects). Regarding the maturity level, there was a separate practice for situated method development. This included a group of method engineers, named 'coaches', procedures, and various artefacts (e.g. instruments, and applications).

We describe the practice concerning method adaptation in the organisation however, by using the language of the practitioners and analysing from the theoretical lenses, further explain method adaptation from our own perspective. The three-phase model (consisting of the preliminary, actual, and posterior phases and discussed in the last section) appeared to be appropriate because it allowed the researcher to better frame and focus on certain aspects of method adaptation (for the details of the research method applied for the field study see Appendix 2).

The *preliminary study* stage was helpful for several reasons:

- to assess the degree of the fitness between organisation motives and the research goal,
- to identify relevant sources of data,
- to understand a local 'reality' of the organisation and,
- to identify possible demarcation points.

The local reality of the organisation regarding situated method development was the core of the field study.

As mentioned in chapter one, this research uses the field study for establishing the foundation of and generic model for method adaptation in two ways: development and illumination. Regarding the development purpose, the field study has helped us to intriguing interplays between the key notions underpinning method adaptation. Regarding the illumination purpose, by referring the practice about method adaptation in the organisation investigated we have been able to show two levels of method adaptation as discussed in chapter five. In terms of the research method used, the second purpose has been realized by adopting interpretive research as we discussed in chapter five.

Table 2.1 The elements of the research method realized in the field study

Organisational characteristics	- An IS development department of one of the leading organisations in the financial industry - One standard ISD method - Substantial method use experience - Various BPA implementations - The organisation was actively involved in the research
Research design approach and specific techniques	- Qualitative Research along with Interpretive Paradigm - Action Research
Research process	- A phase model with three phases (preliminary-actual-posterior) - At each phase a number of activities concerning data collection, codification, analysis, presentation were repeated
Logic of inquiry and key activities	
Unit of analyses	A process or practice concerning situated method development; this process may involve people, instruments, and method fragments.
The goal of the field study along with two roles	- Development role: establishment of the foundation of method adaptation - Illumination role: An example of specific models or patterns of the generic model
Key research activities	In the conduct of the field study, answer the research questions in a manner that describes, analyses, and explains method adaptation: - What does the construction of a situated method (method adaptation) mean in the organisation? - What does decision-making support for the construction of a situated method mean in the organisation? - How can one support decision-making leading to a situated method?
Duration of the research undertaken	On-going research activities through one year
Timeline	Three months for preliminary study phase; one year (actual research) and one year for posterior phase, and a ten-year timeline for retrospective analysis
Approach for the use of empirical materials	Interpretive/ Narrative process
- Collection of empirical materials	- Interviews (open, semi- and structured) with several rounds of interviews - Questionnaires - Prototype and instrument - On-site work - Participant observation (actively involved in daily activities) - Presentations on the site to receive feedback from practitioners
- Codification /classification	- Audiotape interviews and transcribe - Relevant work practice at different organisational levels - Artefacts
- Analysis	- Mainly interpretivist approach where human is the instrument for analyzing data, especially myths, narrative and metaphor
- Presentation	- A case protocol
Sources of empirical materials	- Key informants (method stakeholders) - Secondary data - Artefacts (documents, tools)

We consider the local reality as a continuing and evolving practice rather than a discrete and mutually exclusive local reality. To see this evolving aspect of the local reality we traced backed a ten-year time line for the field study. The existing practice concerning method adaptation was illuminated and articulated along with the research activities concerning data collection, codification, analysis, and presentation in an iterative manner.

The scope of the *actual study* was narrowed and refined as we faced some demarcation points in the actual study stage. These are explained in chapter five. Due to a number of reasons (the high complexity of situated method development realized in organisations and the limitations of research resources available, and for purpose of the research focus) we had to focus on certain parts of methods, study a certain level of abstraction, and conduct interviews with certain people.

The posterior study was useful to update the subject matter. Several visits were made to keep communication alive between the researchers and the participants.

We adopted a qualitative research approach where certain interpretations have been realized in the conduct of the case study (see chapter five). We used action research as a technique to further analyse the reactions of practitioners to the developed decision support instrument based on the proposed instrument (Baskerville and Zmud, 1998). This technique was viable and necessary because the organisation's needs concerning the use of this instrument were immediate.

Regarding the use of empirical materials or qualitative data, we should mention the many countervailing arguments and criticism about the purpose and the way of using (i.e. collecting, codifying, analyzing, and presenting[xiv]) empirical material in qualitative research. Various approaches to qualitative data are distinguished in the literature,: for example positivists, linguistics, and interpretivist (Lacity and Jansen, 1994) or hermeneutics, semiotics, narrative and metaphor (Myers 1997). In fact, (Lacity and Jansen, 1994) consider hermeneutics, narrative and metaphor as types of interpretivist and semiotics as a type of linguistics. For this research interpretive orientation as an approach and narrative processing[xv] as a technique (Davidson, 1997) were suitable for the use of empirical materials. We provide a sample of an interview transcript and cross analysis of the interviews in Appendix 2.

This concludes the elaboration of what underpins the philosophical basis of the research method and how it was crafted and evolved throughout the conduct of this research.

CHAPTER 3: AN UNDERSTANDING OF SITUATED METHOD DEVELOPMENT

"Since in order to speak, one must first listen, learn to speak by listening"
- Rumi

This chapter first reviews the relevant literature studies, critically examines the basis of a number of selected studies, and concludes a need for theorizing situated method development (for which we formally introduce method adaptation along with its underlying notions). Chapter three employs the materials of the academic world and applies the stratification model[xvi] for reviewing relevant research. In doing so it provides an answer for the first research question analytically[xvii].

The stratification model used in this work has four modes of the analysis of relevant research (see Figure 3.1): (i) a *classification system* which includes generic categories of those studies having affinities with method development and situated method development in particular; (ii) a *taxonomy* which reflects basic dimensions for studying method adaptation. With these dimensions we show the focus of this research and characterize a number of selected studies; (iii) a *conceptual system* in which we critically examine the conceptual elements of a few selected studies; and finally (iv) a *theoretical system* which includes a generic model along with a number key constructs and their relations.

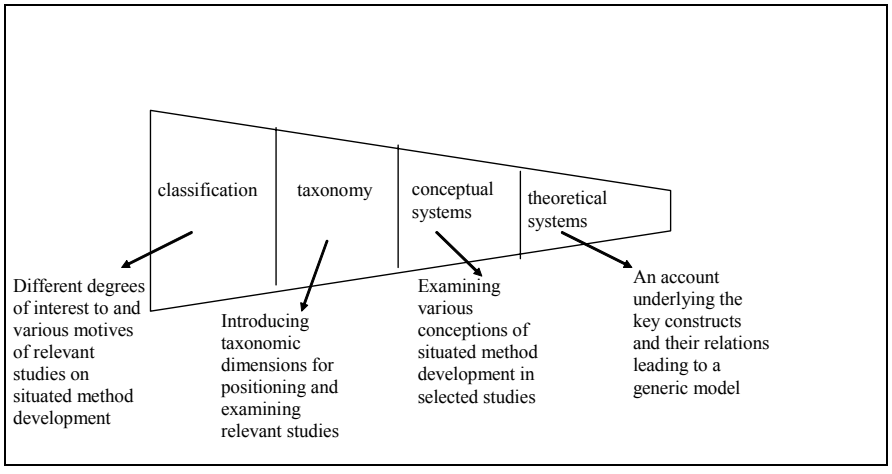


Figure 3.1 The stratification model for the review of existing studies

This chapter includes only the first three modes of the analysis of relevant research (classification, taxonomy, and conceptual systems); chapter four includes the last mode, the theoretical system. In this chapter we seek to answer the following research question:

What does situated method development mean in the relevant literature?

We also discuss the underlying decision support approaches attached to prevailing models proposed for situated method development, which concerns with the second research question.

As Section 3.1 reveals, there is a need for a conceptual discussion about the key terms used in this work. We explain our understanding and definitions of them in Section 3.1. It is necessary to have common grounds for the review discussion and to avoid any misconceptions concerning key terms used in this work.

The structure of the remaining sections is explained below in conjunction with the stratification model. Table 3.1 summarizes certain elements of the stratification model for the literature review (the purpose of each review mode, the codification schema and criteria used, and the outcome of each review as described in the associated section(s)). We elaborate on these elements in each section.

Section 3.2 and 3.3 correspond to the classification mode of the applied stratification model. In the second section, we briefly discuss those studies providing a review of the relevant literature concerning method development. We also explain our own way of conducting the review of relevant research. The third section introduces a classification system that reflects a broader review of those studies concerning method development and situated method development in particular. We see that it is possible to cluster relevant research in certain research streams or bodies of knowledge (BoK). A quick scan analysis of the relevant research is provided by using a number of criteria such as the motives, phenomenon of interest or research theme, research orientations, metaphors, specific findings, and connections with related studies and associated researchers. This section leads to a number of selected papers[xviii] that are subject to close examination in Section 3.5.

Section 3.4 corresponds to the taxonomy mode. In this section, we propose a number of taxonomic dimensions. These are level of abstraction, knowledge types, adaptation situation, aspects of a situated method, method adaptation stages, and decision support aspect.

Table 3.1 The summary of elements in the stratification model for reviewing method development-related studies

Modes of the review done	**Purpose (why)**	**Criterion (How) and codification schema**	**Outcome (What)**
Classification *Sections 3.2 and 3.3*	- Make sense of relevant studies - Provide an overview of relevant studied related to the subject matter	- Motives (is any decision support addressed or not? - Phenomenon of interest - Label or metaphor - Co-citation or colleagues or reference literature	Three research streams - ISD - Method engineering - Implementation
Taxonomy *Section 3.4*	- Provide a more refined list of studies which are essential to the this work - Present the interested dimensions of studies that are eventually be used for the positioning this study	- level of abstraction - Knowledge types - Adaptation situation - Aspects of a situated method - Method adaptation stages - decision support aspect	Taxonomic dimensions used in Section 3.5
Conceptual system *Section 3.5*	- Critically examine selected few studies from conceptual point of view - Show the need for generic model to uncover the basis of method adaptation	- Sensitising notions, presuppositions, approach - Key constructs - Relations (propositions, hypothesis - Limitations	Prevailing models examined
Theoretical system *Chapter 4*	Propose an account with its key constituents for method adaptation	- Comparison of the proposed account with the studies elaborated at the conceptual system level.	- Theoretical account (Foundation) - Key constructs and their relations - A generic model

Section 3.5 corresponds to the conceptual system mode. In the fifth section, we focus on the prevailing models proposed for situated method development in terms of the taxonomic dimensions introduced in Section 3.3. We emphasise the sensitizing notions, presuppositions, key constructs, relations, and limitations of prevailing models. Finally, we contend that situated method development requires in-depth analysis of what accounts for it and what essential notions underlie its theoretical basis.

This chapter helps us exploring the idea of method adaptation along with relevant accounts in the reference (human decision-making and decision support literature) and supportive (sociology, cognitive psychology, philosophy, linguistics) clusters in the next chapter. This leads to theorizing situated method development and eventually introducing method adaptation and its foundation in chapter four.

3.1 On the Conceptions of Key Terms

Discussion of the meaning of situated method development requires an agreed terminology by which we can convey our messages. Such a terminology is especially necessary for this work because we have examined various studies in different research domains of the IS field. We first briefly discuss why and what variations of the key terms are present in the IS field, and then present their definitions together with some explanations.

In the information system (IS) research field, we see that meanings attached to terms vary and reflect the researchers' conceptions. By conception we mean interpretations of terms in a researcher's mind, possible in a specific research context. It is not surprising to see that conceptions of the terms across research fields (e.g., IS, Operation Research) and even IS research domains (e.g., Business Process Re-engineering (BPR), Management Information System (MIS)) vary and are sometimes even contradictory. In this respect, IFIP announcement is worth considering:

> There is a growing concern within IFIP WG 8.1 about the present situation, where too many fuzzy or ill-defined concepts are used in the information system area. Scientific as well as practice-related communication is severely distorted and hampered, due to this fuzziness and due to the frequent situation that different communication patterns associate different meanings with one and the same term. (The first manifesto in IFIP (1988))

Researchers comment that this vagueness is not surprising because the IS field is inchoate and continuously borrows notions, models, and conceptual elements from other fields and sciences (management, engineering, philosophy, etc.). Researchers also often use terms as a matter of conventions or taste and want to give special meanings or assert their own interpretations as unique contributions to the subjects investigated. The domains where this research has been conducted are not free from this fuzziness.

Consider the terms *method* and *methodology* to as an example. (Iivari, Hirschheim, and Klein, 2001) note that in North America and other Anglo-Saxon countries, *methodology* has a similar meaning to how European researchers use the term method. If we consider context-free meaning (i.e., according to etymology) of these terms, we see 'method' and 'methodology' come from Greek, the former means "way of investigation" or "the planned way of doing something or the procedure for obtaining an object" and the latter means "the study of systematic methods of scientific research"[xix]. Scholars including Brinkkemper (1996) and Stamper (1987) already mention

a clear conceptual difference between the terms and encourage researchers to use them properly in their research.

> I use the term 'methodology' under protest bowing only to customer usage. It would be better, as in the philosophy of science, to speak of 'methods' when referring to specific ways of approaching and solving problems, and to reserve 'methodology' for comparative and critical study of methods in general; otherwise this vital of field of study is nameless (Stamper, 1987).

> The misuses of the term methodology standing for a method is a sign of immaturity of our field, and should consequently be abandoned. (…) Nevertheless, some methodological schools can be distinguished: the software engineering world its roots in the programming traditions, the MIS area from business schools, and the socio-technical approaches. (S. Brinkkemper, 1996, p. 276)

There are some attempts to uncover various conceptions of terms in the IS field or in particular subject area. For instance, an endeavour was sponsored by IFIP and resulted in what is called 'A Framework of Information Systems Concepts' (FRISCO) (Falkenberg et al., 1988), which provides definitions of key terms used for IS and explains their preferred conceptions by referring to several fields such as organisation science, computer science, system science, semiotics, and philosophy. Another attempt is Cronholm and Ågerfalk (1999)'s work to provide a model; it integrates various conceptions of the terms related to method engineering. Aside from some ontological problems with the proposed conceptual models and frameworks (Iivari et al., 2001) these endeavours have not paid off as we see researchers continue to use the terms without any reference or without providing clear cut explanations and definitions. It is not really an issue if the researcher has *preferred* paradigms behind the conceptions of the term, but it is important to be clear about the paradigms held. It is this preference that influences the researcher's understanding of the term and the subject investigated. For instance, Baskerville and Stage (2001) mention the presence of two 'styles' or paradigms of researchers studying method engineering-related topics: the *positivist* views on natural sciences and the *interpretivist* views of social sciences. He states that, "Instead of positivist-style of method "engineering", interpretivist social science would seek an adaptive methodology that would open accommodation of soft, ill-structured issues like culture and politics" (Baskerville and Stage, 2001, p. 15)

In a certain research context different styles and conceptions may not be contradictory. They can be complementary and enhance the researcher's understanding of the term as long as one provides sound arguments behind a

multi-view or eclectic approach. However, the involvement of different paradigms for the conception should be managed carefully otherwise one can be faced with a philosophical debate on 'incommensurability'[xx]. This debate seems to be an important basis for understanding and dealing with paradoxical bases mentioned in Poole and Van de Ven (1989), but is outside the scope of this section's discussion.

Different conceptions of terms in the IS field exist and are likely to be present in the near future. To avoid vagueness, we apply the following principle throughout this work: if the key terms used in this research are defined in relevant literature (the IS Development, Method Engineering, Implementation literature), we first check its use in its own context and see whether it is used properly according to etymology. It is not our task to question its use in a specific study, but it is important to know whether or not its use and meaning accommodates our conception and is appropriate to the context of this work. If so, we surely give the reference to the study; if not, we will provide our definition and provide a short elaboration of the term. Figure 3.2 depicts key terms that we discuss below. We begin with the basic term 'information system'.

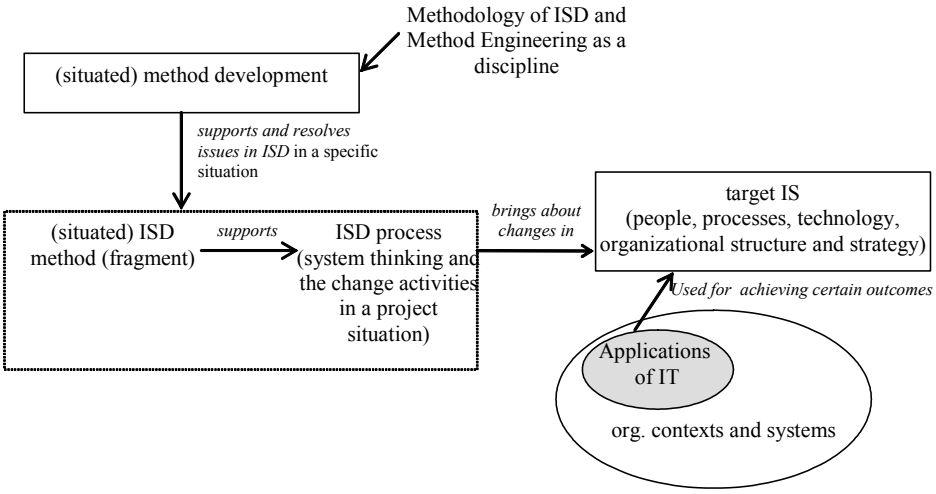


Figure 3.2 The key terms discussed

An **information system** is a sub-system of an organisational system whose main function is to provide support for user decision-making and action in a working system[xxi]. The constituents of an information system and their relations are very much dependent on the account that a perceiver

(researcher and/or practitioners) holds. Researchers intend to distinguish constituents in terms of components (e.g., the organisational, technical, software and data components (Stegwee, 1992, p.15) views (e.g., information, process, behaviour, organisational (Slooten, 1995; Zachman, 1987), or domains (e.g., technology, language, organisation (Lyytinen, 1987). Of course, people, collectives (like department or groups), and all kinds of artefacts (e.g., technology including computers, hardware, software, documents describing rules, formal structures, procedures, and data) are included, but their analytical distinction blurs when one considers the *structuring* and the *use* of artefacts[xxii] that bring about a new conceptual constituent[xxiii]. One can find various types of IS such as business information systems, management information systems, decision support systems.

Part of an information system can be manual or automated by technological means. An automated part of IS refers to a **computerised information system** or an **application** of IT. Some applications are ready-to-use, though further customisations are still possible to meet the special needs of an organisation. These are known as packaged-applications or commercial-off-the-shelf applications. There are others often called custom- or tailor-made applications because they claim to be customer-driven and developed from scratch. Our work concerns those applications specifically aimed to support business processes within or across organisations regardless of whether they are packaged or tailor-made. Business processes are part of the work systems which constitute the whole organisation as a system (Alter, 2002). A business process can be viewed as a structure of activities designed for action with a focus on the end customer and the dynamic management of flows involving products, information, cash, knowledge and ideas (Stock and Lambert, 2001). Those applications that support business processes are called **Business Process Applications** (BPA)[xxiv].

Information systems development[xxv] (ISD) is a *change process* taken with respect to *object systems*[8] in a set of *environments* by a *development group* to achieve or maintain *objectives* (Welke, 1981)[xxvi]. This process includes well-known phases of a development project such as analysis, design, construction, deployment, use, and after use of the information system. Such a process embodies people, development activities, artefacts, and methodical means, and is configured based on working principles and design options concerning aspects of IS development (the way of thinking, working, modelling, supporting, and controlling (Seligmann et al., 1989; Wijers, 1991)) needed in an ISD project. Realization of ISD takes place in a project situation. By a (project) **situation** we mean the *perceived* 'reality' or state of affairs *one* holds in a given (*project) context* at a particular moment in the work system[xxvii]. Given the complexity and uniqueness of information

systems development, ISD needs to be supported by methods, tools, and techniques.

One can treat methods, tools, and techniques (MTTs) as *methodical means* and/or *intellects* – that is, possessing certain viewpoints on thinking about IS and ISD, which supposedly aim to support practitioners for effective and efficient development of an IS. As methodical means the focus of MTTs is on their practical use; as such they can support practitioners' actions during ISD. Besides practical use, one can look at implications in the context of human thinking related to development activities. In this sense, MTTs interact with their users and such interactions can be seen as a hermeneutic – that is, interpretative - processes (Introna and Whitley, 1997). This has to do mutual understanding augmenting and structuring their way of thinking about IS and ISD. MTTs are just instruments, but along with this interaction they have another role and posses certain "intellects" and even aim to convey certain thinking about IS and ISD. As such, MTTs have their own reasoning mechanism or understanding of whatever MTTs are supposed to do. It is this understanding that gives MTTs power to influence the way of thinking held by the practitioners in the course of action during ISD[xxviii]. It is this fact that gives MTTs a special role in the development of human intellects[xxix].

We speak of '**methodology of ISD**' as the systematic description, explanation, and evaluation of all aspects of methodical and amethodical information systems development[xxx]. Kumar and Welke (1992) recognize the need for a school of thought to study MTTs. Later on, Brinkkemper (1996) defined **method engineering**[xxxi] as "a *discipline* to analyse, design, construct, and adapt methods, techniques, and tools for the development of information systems"[xxxii] (*emphasis added*). We use the term **method development** to refer to such analysis, design, construction, adaptation, etc. As the main subject of this work, situated method development is a specific activity of method development. Those (human or non-human) agents involved in situated method development have stakes in a situated method. We use the term method stakeholder to refer to such agents; other alternative terms are 'IS experts or IS specialist' (Iivari et al., 2004), 'ISD professionals' (Goulielmos, 2004), or 'method engineers' (Harmsen, 1997; Brinkkemper, 1996; Slooten, 1995; Tolvanen, 1999).

It is noticeable that the terms 'IS development' and 'method development' are conceptualised in a similar manner in this work; it is not a coincidence in that the development of IS and the development of a (ISD) method are by nature done in parallel and their developments are folded together. We should note that method development can be either merely done by taking into account a priori project situation or can take place in the actual development of IS. In the former case, the method is developed in a

normative or prescriptive manner and in the latter case it is seen as an emergent property of IS development and developed in parallel with IS.

At this point, we should note that an ISD method is different from technique and tool in many respects (e.g., its role, the nature of its content, it representation, its scope, formalisation). In Method Engineering (ME) literature, formalisation and abstraction of the constituents of an ISD method in general and its modelling techniques in particular, are acknowledged as essential to the progress of the school (Wijers, 1991). Compared to technique and tool, the scope of a method is usually broader, its intellects are more abstract, less formalised, and it might be more essential to human thinking and acting in ISD. The constituents of a method are structured along with its own underlying framework or taxonomy[xxxiii]. The relevant literature contains numerous such frameworks (e.g., Essink, 1988; Sowa and Zachman, 1992; Slooten, 1995). As such, a method contains models, concepts, notations, procedures, modelling techniques, tools, etc. We briefly explain these terms below.

A **model** is a purposely abstracted, clear, precise, and unambiguous conception (Falkenberg et al., 1988). The process leading to denotation or specification of a model is called **modelling** (Stegwee, 1992). This modelling process is structured and guided by **modelling techniques**. Brinkkemper (1990) defines modelling technique as a modelling procedure and a corresponding notation to carry out a certain type of modelling activity. **A meta model** is a conceptual model of a modelling technique; as such, it captures the static and dynamic aspects of the technique called meta-data model and meta-activity model respectively. The process leading to denotation or specification of a meta model is meta modelling. In other words, **meta modelling** is the process of the conceptualisation of a modelling technique and is used exclusively for the formalisation of ISD (Wijers 1991; Brinkkemper, 1990). Three categories of techniques for meta modelling are distinguished by Brinkkemper (1990): formal techniques for which the syntax and the semantics are rigourously defined (e.g., petri nets, Z), structured techniques for which the syntax is defined and have precise rules that define which constructs are allowed (e.g., data-flow diagramming), and finally informal techniques for which there is no complete set of rules to constrain models created by the technique (e.g., natural language)[xxxiv]. Because we are concerned with the adaptation of the ISD method to a project context at a generic level, we do not go into details of the adaptation of its modelling techniques but will later show that notions related to modelling techniques are still useful for this work.

In addition to the ME research school, the ISD research school also studies ISD method with different conventions and conceptions. For instance, one of the often-cited definitions of the ISD method[xxxv] is:

> A coherent collection of concepts, beliefs, values, and principles supported by resources to help problem-solving groups to perceive, generate, assess, and carry out, in a non-random way, changes to an information situation (Avison and Wood-Harper, 1990)[xxxvi xxxvii.]

The term resources here may refer to collections of procedures, models, techniques, product descriptions, and tools. Consistent with this definition, methods by nature reflect their creators beliefs and principles on the very notion of information systems, aspects of IS development (the way of thinking, working, modelling, supporting, and controlling). With this definition researchers, including (Wijers, 1991), argue that users of a method can be considered problem-solving groups and that may imply that ISD essentially consists of problem-solving tasks. In fact, by going a step further, one can argue that ISD itself is a problem-discovery and/or problem-solving process (Verhoef and Hofstede, 1995; Offenbeek and Koopman, 1996). Indeed, Van Offenbeek and Koopman (1996) holds this idea and suggests that,

> In terms of systems theory we would call this [the establishment of which parts of the organisation the work of project team is directed] the definition of the "problem system" (Checkland, 1981). The problem system is that part of reality at which the innovation is directed. Using this terminology, the project itself can be seen as the "problem-solving system (Offenbeek and Koopman, 1996, p.167).

The issue here is that most methods are based on the given problem and solution and reflect their creators' ontological and epistemological commitments regarding the problem and solution, and/or the way in which a problem and a solution are identified, articulated, and formulated. Specifically, method creators presuppose and suggest *what* defines problems, solutions, *how* to solve the problem, *what* steps to take, and *how* to perform those steps. They also should, but possibly *rarely do,* suggest the reasons *why* to adhere to 'what' and 'how'. There is usually little empirical evidence to show any claims with respect to "why" (Wedemeijer, 2002). In this sense, method creators hope that method users share and realize their commitments in work practice. This hope may fall short with breakdowns between method and its users. Certain researchers go a step further than referring this failure of commitment and question to the necessity of using a method. For instance, Truex, Baskerville and Travis (2001) introduce the

term 'amethodical' and Introna and Whitley (1997) use the term 'against method-*ism*' to stress the limits of method and its breakdowns in work practice.

Given the limitations of the existing definitions of **method**, we use its simplest yet broadest meaning, as such it refers to "an explicit way of structuring one's thinking and actions" (Jayaratna, 1994). A method consists of what Baskerville and Truex (2000) and Harmsen et al. (1994) called method fragments though the conceptions of the term in the two studies are fairly different[xxxviii]. To accommodate a broader meaning of this term we simply consider two kinds of **method fragments**: structured method fragment which is any element of a *prescribed* method and unstructured or innovated method fragment which is interjected in a project situation and becomes part of a *realized* method. Fragments can be principles[xxxix], fundamental concepts, models, products to be delivered, activities that need to be performed, job aids - techniques, tools, hints, tips - to be used, etc. A method contains descriptions of processes and products involved in the related class of ISD practices.

A method (fragment) tuned to a specific project situation is called a **situated method (fragment).** Method fragments are selected, modified, and configured along with, for instance, scenario aspects Harmsen et al. (1994), or certain route map fragments (Slooten, 1995). An **ISD approach** containing descriptions of certain route map fragments and scenario aspects provides intellection basis (essentials) of an ISD method (Hirschheim, Klein, and Lyytinen, 1996). This approach answers 'why/how/what/' at a more generic and essential level and facilitates answering 'why/how/what/' of the selection, design and modification of the method fragment at the tactical and operational level in the language of Van Offenbeek and Koopman (1996). Consequently, relevant method fragments for the adopted ISD approach are subject to their fine-tuning to the project context. It is this fine-tuning[xl] that we aim to support and as a phenomenon, we entitle 'method adaptation', considered a socio-cognitive human decision-making process. As such, as we provide it as conjecture in chapter four, **method adaptation** is a process or capability in which (human and non-human) agents determine a situated (ISD) method for a specific project through responsive changes in, and dynamic interplays between, a context, an agency, and a method fragment.

3.2 Existing Review Studies Concerning Method Development and Situated Method Development

The subject matter of this work is *situated method development* or in our terminology, *the phenomenon of method adaptation*. It is an essential part of

method development because by nature every method development is subject to "its situation appropriateness". Existing studies apply different orientations and conceptions for *method development* and *situated method development* (shortly, (*situated*) *method development*) and use different terms, models, and approaches. This motivates us to conduct a review of studies relevant in a broader sense (for the list of reviewed studies, see Appendix 1). We aim to make sense of the academic endeavours concerning situated method development. By the term 'make sense' we mean to discern certain orientations adopted by studies that concern ISD method analysis, construction, modifications, and use in the IS research literature. In fact, any researcher whose work has some interest in method engineering may have the 'sense making' section in her study, but here we only mention those studies that specifically focus on sense making of academic endeavours concerning (situated) method development. we provide briefs of the review studies conducted by Avison and Fitzgerald (2002) concerning the progress of ISD research, Truex and Avison (2003) concerning the historical movements of Method Engineering (ME) research, and Tolvanen, Rossi and Liu (1996) concerning a review of ME research. To further focus on situated method development, we examine studies providing classifications of dominant orientations (approaches).

The Progress of ISD Research

Avison and Fitzgerald (2002) reflect on the progress of ISD research over the past 15 years. They mention three eras of ISD methods: the early methodical era (until 1988), the methodical era (until 1995), and the era of method assessment. At the end of the methodical era, researchers studying ISD methods questioned and 'listened to' what the field really needed, how practitioners felt about methods, and how they dealt with ISD from a method use perspective. They mention a number of reasons why organisations have not adopted methods, some relevant to this work: failure to deliver the promise of method regarding productivity, the complexity of the method in terms of levels of detail and abstraction, lack of skills to use method, limitation of the tools embedded in methods, one-size-fits-all issue, inflexibility of the method, goal displacement (a shift from methodical support to method adherence as the goal inherited in the method), a limited built-in understanding in the methods, and insufficiencies regarding social and contextual issues. It is not our intention to discuss all findings in Avison and Fitzgerald (2002) per se, but one thing worth noticing is that the relevance of exposed methods to practice has been undervalued and not studied thoroughly until 1995.

Historical Movements of Method Engineering

Truex and Avison (2003) discuss the historical development of method engineering. They claim that the existing approaches for (situated) method development need certain adjustments to meet the needs of contemporary IS development. They distinguish five types of approaches representing the existing approaches and suggest two more types as future directions for (situated) method development. These, they claim, are different in terms of the focus or model embedded in the approach, their intent, their value added aspect, their orientation, and metaphors used. The types can be summarized as follows:

For Type I, the focus is singular and aims at a standardized approach to engineering method. The added value is to bring order to chaos in ISD and its orientation is 'technical'. The scope or content of a method is constructed for one ISD aspect. The metaphors for this type are "modelling data or processes".

Types II and III are similar to I in terms of focus, intent, and orientation. These three types differ in the added value aspect in that type II brings a general, universal, complete method and type III is more technically capable to realize a 'meta-model' for integrating different parts of the designed method. The scope or content of a method covers more than one aspect. The metaphor for type II is "modelling data and processes". The metaphor for the type III is "modelling various systems components".

Type IV uses contingent frameworks to provide guidance on why and how to modify a method for a project. The orientation here is social and organisational as well as technical. The metaphor for the type IV is "modelling the proper match of components".

Type V focuses on ERP to configure a method that helps customize the organisation to the system. The metaphor for this type is "modelling the ideal organisation".

Type VI is called "post ERP (within ERP structure)" with the intention of customizing organisation and system needs continuously. The added value here is a technical system that fits in with the organisation (not the other way around), emergent contingency, and gain of control. The orientation is organisational and technical and the metaphor for this type is "modelling the system for the ideal organisation". The last type, VIb, is considered as "post ERP (outside ERP structure)" with the intention of integrated subsystems functioning across organisational boundaries. The orientation here is 'true' organisational and the metaphor for this type is "modelling the whole organisation (knowledge, history, and type)".

A Review of Method Engineering Research

(Tolvanen et al., 1996), review method engineering research based on two dimensions: the contexts of ME studied and the research methods applied. What they mean by the context of ME is in fact similar to the three contexts of ISD: the technical, language, and organisational contexts (Lyytinen, 1987).

With regard to the first dimension, the technical context refers to how to efficiently process and store data or sign related concerning method development in some material carriers. As the term suggests, the language context refers to the development of languages for method development. The language context has been the most studied context and is further analysed in terms of four research topics: metamodelling formalisms (Hillegersberg and Kumar, 1999), integration of methods, evaluation of methods, and representational paradigms of ME languages (i.e., supporting a multiparadigmatic representational metamodelling environment- e.g., metaEdit+ and metaCASE (Kelly, 1994)). Located in the group of the organisation context of ME, the research refers to the study of human activities, interactions, and other work practice for method development in its organisational context.

The second dimension includes the research method applied in a study. They identify the following research methods as relevant to method engineering: survey, field study, case study, action research, applied, basic, and normative research[xli].

Their review includes more than 50 studies in method engineering, but the subject matter is more about tools and techniques-related method engineering issues rather than method development. They show that most of the studies reviewed focus on technology and language contexts rather than the organisation context whereas non-empirical studies are dominant in the method engineering. They conclude that,

> For the field of method engineering to progress, we must widen the range of research method we use. More empirical studies are needed to investigate the applicability of tools and languages developed. (….) Again, empirical studies are needed for obtaining a comprehensive view of ME approaches. (Tolvanen et al., 1996)

We believe that our work is more close to the type of studies that focus on the organisational context along with a field study, and the action research method. Their review shows that in the organisation context, the only study in which the case study research method is used is Van Slooten (1995). They argue that typical research questions are: what are the tasks and positions of method engineers? What strategies are applied in ME

efforts? Why are in-house methods developed? What are the requirements for in-house methods? How is method evolution managed? What kind of tasks and decisions are made during ME?

So far we have discussed certain review studies in ISD and ME literature. It is striking to see that both research domains point out the need for conducting certain matters of method development (such as the organisation aspect of method development and empirical investigation), which have been undervalued in existing research. As we see in Chapter 4, this work is oriented towards this need and answers just the kinds of questions mentioned above. In doing so, we aim to contribute to endeavours concerning the need for changing the research direction in ME from the technology and language contexts to the organisational context, from the mostly applied research methods such as normative, laboratory, and survey to the required research techniques such as field, case, and action research.

Classification of Approaches for Situated Method Development

Kumar and Welke (1992), and Van Slooten (1995) have provided classifications of the approaches to method development. They argue that the "method engineering approach" in Kumar and Welke's terminology and the "situated method engineering" in Van Slooten's terminology are promising approaches for method development. Additionally, Harmsen's (1997) and Tolvanen's (1998) classifications are specifically for situated method development.

Harmsen et al. (1994) positions various approaches in what they call a "situational method spectrum". These are termed as:

> …use of rigid methods, selection from rigid methods, toolkit/multiview approach, paths within one method, selection and tuning of method outline, and modular method construction (p. 30).

These approaches are differentiated in terms of their degrees of flexibility. For instance, the use of a rigid method approach allows the least flexibility or even no flexibility, does not permit any adaptation, and suggests the method use as prescribed; modular method construction as the most flexible or most radical solution, suggests selecting, modifying, and assembling prescribed method fragments to achieve an effective, efficient, complete, and consistent "situational method". The development of such an approach is central to Harmsen's thesis and he calls this situational method engineering.

Tolvanen's (1998) classification uses criteria applied to achieve the methodical requirements of ISD. The key criteria identified are contingency-

based, problem-based, and shareholder value-based. A dominant approach mentioned in the Harmsen's and Tolvanen's classifications is the 'contingency-based approach'.

Van Offenbeek and Koopman (1996) reviewed 17 studies which adopt the logic of 'structural contingency model'. In her review study, she presents a list of "seventeen frameworks for choosing an SD (system development) approach". She evaluates the extent to which these frameworks (sometimes she calls them models), support three activities in choosing an SD approach: "diagnosing contextual factors", "describing alternative approaches", and "matching context and approach". She also assesses whether two other issues (social and organisational issues; supporting a dynamic fit between context and approach) are addressed in the reviewed frameworks. Regarding contextual factors, models either have a limited view of certain aspects of IS or consider too many factors making it difficult to test the models empirically. As for alternative approaches, six models offer a typology of SD approaches, five describe one or more dimensions on which an SD approach can vary, and three provide no particular approach. Concerning matching and context, most adopt a similar model as described in (Davis, 1982) and one, (Hirschheim and Klein, 1992), is descriptive in nature and lacks guidelines for this activity. The models reviewed are insufficient regarding social and organisation issues and dynamic fit. She summarizes her review by stating "no model fulfils all five requirements, and in general, more empirical testing is needed". She proposed "a dynamic fit model" examined in detail in Section 3.5, to overcome the challenges of existing contingency-based models. As we see in Section 3.5, a similar attempt has been made by Van Slooten (1995) in proposing "the configuration procedure for a scenario model".

The review studies summarized above provide limited "sense making" about the classification of relevant research. The articulations are partial in that they are limited to their schools of thought. They also lack focus on understanding what accounts for situated method development. There is a need for a classification of studies broader on incorporating ideas on situated (method) development in various domains, yet puts special emphasis on situated method development. To do this, we visit not only ME and ISD literature, but IS implementation literature that provides insights into the course of implementing (situated) method in an empirical setting.

3.3 Classification of Situated Method Development Related Studies

At a high level, we distinguish three research domains (the ISD research, Method Engineering, and Implementation research domain[xlii] (see Table 3.2)) that contribute to an understanding of (situated) method development (see

Figure 3.3). The ISD and ME research domains provide insights into the way or process (situated) method development takes places. The ISD and Implementation research domains help us employ the content of such a way (including characteristics and/or elements used in this process). This work is primarily concerned with the process of situated method development, but also addresses how the process is realized.

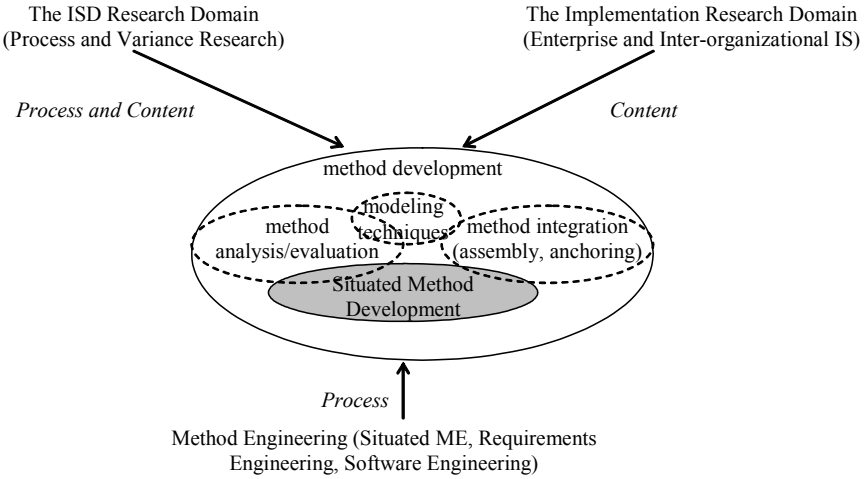


Figure 3.3 The contributions of the three research domains to an understanding of situated method development

Having stated the contributions of the three research domains, we examine them by using certain elements of the codification schema. The domains differ in terms of motives, the phenomenon of interest, the label or metaphor used, and associated researchers. Table 3.2 summarizes differences among three research domains.

Table 3.2 Classification of (Situated) Method Development Related Studies

The Research streams	Motives	Phenomenon of interest	Metaphors or Key Terms used	Proposed ideas, theories, or alike for method development	Examples of Associated Studies
The ISD Research					
Variance Research	To identify the antecedents of method and ISD and their implications on better IS use in an organisational setting	- Analysis and evaluation of an approach, a method - Description of ISD with an emphasize on a socio-organisational dimension of the development process - Selection of MTTs by using contingencies of a project situation	approach determination, contingency-based approach, techniques, tools selection	- Models for the selection of MTTs - Factors influencing the determination of ISD approach - Success/failure factors in ISD - Evolution of ISD in practice and academy	Iivari at el., 2001; Lyytinen 1987; Avison and Fitzgerald, 2002
Process Research	Examining a rich picture of the basis and development of IS	Elements of method Intellectual structures of method Aspect and levels of method Characterization of ISD Experienced-based method dev.	emergent ISD, emancipation, fitness of approach to a project context, amethodical, against methodism, design ideals for a method	- Frameworks or taxonomies for characterizing ISD and/or methods - Approaches or models for determining the ISD approach	Introna and Whitley, 1997; Truex et al., 2000; Lanzara and Mathiassen, 1985; Offenbeek and Koopman, 1996
The ME Research					
Situational or Situated ME	Supporting situated method development	Design, construction, assembly of components of, maintenance of a method	Route map, scenario, tailoring, approach determination	- Models for the selection, modification of MTTs - Formulize the constituents of a method	Baskerville, 1996; Slooten, 1995, Harmsen 1997; Punter and Lemmen, 1996; Tolvanen, 1998
Requirements Engineering (RE)	Supporting RE activities by selecting and/or creating MTTs	Analysis of and support for the process of the selecting MTTs developed for RE	Selection of MTT, tool-box based selection design rationale for RE	Contingency-based selection of MTTs used for RE	Hickey and Davis, 2004; Davis, 1982; Ramesh and Dhar, 1992; Jarke et al., 1994

Software Engineering (SE)	Supporting SE at later stages (construction, maintenance, etc.) by MTTs	Analysis and development of software engineering method	Tailoring, balancing agility and planned approach, spiral model	- Risk-based model for SE method, tailoring or customizing method - A list of software project risks	Schmidt et al., 2001; Boehm and Turner, 2003; Lycett et al., 2003; Tekinerdoğan and Akşit, 2001
The Implementation Research					
	Understanding problems regarding the use of IS and examining IS implementation in organisational setting	IS use, socio-organisational implications of IS, implementation approach, Implementation of Enterprise Systems (ERP, CRM,) and IOS (E-commerce applications	Plan approach, Phase models, Mapping of MTTs of BPR	- A Process theory of ES success - Situation-Activity Framework for BPR - A Taxonomy of ERP implementation	Markus et al., 2000; Kettinger et al., 1997; Parr et al., 1999; Kumar and Hillegersberg, 1999; Muntslag, 2001

ISD Research

The main motives in ISD research are to improve IS and ISD, and to reveal and resolve issues concerning them. The ISD research includes two kinds of research focusing on IS, ISD, and ISD method: the variance and process research[xliii]. The variance research aims to build and/or test a model by which cause-effect relationships among dependent, independent, and mediating factors essential to the subject matter are studied. In contrast, the variance strategy is used to study the phenomenon as a process, a number of events, actions, or episodes that occur in an actual setting where the phenomenon is realized and observed. Sabherval and Robey (1995) state,

> …process research requires data about the dynamics of ISD, which may be obtained through longitudinal or retrospective research methods. Rather than "explaining variation" in outcome variables by identifying significant predictor variables, process research seeks to "explain" outcome states as the result of a preceding sequence of actions (p. 304)

The variance research is designed to specifically identify success and risk factors in ISD whereas the process research strategy is applied to reveal underpinnings of ISD and its constituents by proposing frameworks, models, and approaches for ISD.

The variance research is geared towards studying methods in terms of a number of characteristics or dimensions, to identify the effects of dominant characteristics related to application, project environment, etc. the use of ISD method, selecting methods, tools and techniques. The process strategy studies why and what a method should strive for in the ISD, what constitutes ISD method, how the method should or is used in practice, what/why limitations of a method are encountered, and what can be learned from practice. The process researchers, including (Truex et al., 2000), hold a position that allows them to critically examine the essence and functioning of a method in the ISD. To pinpoint such a critical view, they use metaphors or terms like amethodical, against methodism, fetish of technique, emancipation, and transparency. Their research is about the understanding of a method by proposing frameworks or taxonomies of approaches to ISD.

The idea of a critical examination of method is articulated by Hirschheim and Klein (1994); they call it "critical reformulation" of an ISD method. Critical reformulation proceeds in two steps: (1) assumption analysis that identifies the basic building blocks and reveals the dependence of their validity on the acceptance of underlying philosophical perspectives, and (2) the proposal of improvements for overcoming limitations inherent in the

assumptions. The contribution of the critical reformulation process is that it offers a way of testing whether the knowledge base captured in a method is as adequate and penetrating as possible. Hirschheim and Klein (1994) contend that,

> We know of no other way to achieve such a testing but by relating the core principles of a method to the current state of informed opinion about the factual and normative content with which the method deals. This is exactly what we mean by critical reformulation. It is only thorough critical reformulation that the connections between the procedures of a method and its theoretical basis are revealed, thereby becoming the subject of informed criticism. It is only through such criticism that ways and means can be found to overcome the biases and limitations of current practice (p. 99).

In this sense, they claim critical reformulation contributes to broadening the scope of current methods. They assert that,

> …these methods may unduly restrict the consideration of all factors that are important for success of systems development projects. Insofar as the narrowness and rigidity of a method is a cause for IS failure, critical reformulation redresses one of the reasons for IS failures. Hence, the method reformulation not only makes explicit the implied theoretical basis bit also may contribute to improving the method (p. 100).

Consistent with their idea of critical reformulation, our work aims to help agents involved in situated method development to facilitate a kind of critical formulation.

The ISD research domain employs ideas and theories from sociology, economics, psychology, and system sciences. Studies classified as the variance research adopt various versions of contingency-based models. Many researchers, including Mathiassen and Stage (1992), emphasize the domination of this research in ISD and method development related studies. One of the earliest uses of this model for determining MIS design approaches is in Schonberger (1980), to determine strategies for information requirements in Davis (1982), and to select model for system development tools in Naumann and Palvai (1982). Van Offenbeek and Koopman (1996) identifies many variations of similar research models that indeed adopt or modify structural contingency theory. Later on we discuss the premise, the constructs often used in these models, and their limitations with respect to the level of details provided concerning how ISD and ISD method are developed and how to support such a process.

Having stated an overview of this research domain, we posit that their contribution to the theoretical basis of our research may be summarized

as follows. The ISD research literature provides: (1) insights into what problems of methods should be targeted in (situated) method development, (2) insights into the functioning, use of method and in work practice, (3) alternative ways of characterizing a target work system, (4) alternative ways of characterizing a method, and (5) alternative ways of selecting the elements of a method.

Some limitations of studies in the ISD research are:

- Coarse grained description of the constituents of method (see, e.g., Hirschheim et al., 1996)
- Lack of well-defined models for method development and method adaptation.
- The proposed models for method development are based on prescriptive models and rarely studied in empirical settings.
- Despite criticism for contingency-based models for method development, alternative models are not provided yet.
- Only a few studies put special attention on situated method development.

Method Engineering Research

Under this research domain, we distinguish the following sub- domains: Software Engineering, Requirements Engineering, and Situated Method Engineering (SME). Even though the object of interest of these sub-research domains varies with respect to the scope of method under investigation, they often provide procedures for the selection of components of a method. We briefly discuss the three sub-research streams, but it should be noted that SME is different in that the research efforts are directed to customization of a method to better suit a project situation. Often in this research stream, constituents of method are specified with a certain degree of formality to achieve unambiguous descriptions of the constituents (see e.g., Harmsen, 1997; Rolland and Prakash, 1996).

Recently, in the *Software Engineering (SE)* research sub-domain, number of methods has been promoted as the solution to the long-standing problem of the so-called conventional software development methods characterized as complex, rigid to change for different project types, technology oriented, and inappropriate for post modern forms of organisations whose distinctive character was adaptable to continual change (Sauer and Lau, 1997). The reaction of software engineers and associated researchers (Beck et al., 2001) has been presented as a manifesto for agile software development. The 'new' methods have been described as 'agile' methods in that they adopt lightweight development processes based on

iterative and incremental development, active user involvement, prioritized requirements, etc. (Abrahamsson et al., 2003). Larman and Basili (2003) however, show that iterative and incremental development characteristic of agile methods dates back as far back as the mid-1950s. With the promotion of agile methods, the notion of method engineering has become an important topic, with a special emphasis on the necessity of choosing the right method and selecting reusable components of the method. To our knowledge there is no a study that explicitly provides an extensive review of the existing studies concerning method adaptation in the software engineering field. As we show, there are some studies providing some models and guidelines concerning the adaptation of certain aspects of a method.

Software engineering literature pays more attention to the stage of application construction and selection of elements of development process by applying techniques in a pragmatic manner. For instance, CMMI (Capability Maturity Model Integration), which is an upgraded version of CMM, is used as a model to standardize and measure maturity of the practices for software development. Among a number of key process areas, software product engineering (SPE) indicates the need of tailoring a method. For this purpose, a matrix is often used to match project characteristics to the standardized elements of a software development process (Kaltio and Kinnula, 2000; Schultz et al., 2002). Another example cited is experienced-based approaches to method development by which method use-experiences concerning development processes and associated elements such as activities, roles, and deliverables are collected, stored, maintained, and distributed. To facilitate the choice of the appropriate method elements by developers, a case-based reasoning technique is often used through which characteristics of the situation realized are linked to the applied process model and its constituents (Henninger and Baumgarten, 2001). Additionally, the decision-making process for the development strategies is supported with some heuristics.

The *Requirements Engineering (RE)* research sub-domain has produced many methodical means for major requirements engineering activities such as requirements elicitation, analysis, triage, specification, and verification. Two orientations are seen with regard to method development: the way to support the requirements engineering process along with the design[xliv] process and the way to select tools as part of a method.

For the requirements engineering process, researchers aim to capture the design rationale and provide the systems developer and project manager with potential benefits in understanding and monitoring the RE process (Nguyen and Swatman, 2003). Several models and support environments (e.g., REMAP: Representation and Maintenance of Process knowledge), an extension of IBIS (Issue-based Information System), are proposed for

capturing and supporting design decisions (Potts and Bruns, 1988). Rossi et al. (2000) adopt REMAP for method rationale in method engineering.

For selecting tools as part of the method, the need for developing strategies for information requirements (Davis, 1982) and for selecting tools and techniques for requirements engineering (Naumann and Palvia, 1982) has already been identified. Several models have been proposed for the selection purpose. Hickey and Davis (2004) review the existing models concerning requirements elicitation technique selection and state,

> Although some limited guidance has been provided on when various elicitation techniques should be used (see, e.g., (Basili, Caldiera, and Rombach, 1994; Jiang, Klein and Discenza, 2001)), no one has defined a general model of the elicitation technique selection process and the factors that should be considered when selecting techniques" (p. 69).

The *situational or situated Method Engineering (SME)* research sub-domain plays a central role in this work; it provides accounts, approaches, and models for studying method adaptation. The proposed research approaches are of primary importance to this work and called alternately situated method engineering (Slooten and Hodes 1996), situational method engineering (Harmsen et al., 1994), context-specific method engineering (Rolland and Prakash, 1996), and incremental method engineering (Tolvanen, 1998). We examine their proposed models in detail.

The metaphors used in this research sub-domain appear to be method tailoring, route map, scenario development, engineering, customizing, etc. Such an exclusive focus on method development results in several prescriptive and even normative models for activities needed for method development. In the literature there are no known accounts that these efforts have been fully utilized and this challenges the applicability of the proposed procedures, models, instruments, and support means concerning method development. This limitation is mentioned in both the ISD (e.g., (Iivari et al., 2001)) and ME literature(e.g., (Tolvanen et al., 1996; Henderson-Sellers, 2003)). The proposed models employ factor-based analysis and selection of the elements of a method or methods. The owner of method development is a specialized group of experts known as method engineer, quality assurance manager, etc.

Implementation Research

This particular literature refers to those studies that examine method development in particular domains for certain application types. We use the term implementation because studies in this research domain consider

applications as ready-made solutions and often focus on later stages of ISD (e.g., modifications and installation). It is almost impossible to find a study that examines how a method is developed and used in BPA implementations in detail. The level of analysis is limited to a general description of phases, stages, key activities, and tools used in implementation. Nevertheless, this research domain provides insights into characteristics of BPA, and issues and concerns about the use of methods in BPA implementation.

We already mentioned that this work concerns method development for BPAs by which one aims to support business processes within or across organisational boundaries. Any research efforts aimed at studying method development for applications supporting business processes are of interest to the literature review of this work. Consistent with this, we identify a number of sub-research areas that provide relevant studies usually related to enterprise systems implementations, IT-enabled business process (re)engineering, and inter-organisational systems implementation. Similar to research strategies applied in the ISD, the implementation literature consists of the variance and process research strategy. With regard to method development, the variance research focuses on risk and success factors of implementation projects and relates them to 'implementation approach' or 'implementation strategy' which is a high level description of the way in which implementation is carried out. A number of orientations on the implementation of BPA are proposed in this literature. Considering an implementation project as technology adoption appears to be the dominant view in studying implementation projects. Researchers adopt the diffusions of innovations theory (Roger, 1995) and/or technology acceptance model (Davis, 1989) to study strategies for implementing BPA. Taxonomies of implementation approaches are provided based on these theories, (see, for instance, Parr and Shanks (1999)). The proposed taxonomies suggest only a high level description of possible ways in which implementation can be carried out and do not provide any explanations about how an approach can be refined with methodical elements. In addition to proposing taxonomies for the implementation approach, some studies which usually employ the process research strategy, suggest several phase models for an implementation. In fact, these phase models or taxonomies (see, for instance, (Lucas, Walton, and Ginzberg, 1988; Ross and Vitale, 1996; Markus et al., 1997; Munstlag, 2001) provide several options concerning the development process and essential activities for ISD where the focus is on organisational change-related activities. There are few studies in this domain that specifically examine method development in the context of enterprise systems implementation (especially in relation to enterprise resources planning applications) and BPR. For instance, Alleman (2002) examines how 'agile' methods have been

used for ERP projects in practice. Similar to what is experienced in ME research, in the BPR sub-domain most studies mention the limitations of the existing methods, techniques, and tools and tend to propose new framework or MTTs (see, for example (Vakola and Rezgui, 2000; Fitzgerald and Murphy, 1996). The emphasis in BPR studies is usually on the business change issue and it is often acknowledged that choosing an appropriate project management approach is essential to project success. Gibson (2003) asserts that "success may mean adapting a different project management approach that better matches the degree of change" (p. 112).

Few studies consider method adaptation in the context of BPR. (Kettinger, Teng, and Guhal, 1997) provide a mechanism for how to select activities, tools, and techniques from a generic framework proposed for BPR projects. The proposed mechanism adopts the contingency approach, which employs dominant project characteristics as input for the selection of elements in the framework.

This research domain employs ideas from strategic management, organisational studies, and system sciences. The metaphors used in connection with method development are implementation approach, strategy, and process model.

This classification of relevant studies and their review indicate that:

- ME literature provides an elaborate examination of situated method development as process wise. A few models proposed for situated method development are actually adopted or extended by most of the studies in the ME research domain.
- ISD literature provides a partial examination of situated method development as both process and content wise. Most of the proposed models of SME adopt a contingency-based approach which appears to fall short in detailing situated method development (see section 3.4 for an elaborative discussion of this point).
- Implementation literature provides a partial examination of situated method development as content-wise. Most of the proposed models of method development adopt a contingency-based approach.
- Each research domain and corresponding sub-domain need to make use others' BoK as much as possible.
- Almost all of the relevant studies as classified and reviewed do not provide a satisfying taxonomy for positioning our work in the literature. This motivates proposing certain taxonomic dimensions for studying situated method development.

3.4 Manifestation of Taxonomic Dimensions for Studying Situated Method Development

We have provided existing reviews of relevant studies concerning (situated) method development without limiting ourselves to dimensions that can be used to characterize the study concerning situated method development. In this section we propose what we call taxonomic dimensions, which allow us to position situated method development related studies in the method engineering discipline. In Section 3.5, we use them to critically examine four studies (Slooten, 1995; Harmsen, 1997; Offenbeek and Koopman, 1996; Baskerville and Stage, 2001) as they present prevailing models. The four studies are chosen because,

- They are found to be the most relevant studies; they satisfy the criteria mentioned for the conceptual system of the stratification model discussed in the first section (Figure 3.1).
- They are also found to be the most relevant studies in terms of the match between their object of research interest and the focus of this work.

A reminder about working definitions of method development and situated method development: method development is the way through which method stakeholders develop a method in a specific context. Technically, this 'way' is a mental activity by which method stakeholders construe and model human thinking and action to be performed in a situation. Situated method development is a part of method development and refers to the process or ability through which (human and non-human) agents determine a system development approach for a specific situation through responsive changes in, and dynamic interplays between, contexts, intentions, and method fragments. To see the distinction between method development and situated method development, consider method analysis and the assembly of method fragments, two overlapping activities along with situated method development and part of method development. Method analysis is about the critical examination and elaboration of all aspects of a method and the context in which it is used. Method assembly is only about how the fragments can be integrated. There are different types of integration: horizontal (integration of fragments at the same level of abstraction, but from different aspects of method) and vertical (integration of fragments from the same aspect of a method, but at different abstraction levels). For method analysis (that is, to reveal limitations and benefits of using a method), many authors in the ISD domain (e.g., Fitzgerald (1988), Jayaratna (1994), (Hirschheim et al. (1996)) provide in-depth studies. For the assembly, some authors (e.g., Van Slooten (1995), Brinkkemper, Saeki, and Harmsen (1998), Harmsen

(1997)) suggest ways to deal with it. Situated method development differs in that it does not focus on method analysis or assembly of fragments *per se*, but employs the input of the analysis and provides the output for the assembly. The key issue of situated method development is not exclusive focus on the analysis or the assembly, it is how method fragments, context, and method stakeholders are adapted to each other in a situation. With the introduction of taxonomic dimensions (Table 3.3), we better position our work and relevant studies.

The first dimension (level of abstraction) has already been mentioned in method engineering. Harmsen (1997) introduces three levels of the method engineering hierarchy each of which contains different method knowledge. These levels[xlv] are: classes of method concepts are described at the *method engineering* (ME) level, instances of the concepts at the ME level are examined at the *ISD method* (ISDM) level, and the third level is the *information system development* (ISD) level at which the actual fragments of an IS project are located. Notice that the IS situation in which actual business activities are performed is not included in the hierarchy. Most of the IS method engineering studies stay at the ME and ISDM levels, while studies in ISD research and implementation research stay mostly at the ISD level; only few stay at the ISDM level. For this work, the ISD and ISDM levels are central to the examination of situated method development.

The second dimension concerns types of method knowledge as described in Tolvanen (1998). The shell model on method knowledge has six types of method knowledge: *conceptual structure* including the fundamental concepts of a method and their interrelations; *notation* with which modelling techniques can be represented; *process* which indicates how models are created, adopted, and used; *participation and roles*; *development objectives and decisions* concerning design choices; and finally *assumption and values* embedded in a method. For this work, method knowledge concerning development objectives and decisions is central to the examination of situated method development. Related to this dimension, one might consider the level of details or granularity level (fine or coarse grained, see Harmsen, 1997) and degree of formulization via modelling techniques for each type of knowledge. In our work we use a structured technique to model the method type to achieve fine-grained knowledge representation.

In addition to these two dimensions, we suggest four additional taxonomic dimensions specifically for situated method development: types of the situation in which adaptation takes place, aspects of a method, adaptation stage, and decision-making and support orientation on situated method development. The last dimension is particularly essential for

situated method development as it relates to possible viewpoints of decision-making and support on situated method development.

Table 3.3 Taxonomic Dimensions for Studying Situated Method Development

Taxonomic Dimensions	**Operationalisation**
Level of Abstraction	Method Engineering Hierarchy (Harmsen, 1997): Method Engineering Level, *IS Development* Method Level, IS Development Level*
Knowledge Types	The Shell Model (Tolvanen, 1998): Conceptual Structure, Notation, Process, Participation and Roles, *Development Objectives and Decisions*, *Assumptions* and Values
Adaptation Situation	*Project Specific*, Project Independent (Aydin *et al.*, 2004)
Aspects of a Situated Method	*The Philosophy*, The Framework, The Techniques (Aydin and Harmsen, 2002)
Adaptation Stage	*Pre- or Early Stage*, Later Stage, Final or Post-Stage
Decision Support Aspect	*Descriptive*, *Prescriptive*, Normative

**Italic items show the positioning of this work*

The third dimension, *adaptation situation*, has two generic variants: project-independent and project-specific method adaptation. Project-independent refers to the situation in which some predefined situations are taken for granted and for which some contextual attributes are used as a priori knowledge (e.g., types of applications, types of problem situation, target domain characteristics, or other typical project characteristics such size of project, degree of time pressure). The latter refers to the consideration of method adaptation in an actual ISD project where the knowledge used for method adaptation is situated in the course of the project rather than based on a priori knowledge. While this work concerns both types of situations, we especially intend to study project-specific method adaptation.

Consider the fourth and fifth dimensions, *the aspects of a method* and *the development level of an IS*. For the first, we distinguish three essential aspects at a high level: the philosophy, the framework and essential techniques, and we adopt Wijers' way of thinking, modelling, working, supporting, and controlling (Wijers, 1991). The philosophy aspect is akin to the way of thinking, the essential techniques aspect is more or less similar to the way of controlling and supporting, and the other ways of Wijers are subsumed in the framework aspect.

The fifth dimension indicates the positioning of situated method development on the ISD timeline. Several notions or terms are used to logically split the timeline of ISD. For instance, Harmsen (1997) used the term 'stages of ISD' referring to decreasing level of abstraction (e.g., business modelling, functional design, technical design, and implementation) or

increasing level of detail (e.g., global analysis, detailed analysis, global design, detail design). Van Slooten (1995) uses 'the levels' as he adopts Zachman's framework (1987) (e.g., scope, object system and analysis and design level (OSAD), information system analysis and design (ISAD) level and so on). Iivari (1989) mentions three levels (organisational, conceptual/infological, datalogical/technical) as he adopts the three contexts described in Lyytinen (1987). The implementation literature (e.g., Markus et al., 2000; Kettinger et al., 1997)) uses several stages or phases. Given the multiplicity of the terms, we prefer to use the timeline notion in terms of beginning, earlier, during, and later time in ISD. In terms of ISD timeline, we are interested in method adaptation at the beginning and the earlier time of ISD; in terms of the aspects of a method, it examines mainly the philosophical aspect of an ISD method.

The final dimension is decision-making and support orientation on situated method development. We address three basic views on decision-making and decision support: normative, descriptive, and prescriptive. These are cited as key orientations pertaining to the decision-making and support model (e.g., Bell, Raiffa, and Tversky, (1988)). We closely examine these three orientations later (see Chapter 4 and 6); we outline them now to see how method adaptation can be analysed from a decision-making and support point of view. The normative view is mainly concerned with the question "How should people ideally make decisions?"; the descriptive view focuses on "How and why people make decisions" whereas the prescriptive view addresses "How can we help people make better (not necessarily ideal) decisions while still taking human cognitive limitations into account". This work is interested in both the descriptive and prescriptive views on method adaptation as we argue that naturalistic decision-making can serve as a good ground for studying method adaptation (Liptshitz and Strauss, 1997). We use taxonomic dimensions to further discuss prevailing models proposed for situated method development.

3.5 Examining Prevailing Models for Situated Method Development

Situated Method Engineering and Configuration Procedure for a Scenario

Sensitizing Notions, Presuppositions

Van Slooten introduces "Situated Method Engineering", a particular model of situation-specific approach to method development. As depicted in Figure

3.4, four notions (project context[xlvi], configuration process, project performance, and method engineering information systems consisting of formalized rules and a method base that includes method and route map fragments) are suggested to describe the process of situated method engineering. Notice that the numbers with arrows do not indicate the sequence of actions needed for situated method engineering; Van Slooten (1995) uses them to explain the functioning of the four constructs. Even though he explains each notion and their interrelationship (an arrow in the picture below), and elaborates with examples, he has not hypothesized them explicitly. See for instance the explanations for arrows 1 and 2.

> Contextual or contingency factors, derived from the project context, are important for the entire method engineering process (arrow1). However, it may sometimes be possible and desirable to change the project context as a result of the method engineering process (arrow 2, chapter IV) (p. 19)

The only hypothesis that Van Slooten (1995) has formulated in his work is about feasibility of situated method engineering. He says, "The situated method engineering approach, structured and supported in that way, is feasible in practice" (p.13).

Approaches and/or Models

The configuration procedure, acknowledged as the heart of method engineering, consists of four stages briefly described in the previous section. As seen in figure 3.5, the configuration procedure includes other notions such as (method) fragments, route maps, intermediate variables (aspects, levels, constraint, and development strategy) scenarios, and their relations. The reader can find full explanations of each notion in Van Slooten (1995), but we briefly mention some aspects of situated method engineering. Route maps are described as plans associated with development strategies, including activities to be performed and products to be delivered; he explains method fragments and scenario[xlvii] in the following,

> …method fragments are part of methods, techniques, tools that can be incorporated in a route map forming a complete project approach. A project scenario is composed by selecting the most appropriate route map and corresponding number of fragments. These are finely tuned to the project characterization" (p. 33).

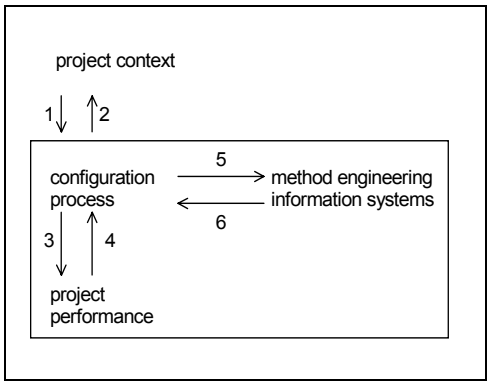


Figure 3.4
High-level representation of situated method engineering (after Van Slooten (1995))

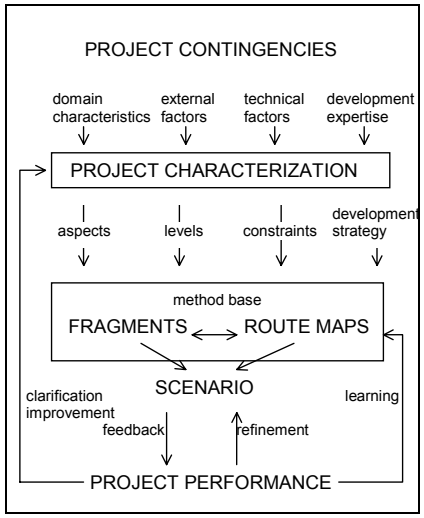


Figure 3.5
Configuration Procedure for a Scenario (after Slooten (1995))

To explain the relationship between contingency factors and intermediate variables, we use his example:

> Suppose there is a clearly described problem in a rather simple business situation and the policy of the organisation is re-use of a common data model. In such a situation it is appropriate to apply a data-oriented system development approach (the data or information aspect), to re-use the common data-model (an organisational constraint) and to develop the system in a linear way with the possibility of skipping some activities during the first stages of the project due to the relatively simplicity of the problem domain (Van Slooten, 1995, p. 106)

The example explicitly indicates with the parentheses how *aspect* and *constraint* are incorporated in the contingency factors. With close examination, one can also see the other two intermediating variables – development strategy and level. For development strategy, consider "to develop the system in a linear way …" an indication of the phase-wise development as we discuss later. For level consider "the first stages of the project …" which suggests the scope and/or OSAD levels. The example is provided here not only to explain the key notions in situated method engineering, but as an indication of whose and what kind of reasoning mechanism is used for the selection of method fragments, of primary interest

to the discussion below. We now look into the part of the model concerning the selection of a route map and method fragments. Elsewhere, (Slooten and Hodes, 1996) introduce and define a "route map fragment" as a coherent part of the complete route map and provide nine route map fragments. Drawing upon the analysis of nine projects implemented in an organisation, they identify several options and discuss the relationships between dominant contingency factors and options for each route map fragment. The discussion is one sided in the sense that they analyse how contingencies affect route map fragments. They found that complexity ("to what extent the functional components of the information system are complex"), as one of the seventeen contingencies influenced six route map fragments. Among the affected route map fragments, we examine how the relations between the development strategy fragment route map and complexity is discussed in Van Slooten and Hodes (1996):

> In one project the complexity was the reason for choosing a tile-wise development strategy. (…) In another project complexity was the reason for choosing an outsourcing strategy, because an existing software package was more appropriate than internal development of a new project (Slooten and Hodes, 1996, p. 241).

Elsewhere, (Slooten and Schoonhoven, 1996), by drawing upon another field study, the authors identify several pre-conditions for five development approaches akin to the options of the development strategy route map as described in Van Slooten and Hodes (1996). Van Slooten and Schooven (1996) analyse the other direction of the relationships between the contingencies or pre-conditions and each of the five development strategies (i.e., for each option of development strategy[xlviii] dominant contingencies are discussed as pre-conditions). For instance, for the phase-wise development strategy, some of the identified pre-conditions listed in Van Slooten and Schooven, (1996) are the following:

- The specifications of the system are clear and stable. There is a clearly arranged project.
- How to realize the solution of the problem is clear and well-known. There is no uncertainty about the success of the project
- It is a critical system with strategic importance for the customer organisation (p. 132)

So far we have presented some aspects of his work concerning the selection or construction of the fragments of a situated method. We have also showed how the selection rules or heuristics based on his empirical studies,

are formulated, and used for the selection of fragments. In addition to these heuristics Van Slooten (1995) also uses the framework which has the dimension of the aspects of object system and the ISD levels, for selecting *method* fragments. He states that "the framework connects the project characteristics and the selected fragments". He instantiates the framework by using fragments such as *decomposition process technique* for the process and information aspects at the OSAD level; *MERISE*, dynamic modelling method, for the behaviour modelling aspect at both OSAD and ISAD levels; *NIAM,* information structuring method, for information structuring aspect at the ISAD level; and *ISAC,* analysis of change method, for problem articulation and solving aspect at the OSAD level. As he considers these examples, the selection of fragments is rather intuitive or pragmatic in the sense that he explains that these methods and some method knowledge were available in the research group where he was involved, but he has a reservation about how carefully the selection of fragments should be done.

Positioning Along With Taxonomic Dimensions (Pros and Cons)

With a concise and in-depth presentation of situated method engineering, we are ready to explicate the taxonomic dimensions. Notice that Van Slooten (1995; 1996) has not used or mentioned the proposed taxonomic dimensions in his work. Given the fact that he was one of few researchers investigating the idea of situation-specific approach to method adaptation in the 1990s, his works can be seen as explorations of this idea in an organisational setting and the introduction of a new model, new notions, and new concepts without always providing their clear cut definitions as his findings have been conceptualized and perpetuated during the course of an investigation that goes back to 1987 (Slooten, 1987). Nevertheless, we are now able to apply the taxonomic dimensions to better understand his endeavours. With regard to the level of abstraction, situated method engineering appears to stay at the ME level for which he provides a 'configuration procedure' model and at the ISD level for which he has described how (route map or method) fragments have been used in an actual project context. With regard to the type of method knowledge, we contend that situated method engineering emphasises the method knowledge type pertaining to the development objectives and decisions concerning design choices of a situated method. With regard to the adaptation situation, it suggests the use of a configuration process in the course of the project situation, but appears that project execution is a black box for method adaptation: only the output of the black box is used to feed 'method base' and 'project characterization'. Situated method engineering employs on the one hand a priori knowledge (known or foreseen contingencies, project

characteristics) about the project that implies project-independent method adaptation, while on the other hand it acknowledges the unprecedented project situation and includes a feedback mechanism but is not fully operationalized to accommodate method adaptation in the progress of ISD. With regard to the aspect of a method, situated method engineering supports all aspects except the way of thinking, along with a variety of fragments. Some of the route map fragments mentioned in (Slooten and Hodes, 1996) can be seen as part of the way of thinking related aspect of the method. We clarify this point in the next chapter where we explicate fragments pertaining to this particular aspect. With regard to the adaptation stage, it is clearly proposed for the beginning or earlier time. With regard to the final dimension, we contend that the decision-making model (presented in the next chapter) behind the configuration procedure is prescriptive, but the decision-making model behind the framework is descriptive as used by Van Slooten (1996). Concerning decision support, it appears that 'method information systems' in figure 3.7 and 'method base' in figure 3.8 are supposed to include an automated decision-support system which guides the selection and construction process. Situated method engineering advocates the significance of this decision support idea for future research as we encourage this research direction. Situated method engineering does not exclusively focus on what/how or by whom decision support is or can be provided for situated method develpment

Situational Method Engineering and the S^3 -Situation, Scenario and Success- Model

Sensitizing Notions, Presuppositions

Harmsen and his colleagues (Harmsen and Brinkkemper (1994; 1997)) have worked on the idea of the situation-specific approach to method adaptation by adopting a slightly different orientation on the subject. Most of their work seems to provide clear-cut definitions of the models, notions, and concepts suggested for what they call Situational Method Engineering (SME), referring to the research discipline focus on development of situational methods. In Harmsen (1997) basic concepts of SME are described. Among other things, his works include an ontology for product fragments and a process classification system to anchor fragments with their semantics, Method Engineering Language (MEL) to enable method fragment representation, the SME process (Figure 3.6) indicating the necessary steps needed to achieve situated method, and the S^3 model relating the three key notions- *S*ituation, *S*cenario, and *S*uccess, which is proposed for the selection and assembly of method fragments (Figure 3.7).

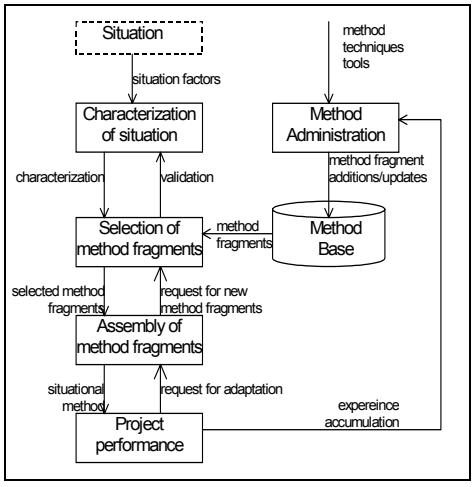


Figure 3.6
The process of SME after Harmsen (1997)

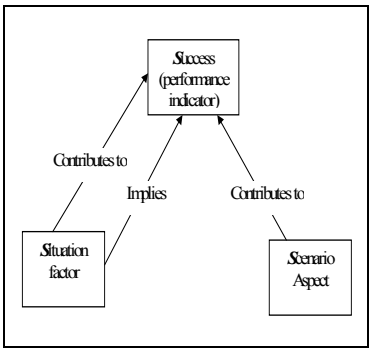


Figure 3.7
S^3 Model after Harmsen et al. (1994)

Approaches and/or Models

Let us discuss an underlying rationale behind the S^3 model. Harmsen summarizes the relationships between the situation, success, and scenario in the following way:

> …a certain aspect of a situation contributes to or implies negative success with respect to a certain aspect of the project performance. Scenario aspects contribute to positive success of the project performance. Therefore, if a specific situation occurs contributing to or implying negative success, this should be nullified by incorporating a specific scenario aspect. (p. 204).

The concepts of situation, scenario, and success are operationalized with eighteen situation factors, nineteen performance indicators, and thirteen scenario aspects. Note that the relationship between situation and scenario is indirect and negative success is strongly related to risk. To explicate this model consider the following example,

> Example 3.1: Suppose the situation factor 'management commitment' is low. According to the literature this contributes to negative success with respect to the performance indicators 'organisation management', 'organisational fit' and system acceptance. This would require the incorporation into the project scenario of the aspects 'organisation approach', 'custom development', 'high degree of user participation', 'responsibility for installation with user organisation', 'information management', and 'phasing', because all these

aspects contribute to the success of the performance indicators mentioned. (p. 204)

For a representation of the relationships between *success* and *situation*, and the *scenario aspect*, a matrix representation is used. Figure 3.4 shows a matrix indicating that the situation factor contributes to or implies performance indicators.

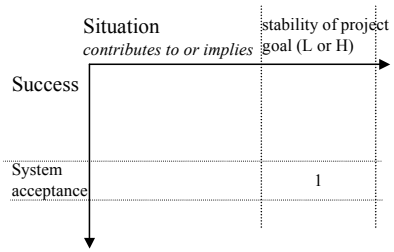


Figure 3.8.
The matrix representation for the relationships between Success and Situation

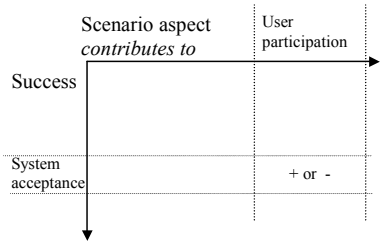


Figure 3.9.
The matrix representation for the relationships between Success and Scenario aspects

A filled matrix cell indicates that the associated situation factor implies additional attention to the associate performance indicators (see Figure 3.10). The H's and L's are abbreviations for 'High' and 'Low'. The numbers refer to the number of associated situation factors and implies additional attention to the associated performance indicator. Harmsen mentions that about 550 relationships based on relevant literature were identified. Given the difficulty of practical use of these relationships, a clustering analysis was performed. The 20 clusters were mapped onto the scenario aspects, using the relationships between scenario aspects and performance indicators. Another representation of the relationship is formed as an heuristic, depicted in Figure 3.10 and 3.11. In that representation, if project success is important with respect to X, and situation factors Y are applicable, then scenario aspects described by Z are candidates for incorporation into the project scenario.

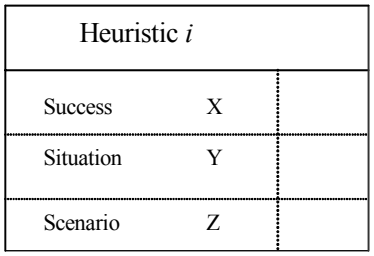


Figure 3.10
The representation of the relationships between success, situation, scenario (after (Harmsen, 1997))

Success	Project organisation, system acceptance, organisational fit
Situation	High strategic importance, high systems complexity, high conflict potential, low management commitment, high organisational impact
Scenario	Organisation approach, high degree of user participation, user responsibility for designing specifications and testing, information management, quality audits and inspections, organisation management, analysis (…).

Figure 3.11
An example of an heuristic which uses the representation depicted in figure 3.10 (after (Harmsen, 1997))

The heuristic is used for selecting and assembling method fragments. Harmsen identifies five steps for the procedure of method selection and assembly:

- Determination of the project goal out of the following options: knowledge acquisition; adaptation of an existing IS system, development of a new IS via a packaged system or custom development.
- Determination of a preliminary scenario (an ideal situation including standard and alternative options for fragments, irrespective of situation factors)
- Adaptation of preliminary scenario: analyse the situation, find salient characteristics/situational factors and expected success with performance indicators). The sequence of activities for determining situational factors is as follows.
- Factors related to the project environment are determined.
- The process-related performance indicators are considered, and the other situation factors are assigned.
- The factors related to project organisation, as well as the product- and result-related performance indicators, are determined

- Selection and assembly of method fragments. This is the step in which method fragments are selected from a method base which stores fragments linked to the readily available methods, tools, and techniques. The assembly of method fragments should be done carefully to assure situation independent quality of a situational method such as completeness, consistency, efficiency, soundness, and applicability.

Positioning Along With Taxonomic Dimensions (Pros and Cons)

Now we turn our attention to the characterization of situational method engineering based on the taxonomic dimensions. SME is one of the first attempts to provide a full-fledged description of the basic concepts needed for the design and construction of a situational method. Harmsen and his colleagues' endeavours have often been cited as a significant attempt for formalization of the basic concepts required for a situational method or as a limited view on the way a method adaptation can be realized[xlix] (see, for instance, Rolland and Prakash (1996), Tolvanen (1998), Ralyte, Deckere, and Rolland (2003), Henderson-Sellers (2003), Baskerville and Stage (2001)). With regard to the level of abstraction, SME stays at the ME level where it provides descriptions of basic concepts and their relationships for a situated method. With regard to knowledge type, SME does not limit itself to any particular type of method knowledge, but appears to employ a special conceptual structure and notation pertaining method knowledge probably due to the need for a degree of formalization of concepts and their relationships often expected by the IS ME community. The level of detail preferred is fine grained in terms of semantics of method fragments in SME. With regard to the adaptation situation, situational and situated method engineering have some similarities. The idea is that project situation can be characterized by readily available contextual factors and one can perform other steps in the process of SME. Nevertheless, this approach puts more attention on project-specific adaptation as it acknowledges changes in project situation in the later stages of ISD. The mechanism proposed to accommodate unprecedented project situations needs to be improved and justified in an empirical setting. Given the characteristics mentioned, the adaptation stage is clearly proposed for the beginning or earlier time of ISD. Finally, SME includes procedures for method adaptation with a reservation that human and/or inanimate agents have some freedom to adhere to these procedures with regard to decision-making and support. In general, however, SME opts for a prescriptive view and even uses some normative techniques like cluster analysis on method adaptation. Harmsen (1996) says "the complexity of SME requires computerized support tools" and devotes an

entire chapter to computerized support for SME. Even though some customizable CASE and CAME tools and environments are suggested (but not tested empirically), the support is meant for efficient and effective execution of SME rather than for supporting a human agent in the course of making decisions pertaining to situated method development. We believe that decision-making support for situated method development is not the central focus of these suggested CAME tools.

The Levels of ISD Approach and The Dynamic Fit Model

Sensitizing Notions, Presuppositions

This section is devoted to the examination of Offenbeek and Koopman (1996) because this work suggests a model which supports a dynamic fit between context and approach. As mentioned earlier, they survey seventeen studies in the ISD research literature. Interestingly, studies in the IS ME literature are not included in their survey. Their theoretical ground to evaluate these studies is based on the key notions of structural contingency theory rooted in organisational science (e.g., Galbraight (1973), Donaldson (2001)) and has been adopted by many researchers in strategic management and IS literature. It is outside the scope of this work to study all aspects of structural contingency theories but as they are often cited and employed for determining an ISD approach, it is important to know their use and limitations with regard to situated method development. Structural contingency theories are based on the assumption that the effectiveness of an organisation is dependent on the congruence or fit between its (social) structure and its context. Van Offenbeek and Koopman (1996) show that this assumption has been implicitly or explicitly adopted in the models that study the degree of congruence between an ISD approach (structure) and its context, and its (match) effect on ISD outcome (effectiveness). Note that the review of relevant studies in the chapter reveals a similar observation in that contingency-based models are indeed often employed as an account, especially in the ISD variance research literature. In fact, Van Slooten (1995) has elaborated the use of structural contingency theories for method development (or for "determining ISD approach" in his language) quite elegantly (see Figure 3.12). The fit (match) - performance (outcome) relationship is the foundation of the contingency theory paradigm and indeed Van Slooten et al. (1993) discuss this assumption along with possible relationships between organisational structure, situation, and outcome, and the specific models (Figure 3.12) We believe that most of Van Slooten's (1995) comments concerning the use and the limitations of the contingency-based models applied to method development are shared by and explicated

with the seventeen studies in (Offenbeek and Koopman, 1996). These limitations are related to the following themes: diagnosing context, describing alternative approaches, matching context and approach, looking at social and organisational issues, and supporting dynamic fit context and approach. Both researchers mention difficulties in operationalising the three notions, limitations concerning a deterministic use of contingency factors, and the unidirectional relationship between organisation structure and situation (context).

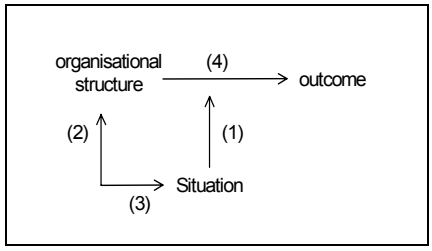


Figure 3. 12
Model of Contingency Approaches (after Van Slooten (1995))

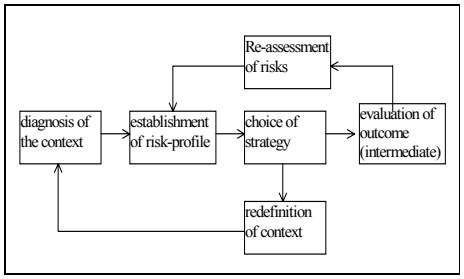


Figure 3. 13
A Dynamic Fit Model for Determining SD Approach (after (Offenbeek and Koopman, (1996))

Approaches and/or Models

Van Offenbeek and Koopman (1996) propose a dynamic fit model composed of three groups of variables: endogenous and/or exogenous (i.e., changeable or not by project team members) *contingency or contextual factors* leading to five types of risks, *approach characteristics*, and *outcome factors* indicting the effectiveness of the SD process (Figure 3.13).

The dynamic fit aspect of the model necessitates a re-assessment of risks and a redefinition of context, acknowledged in the works of Van Slooten (1995) and Harmsen (1997). To evaluate the prescriptive power of the model, they formulate five propositions and 'test' them in seven cases with ten project episodes, five of which are considered as failures[1]. Each proposition relates to one of the five risk types to required 'dimensions' of SD approach. They distinguish thirteen dimensions as characteristics of an ISD approach and relate the dimensions to five decisions at three levels.

At the strategic level, the decisions are *definition of problem system* pertaining to the dimensions of function domain and social domain, and

orientation of problem-solving system pertaining to the dimensions of problem orientation, solution orientation, and technical administrative versus social-organisational.

At the tactical level, the decisions are *differentiation of development process* pertaining to the dimensions of linearity of activities, magnitude of development steps, and parallelisation of activities; and *coordination of development process* pertaining to the dimension of formality of coordination mechanism.

At the operational level, the decision is *interaction during development process* pertaining to who should be involved, how many people, forms, timing, and function of interaction. We argue that these dimensions have some similarities with scenario aspects in Harmsen (1997) and route map fragments in Van Slooten and Hodes (1996). To give an example of how a risk type is related to the required ISD approach dimensions, consider the following:

> A high resistance potential requires (a) a 'step-by-step' approach with (b) some interaction of the responsible, management and/or system developers with all users, aimed at motivating and information exchange and (c) a social-organisational orientation (p. 256)

Positioning Along With Taxonomic Dimensions (Pros and Cons)

While they conclude that their findings support the model and are in line with the propositions, they admit that there is a need to translate them into more detailed requirements for a specific SD approach. This has a lot to do with the coarse grained level of detail required for method knowledge. We now discuss other taxonomic principles. Their model is targeted for the IS development level with regard to the level of abstraction. Even the dimensions of SD approach are conceptualized at the ISD method level; their elaboration at this level is limited and theoretically needs to be justified (for instance, the basis of these dimensions and how they are derived remain quite fuzzy). Their model clearly accommodates three types with regard to knowledge: development objectives and decisions, participation and roles, and process. With regard to adaptation situation, their model appears to support project-situation method adaptation, but is limited by perceived contextual factors and given dimensions of an ISD approach. With regard to the adaptation stage, even though it is not limited to certain levels or times of ISD, given the nature of decisions, we believe the model with the mentioned constituents is especially applicable to the earlier time of ISD. Finally, with regard to the decision-making and support aspect of the

dynamic fit model, it is stated explicitly in their study that it is descriptive in nature in that the model helps practitioners identify the risk and eligibility of the context for an ISD approach or vice versa. However, it is also prescriptive in that practitioners can use it to determine an appropriate approach. Concerning decision support, they state, "… models like ours can be tools that assist practitioners to step back and consider the context they are in, and subsequently determine their approach" (p. 262). They also mention that, "people are bound to their context (both literally and metaphorically) and are active and passive victims (p. 263)" (Offenbeek and Koopman, 1996). With the introduction of our model, we argue that the last statement reflects a particular type of behaviour we expect from method stakeholders while adapting themselves, the method, and the context to each other. It is this adaptation that motivates us to question the generic and dynamic aspect of their proposed model in the next section.

A Social Process for Method Fragment Adaptation

Sensitizing Notions, Presuppositions

Baskerville and Stage (2001) put more emphasis on the emergent aspect of ISD and argue that much of the literature on method development is normative, conceptual and that empirical work is lacking. One of the central notions in their work, as well as in this work, is 'work practice'. This refers to the way in which a concrete development process is actually conducted in practice. They show that this notion may be best understood together with two additional concepts: situation and constraint. Though they do not provide clear definitions of these terms, they discuss how the concepts are related. They assert that,

> The conditions and work practice influence the situations that occur, the situations may change conditions and work practices, and work practices may filter the influence of conditions on the situations that occur (p. 15).

They describe a work practice along with seven elements: (1) O*rganisation*; the structural and organisational boundaries for the project team and its work, (2) *management*; the monitoring, control and coordination of the project organisation, (3*) strategy*; the overall approach adopted in the ISD, (4) *collaboration*; any interaction among project team members, or between them and other non-project team members, (5) *techniques*; the detailed way in which certain development activities need to be carried out, (6) *tools*; the means to be used for executing of any

development activities, and (7) *evaluation*; the procedures and measures used to assess the project execution and project outcome.

Their work focuses on the way work practice is supported and the selection of a method fragment. Such a selection process is seen as a sociological process in their work. They acknowledge that method engineering endeavours are directed towards such a selection process and have some limitations on the way method adaptation is treated. They claim that,

> The method engineering approach is limited in its ability to consider the social and organisational aspects of ISD method adaptation. It has a tool orientation that brings focus to structural aspects of the methodology: notations, specifications, process definitions, etc. However, the approach lacks deep consideration of organisational culture, politics, social communication channels, etc. Fragment selection is assumed to be a technical rational debating process (cf. Harmsen et al., 1994; Oinas-Kukkonen, 1996) (Baskerville and Stage, 2001, p.14).

Approaches and/or Models

They propose a framework based on the idea that practitioners "accommodate" by selecting, inventing and combining method fragments to fit their needs in work practice. They define method fragment as,

> …any element of a methodology's guidelines for its activities that is separated from the methodology. It is a concept, notation, tool, technique, etc. is lifted from the framework of an overall methodology and interjected in a specific work practice (p. 18).

The proposed framework for method fragment adaptation consists of three components, illustrated in figure 3.14. The first component is about method fragments originating from published methods and innovated through previous practice. The second component is aspects of work practice listed in figure 3.14. The third component refers to a method adaptation process which is seen as a sociological process for the on-going accommodation including selection and combination of fragments appropriate in a given work setting.

They use four essential elements for a description of a method,: *perspective* refers to the method's overall view on and understanding of activities in the target and development organisation, *application domain* denotes the cluster of projects toward which the method is oriented, *prerequisites* refer to "the requirements to conditions and work practices that arise when the methodology is applied" (Baskerville and Stage, 2001, p.

17), and *activities* are further refined in terms of principles, concepts, techniques, notations, and products.

To further elaborate method adaptation proves they employ Agar's (1986) idea of practical ethnography, one of the three types of ethnographic methods. The focus of practical ethnography is the encounter, which has four major units of analysis: *scheme*, *strip*, *breakdown*, and *resolution* (Figure 3.14). The schema consist of goals referring to the people's set of objectives, frame referring to the way people organize their beliefs and knowledge, plans referring to the way in which each person hopes to achieve objectives. Strip refers to an observable social act. Breakdowns occur when people are unable to make sense of the encounter and resolution occurs when people discover the reason for a breakdown. Baskerville and Stage (2001) employ these four notions to explicate method accommodation.

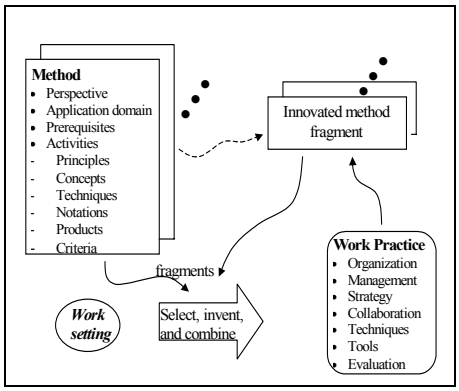


Figure 3.14
Components of a Social Process for Method Fragment Adaptation (after (Baskerville and Stage, 2001))

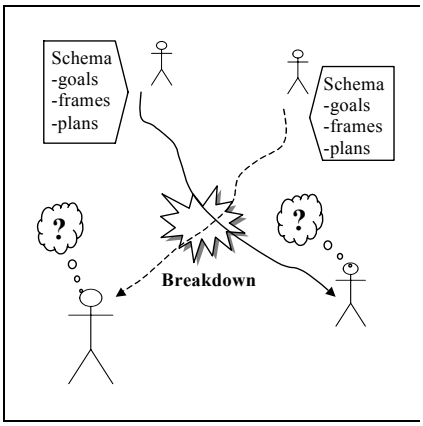


Figure 3.15
The Ethnographic Strip (after (Baskerville and Stage, 2001))

They illustrate the proposed method adaptation process by providing three examples (strips) from an IT development case project in a bank. The three strips show three different breakdowns indicating that the method is somehow inconsistent with the schemas of the stakeholders with respect to the *concepts*, *perspectives* on the way a system is to be developed, and the *notation*.

As is clear from the summary of their work, compared to the other three works examined in previous sections, Baskerville and Stage (2001) have used a fairly different account to illuminate method adaptation, though some of the constructs they propose are already used in the ISD literature.

For instance, the construct 'encounter' they propose as a unit of analysis for method adaptation is similar to the notion 'encounter' that and (Robey and Newman 1996) use to analyse the events that occur in an information system development process.

Positioning Along With Taxonomic Dimensions (Pros and Cons)

Baskerville and Stage's (2001) comment on the limitations of 'method engineering' on method adaptation appears in R. Baskerville's earlier work. For instance, Baskerville (1996) already mentions the need to look into work practice, which corresponds to the level of ISD in method engineering hierarchy, to identify ISD conflicts and fit these conflicts to structural artefacts at the third level of abstraction which corresponds to the ISD method engineering hierarchy. So, with regard to level of abstraction, their work concerns method adaptation at the ISD method and ISD levels. With regard to the types of method knowledge, their framework does not emphasize certain types, but examples in their work are related to conceptual structure and notational types of method knowledge. The degree of formality used in their illustrative case is coarse grained and expressed in terms of narratives. The proposed process model aims for a project-specific method adaptation and does not focus on particular aspects of method. Even though there is no clear emphasis on the timeline dimension of method adaptation in their work, from the illustrative case study it appears more attention is given to the earlier time of ISD. Concerning the decision-making and support dimension, the object of interest in terms of method stakeholders is extended to a broader audience including designers, users, programmers, method engineers, and other people involved in the project and/or the target IS domain. Their work does not mention any decision-making support in method adaptation and the decision rational behind their model reflects a descriptive view on method adaptation.

Concluding Remarks on Prevailing Models

One may notice syntactic and semantic differences, and some commonalities of certain terms[li] (e.g., fragment, scenario, context, or situation) in Van Slooten (1995), Harmsen (1997), Van Offenbeek and Koopman (1996), and Baskerville and Stage (2001).

Our literature review indicates that situated method development related studies adopt certain notions (situation, context, agency, method fragment) for their theoretical underpinnings. Such notions have been incorporated with different interpretations in the core cluster research (ISD research, IS ME research, and Implementation research) (see Appendix 1 for

the list of those studies incorporating such notions). What is interesting to see in this review is that most of the studies mentioning and adopting these notions fall short in incorporating the essential attributes and often do not provide explicit definitions of the terms. In particular, the notion of agent as part of situated method development is undervalued in the prevailing models. Only Baskerville and Stage (2001) emphasise the matter, but as a conceptual system their proposed model requires factual validity in an empirical setting and lacks unambiguous descriptions of certain elements (situation, context). With regard to the conceptual system review mode, the common terms in the aforementioned studies are conceptualized as sensitizing notions in their model building. We claim that the treatments of these notions are partial as they provide alternative or complementary viewpoints.

We contend that the prevailing models show alternative approaches to situated method development along with their pros and cons. For the examination of alternative approaches we propose to investigate situated method development as a phenomenon. The examination should be done at a fundamental level where its key underlying notions are naturally revealed and articulated. This examination will provide a beginning for the foundation of the phenomenon (method adaptation) as we present it in chapter four.

CHAPTER 4: FOUNDATION OF METHOD ADAPTATION

"Logic will get you from A to B. Imagination will take you everywhere"
- Albert Einstein

This chapter introduces method adaptation and establishes its foundation through the articulation of its underlying key notions as well as relations between them. To achieve such a foundation, the basis on which one can study *situated method development as a subject*, certain accounts in the reference (human decision-making and decision support literature) and supportive clusters (sociology, cognitive psychology, philosophy, and linguistics) have been employed. Along with the employed accounts, we have examined the idea of a situated method to understand what underpins the very notion of the situation.

Four notions (situation, context, agent, and a method fragment) , as we claim, are essential to our understanding of situated method development when we make a critical examination of the notions of 'situation' and 'method'. These notions are treated carefully by relating them to their appropriate grounds (theoretical accounts). We argue that these four notions naturally and essentially necessitate an introduction of the Method Adaptation Process (MAP). Together with the MAP introduction, we propose a decision-making process leading to a situated method. Such a process is represented as a generic model that shows how the dynamic interplays among the essential notions might occur.

The structure of this chapter is as follows. Section 4.1 includes a simple description of situated method development. We then discuss possible orientations on the subject matter in Section 4.2. We contend that decision-making orientation on the subject matter is promising and necessary. Having stated this, we provide an elaborate discussion on essential features of situated method development and illuminate them with an appropriate decision-making account in Section 4.3. In Section 4.4 we articulate four essential notions for theorizing MAP. In Section 4.5, a generic model for MAP is proposed.

4.1 Description of Situated Method Development

We characterize the task of achieving a situated method in terms of agents involved in the task, the input, execution, and outcome of the task, the

setting where the task occurs, and the means to support execution of the task. This provides an overall description of the situated method development without using a particular model. In doing so, we shall be able to search for a promising orientation on the subject matter.

Involved Agents

The task is often assigned to one individual as a responsible person. Given the fact that the proposed situated method is essential to all aspects of development (briefly, thinking and acting or in Wijer's term, or a way of thinking and working (Wijers 1991)), such a person often consults with those people providing peer review and legitimating and/or supporting the use of the resulting method. In this way, situated method development incorporates certain feedback from interested parties. This feedback is not always codified or realized in a formal way; instead, personal communications among peers are involved. The latter has something to do with accumulation and utilization of distributed knowledge, which raises several questions, for instance: how do several ideas converge into a situated method? And how is the feedback incorporated? Consequently, the decision-making process for a situated method is under the responsibility of 'one man', but often involves several opinions of interested people. We use agency as a notion and agent as a generic term for an actor who plays a certain role in situated method development.

Execution Time

Depending on formality attached to this task, duration is determined or undetermined. Due to the nature of the task, situated method development is subject to change and as such occurs many times during IS development. That is why the task repeats many times during the development of method. The duration and its continuity is not planned or specified in terms of a certain number of hours or days. It is expected that with a high granularity the content of situated method will be determined at the beginning of the project, and gradually becomes richer, finer and, hopefully, complete. What we can point out with this timeline aspect is that the practitioners often mention a lack of time to conduct all activities, but comment that this is typical for any project and independent from the context where the project runs. Consequently, in this thesis we have not studied the effect of execution time on the task, but are interested in the moment at which the task is performed.

Setting

The task occurs in an organisational setting. The setting is perhaps best understood from a socio-technical perspective. The technical aspect includes all relevant artefacts materialized as documents, computerized information systems, procedures, roles and responsibilities, performance criteria, and values and norms. The social aspect is about the use of such artefacts in an organisation. The setting is certainly part of a project organisation but cannot be isolated, at least from the target organisation or the third parties from which the services are acquired by the project organisation.

Means Supporting Execution of the Task

In terms of materialized artefacts (e.g., internal or external documents computerized information systems) the responsible agent might use several means from various sources owned by certain interested agents, organisations, or external parties. There could be some cases with no specific input materialized as an artefact. As an alternative to this materialized aspect of the input one can consider the input as a cognitive element in the human mind. In fact, the input needs to be considered with respect to its tacit, implicit, and explicit dimensions (Al-Hawamdeh, 2001).

The Outcome as Materialized

Although the output (a situated method), is materialized as a project deliverable for which different names have been coined such as project plan, development method, or plan of approach, its complete content is distributed to or embedded in other deliverables. It is materialised as a composite deliverable. We shall articulate further, that its materialised aspect is considered as a thing-in-itself.

Output and Evaluation

It is often the case that there is usually no explicit criterion for the evaluation of situated method development. In some cases, as part of project evaluation the assessment on the use of a (situated) method is done. Basically, if a situated method is achieved, it is considered as 'the task is performed good enough'. The user of the output is the one who eventually employs it to support her activities in a project. As we have already discussed about functioning of method, the output is effective on structuring the method user's thinking and actions. This suggests that the outcome has to do with the establishment of the way of thinking and actions to achieve successful IS as part of a socio-technical system. This is where a link

between situated method (the outcome of situated method development and often concerned with project execution), and successful IS (the outcome of successful IS development) occurs.

Having provided overall theory-independent description of situated method development, we consider possible orientations for the subject matter.

4.2 Possible Orientations for Studying Situated Method Development

What should be a starting point for studying situated method development?

This is the question with which we shall ground the basis of studying the subject matter- that is, situated method development, considered as a specific task contributing to a method development - and for which an answer will be provided, later on, in the form of a proposition. We need some preparation to answer this question and perhaps as a preliminary question one might ask, "What orientations towards studying situated method development are possible?" Let us discuss them briefly.

- A design activity, where the situated method crafted is seen as an artefact. At the ISD level, these artefacts (constituents of a situated method) are used for the development of IS which is itself an artefact (e.g., (Stolterman, 1994))
- A problem-solving activity, where the problem concerns how to achieve a situated method. Modelling of such a problem-solving activity is a subject often studied at the method engineering level (e.g., Verhoef and Hofstede (1995)). Consequently, at the ISD level the method is used as a means in the development of IS, which is itself solving a business problem in a target organisation (e.g., Seligmann et al. (1989)).
- A modelling activity where the situated method is an abstraction of reality in which the method helps its user in framing a mental schema about what is and how to carry out her abstraction. The functioning of method in this case is concerned with its cognitive impacts on IS development activities. One implication of this functioning is addressed in Backlund (2004) as adopting the account of distributed cognition (Hutchins, 2000).
- An establishment of institutionally embedded ways of conducting system development activities. This orientation suggests that what drives situated method development are social structures

represented as values, roles, relations, procedures, and artefacts (partly studied by Orlikowski and Baroudi (1991) and Baskerville and his associates (1996; 2001)). This orientation is different from the previous ones in that it puts more emphasis on the organisational setting of situated method development and a group involvement in situated method development.

- A planning activity for carrying out IS development. Such planning is done carefully by configuring strategies, activities, products, and means, which are appropriate to the project situation. In this case, situated method development is conceived as scenario building that best suits the project situation (partly adopted in Van Slooten (1995) and Harmsen (1997)).
- A decision-making process leading to a situated method. Such a process is present in an organisational setting where various agencies holding different socio-cognitive considerations are involved in framing the context in which an IS is developed.

Are these orientations on the subject matter different? We argue below that they have commonalities and differences. The choice of an orientation can be based on research taste or on the very nature of the topic from which the choice follows. The latter, applicable to this work, legitimises and strengthens establishments of the ideas with logical imperatives in terms of definition, assumptions, propositions, corollaries, and theorems[lii]. Let us discuss the nature of situated method development.

Consider the following typical statement from a project manager: "We need to use a guideline or procedure to steer the project. Surely, we take into account our previous project experience based on the similarities and differences with the new one" (anonymous).

Consider also the following questions often heard in practice: "What kind of method do I need for the project?" "What shall or can I do with a method in the project?" "How can I compose an effective method?" "What should a desired method include for a specific project?" "At what degree the elements of a method should be detailed so that the method can be enacted easily?"

The typical sayings and questions exemplified above are in fact appearances of the decision matters for situated method development. To give a taste of such decision matters and for the sake of simplicity we will discuss each question in turn. We show that situated method development is by its very nature tied to the acts of determining on the matters related to a method.

The first question indicates that a choice should be made for a specific type of method, granted that one is able to differentiate methods and of

course different types of methods are available to her. To make this choice, which is clearly the act of determining a particular type of method, one may also need some criteria (e.g., some degree of matching between the characteristics of the project and method).

The second question points out a need for the method in a project. For instance, we need to use a certain method because the target organisation requires it. Formulation of such a need is again related to what the method is used for.

The last three questions are clearly related to the determination of appropriate elements of a method and their integration. Here we run the complexities of composing a method together with its contents and structure if we don't know how to do this composition, what is available, or how constituents are distinguishable. Several follow-up questions can be expected in this case (Do we have different guidelines, documents or any artefacts needing to specify a project situation? How are we going to say one artefact is preferable to others?) Consequently, all these questions emerge while determining the matters concerning situated method development. These questions are not new to scholars in method engineering where the meta-modelling approach is extensively used. Our goal is to complement and perhaps extend prevailing models to the model which accommodates an appropriate orientation.

The five simple questions discussed above generate a chain of follow-up questions and are intrinsically coupled with *decision matters* for situated method development. We adopt a certain line of reasoning to justify that situated method development is best studied as a human decision-making process. The adopted line of reasoning employs the assumption about method existence, the proposition and its corollary about decision-making orientation on the subject matter. Besides the following section, we also adopt similar line of reasoning in the remaining sections. That is, we also induce assumptions and propositions to achieve a theorem of method adaptation as stated in the last section. In particular, the logic of inquiry adopted in this chapter includes certain imperatives such as assumption, proposition, corollary, conjecture. These imperatives are used to show the reader how the line of reasoning is established. As such, assumptions refer to basic elements of the logic of inquiry that are needed to start investigating the subject matter. Propositions are those assertions proposed to induce corollaries. Finally, by using assumptions, propositions, and corollaries we reach the conjecture stating what method adaptation process is about.

We begin with the *assumption about method existence*[liii].

Assumption 4.1 As long as IS development takes place, a method must be present in development of an IS; human actions and thinking involved in IS development are purposely structured to achieve certain goals.

This assumption follows from the definition of method (an explicit way of structuring one's thinking and actions (see chapter 2). Accordingly, method has two essential functions in ISD:

- the function that purports certain effects on human thinking (such as augmenting, facilitating, and structuring), for which we use the term "intellectual": punctuating strategic orientation of a method fragment.
- the function that purports certain effects on human behaviour (i.e., supporting, automating), for which we use the term "procedural": emphasizing operational orientation of a fragment.

These two functions are intimately intertwined because it is granted in the field of philosophy of mind that certain kinds of human behaviour (e.g., purposive human behaviour) cannot be isolated truly from associative cognitive models (schemata) in the human mind. The interested reader is referred to the work of Beakley and Ludlow (1992), where the quest for the relation between behaviour and thinking is acknowledged as the mind-body problem in the philosophy of science. At this point it is necessary to say that a better treatment of this problem can be found in the philosophy of mind literature, the coverage of which is beyond the scope of this work; this particular literature provides certain accounts useful for establishing a foundation of method adaptation.

Proposition 4.1 The decision-making orientation provides an appropriate way of studying situated method development.

The following two remarks justify this proposition.

Remark 4.1 Decision-making is essential to human actions and thinking. This suggests that a method has some effects on structuring human thinking and actions (see the definition of method in Chapter 2), and decision-making orientation is an appropriate way (i.e., reasonable and effective) to study the subject matter and method development in general.

Remark 4.2 Other orientations are inscrutable for studying the subject; the decision-making orientation provides broader and narrower views on the subject. It is narrower in that it is concerned with both human thinking and actions; it is broader in that this particular orientation is intrinsically employed by the other orientations. Each orientation above has

distinct features by which researchers conceive the subject matter (often reduced to a particular view or an account related to the orientation) but these orientations have a common denominator: human decision-making.

For instance, by considering situated method development as a modelling and/or design activity one should not preclude the decision-making orientation as essential to modelling, design, and in turn to decision-making. Another orientation, which is coined with 'problem solving', is also acknowledged as a kind of decision-making activity (Simon, 1983). This suggests that the underlying orientation for situated method development as problem solving is the decision-making process. The same holds for other orientations such as planning and establishment of organisation structures and administration, of which several researchers including Simon (1945) conjecture that decision-making is essential to other orientations.

This decision-making orientation has been already adopted by other orientations, yet has its own accounts, among which we seek that which is suitable for this research.

Corollary 4.1 Situated method development can be studied in-depth as a human decision-making process.

Corollary 4.1, which we recall throughout the book, brings both advantages and challenges for us. The advantages are partly explained in Remarks 4.1 and 4.2; concerning challenges we point out certain matters mentioned in the literature of decision-making.

First, studying situated method development the way we would like to is new to the literature reviewed and presented in chapter three. This necessitates a careful examination of what features of situated method development are addressed by existing accounts in the decision-making literature. Given the vast number of alternative accounts in the decision-making literature, it was not feasible to execute all the reviewing steps as we have done for the core cluster (see figure 3.1 in chapter three), but our general research approach (as explained in chapter two and depicted in figure 2.1) holds for the review of decision-making studies. Compared to the review in chapter three, the review presented in this chapter is no by means exhaustive.

Second, we realized after the review no single account in the decision-making literature is adequate to explain all features of situated method development. Thus, we need to incorporate multi-accounts backed by multi-disciplinary evidence as opposed to a monolithic approach adopting ideas only from a particular discipline such as psychology, sociology, or philosophy. We return to this point later when discussing how to employ certain accounts from different disciplines in our work. Indeed, certain

accounts help us to partially explain the phenomenon, but also contribute to establishment of the foundation of the decision-making process underlying situated method development. The problem remains how to proceed in searching for a ground for this foundation. We have applied the following inquiry: we de-contextualized the subject matter (that is, kept aside non-essential features of the phenomenon) and used its essential features (the agency, purposive actions, interaction) to investigate similar types of phenomenon studied in the literature, and reflected on the extent to which the prospective accounts are adequate in explaining all essential features of situated method development. The question remains: what are the essentials of the phenomenon to be used for the foundation of the decision-making process underlying situated method development? Below, we provide such features in the form of a proposition. Afterwards we relate them to relevant decision-making approaches to articulate them further.

4.3. Situated Method Development from Decision-making Perspective

Essential Features of Situated Method Development

Proposition 4.2 As a subject matter, situated method development necessitates inclusion of the following features essential[liv] to an understanding of how a method is situated:

(i) *Interaction* between the agency and method – in the setting – is a cognitive process coupled with purposive actions.

(ii) *The setting* can be understood as things-in-themselves (socio-technical attributes) under the consideration of the agency and/or method while the interaction takes place.

(iii) *Adaptation* to the setting at hand underpins how this interaction leads to so-called a situated method.

Preparation

To better understand what interaction for a method means we might think of method as an inanimate agent 'intelligent' enough to make sense of certain situations, if at all. Maybe we should remark that the creator of a method in that sense takes place through its existence of a 'frozen' intelligence materialized as those fragments which embed the way of thinking about systems development. The interactions clearly involve certain purposive actions from the agency side (reading documents, arguing *things* with people, thinking alone). These purposive actions are not independent from certain cognitive elements that lie on their 'minds' (in the

case of an inanimate agent think again about its creator and note that this inanimate agent has a sort of fixed cognitive elements). Adaptation is then the process of matching, adjusting, and transferring these cognitive elements of the agent with/to other agents. Such transference is internalized as a cognitive process involved with structuring the thinking aspect of the situated method and externalized as purposive actions that structure the actions aspect of the situated method (which is eventually manifest in methodical artefacts as a product of agency).

To see how setting, interaction, and adaptation are essential to an understanding of situated method development, consider the negation of the proposition.

Remark 4.3 Assume the contrary of (i) in Proposition 4.2 that situated method development has nothing to do with interaction, setting, and adaptation. If interaction is not possible, then the notion of situation is inconceivable, because this interaction is required due to uniqueness and relativity of the situation. The contrary suggests that there is no concern about changes on what the method suggests. This contradicts the idea of situated method development.

In the following we illuminate features of situated method development by referring to the decision-making literature. In doing so, relevant decision-making accounts for situated method development is examined. We begin with the meaning of decision-making.

Decision-making is essential to human thinking and actions for which theories of human mind and behaviour respectively have been developed in various disciplines including philosophy, psychology, and sociology. Given the fact that modern science has several disputes about the agreed theory on human thinking and behaviour, we can consider the former as distinct from the latter in that human thinking involves non-observable acts. Upon deeper examination of the distinction one might end up with extraordinary complexity concerning their distinction and relationships[lv] (how and what triggers the other). For the scope of this work we need to make a number of assumptions regarding the nature of human thinking and actions involved in situated method development.

Articulating Essential Features in Decision-making Literature

Before relating essential features to an appropriate account of decision-making for situated method development, we briefly discuss basic concepts (Figure 4.1) and relevant approaches in the decision-making literature.

Decisions are made in all steps in life that varying with different degrees of their visibility. The notion of decision is intimately linked to *agency* (the one(s) involved in making a decision), *several actions and cognitive activities*, *the matter and relevant information* on which a decision is made, and *its boundary* in terms of time and other contextual features (e.g., space).

Decision[lvi] is the act of determining on a subject of concern. With the exception of mere happenings, an act is due to an occurrence of compulsion that the object possesses. The difference between mere happenings and deliberate action lies in the nature of act that ensues. In case of mere happenings, the agency is under the influence of forces beyond the agent's control (Meredith, 2004). On the other hand, deliberate actions involve internal or external compulsions. Consider the following illustrative situation to see the difference. Let us suppose that someone is assigned to manage a project with a standard way of working. It is advised to adhere to the provided standard as much as possible. In this case, assigning someone to a project can be considered a mere happing from the perspective of the assigned person though the act of assigning someone is purposeful, which is done by another person.

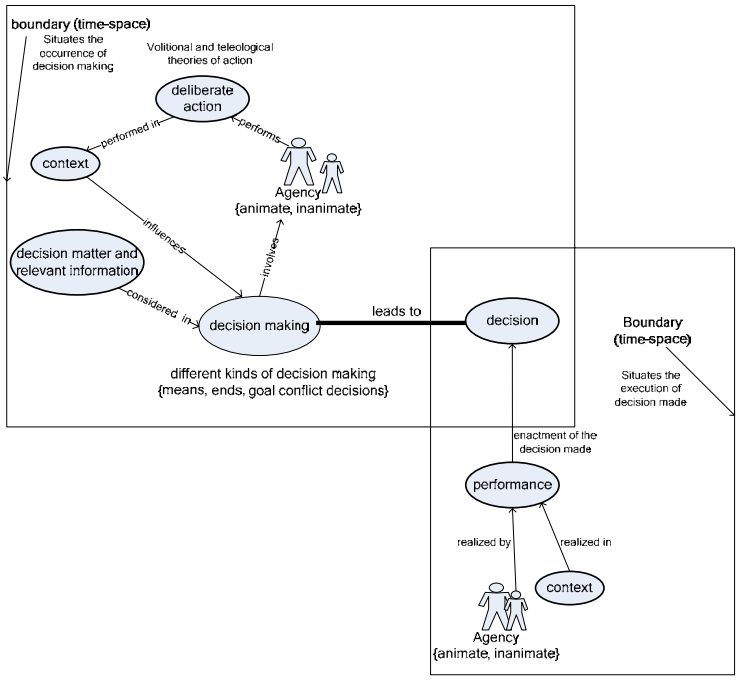


Figure 4.1 Basic concepts relevant to decision-making

On the other hand, adhering to the standard in the project is external compulsion for making decisions about the subject of concern (managing the project with a standard). It is up to the assigned person to do her best to follow this external compulsion driven by an internal compulsion. The nature of being assigned to a project is beyond the control of the object, yet in adhering to the given standard, the object has a mixture of internal and external compulsions which motivate her course of action. Figure 4.1 indicates how key notions relevant to decision-making are related intuitively.

An Account on Agency Act for Situated Method Development

In general there are two alternative theories concerned with the subject of human acts: the volitional and teleological theories of action. Volitional, enriched and entitled the "New Volitional Theory", states that human actions are events caused by an act of will or volition (Care and Landesman, 1968). It is proposed, however, that for certain types of acts (i.e., 'basic actions') an act of will is a purely mental event and not physical (Moya, 1990). This is where volitional theories fall short of explaining how mental events occur or trigger physical acts. An alternative to this theory is the teleological theory of action (Bennet, 1965). This theory states that an action has a purpose and is meaningful rather than being a mere event (Meredith, 2004). In other words, a purposeful act is meaningful with an involved agency whose intention is achievable. This theory, as we elaborate, contributes to the foundation of the decision-making process for situated method development. Especially the notions of agency and intention are tied to human action, one of the two essentials of decision-making involved in situated method development.

Of course, mere happenings would question the existence of compulsion if one adopts the alternative view on the theory of action as opposed to its teleological view. In this work we value the standpoint asserting that causes for decisions to be made exist. It could be the case that compulsion is the cause and effect of decision. Decision is considered an outcome of mental activities that take place consciously or unconsciously. It is visible if actions (performing activities with artefacts) can be associated with it. In addition, acts of deciding (i.e., selecting the option that is satisfying rather than maximizing according to the principle of bounded rationality, proposed by Simon (1965)) are mentioned as part of discourses underpinning decision-making in the literature (e.g., Humphreys (1992)).

Assumption 4.2 Purposive actions as a specific kind of action are part the decision-making process for situated method development.

Proposition 4.3 The theory of purposive actions contributes to the foundation of the decision-making process underlying situated method development.

If situated method development is considered a human decision-making process, what type of decision problem does situated method development deal with? In the literature concerning the nature of decision problem, Gorry and Scott Morton's (1971) classification is often referred to. It asserts three types of decision problems: structured, semi-structured, and unstructured decision problems. Structured decisions can be programmed to the extent that a definite procedure is readily available and used whenever the decision situation occurs. On the other hand, unstructured decisions are new to the decision-maker and no 'cut-and-dried' method for handling the problem exists. The second type is considered when a decision is structured at some decision phases and unstructured at others. Decisions focused in this work are those method fragments used at the scenario construction level of a situated method. These fragments can be best examined as unstructured or semi-structured, but not structured decision problems because these fragments are tied to *implicitly* defined principles, assumptions or a 'strategic' orientation of a situated method (i.e., an underlying epistemic basis related to the way of thinking for systems development). An essential characteristic of this kind of decision problem (unstructured or semi-structured) is that decision-making is realized as matter of fact under uncertainty[lvii]. This suggests that models of decision-making under uncertainty provide a good start to study what ground is applicable for situated method development.

In the literature, there are various theories of decision-making incorporating the idea of uncertainty. Theories of decision-making are usually characterized with respect to an underlying ground for theorizing human decision-making. Three kinds of decision theories (descriptive, prescriptive and normative) are distinguished (Figure 4.2) in this regard. If theory is oriented towards understanding and predicting human decision-making, then it is called descriptive whereas normative theory asserts how decisions must be made. Somewhere on the decision-making spectrum (see Figure 4.2), uncovered by the two kinds of theories, a third category known as prescriptive theory is introduced that aims to stipulate how decisions should be made based on normative or descriptive grounds.

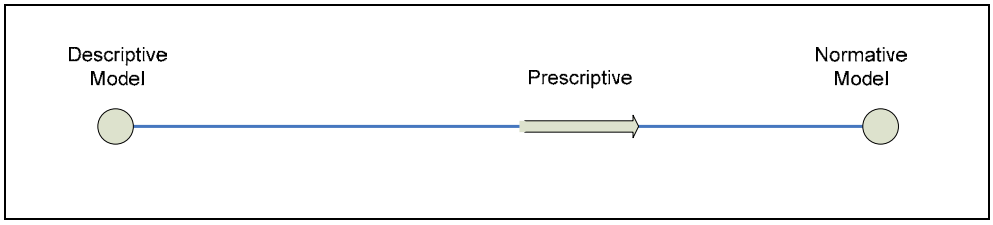


Figure 4.2 The Decision Making Spectrum (Meredith, 2004)

Several accounts or models[lviii] are proposed for the theories of decision-making above. Lipshitz et al. (2001) discuss four prevailing accounts in the decision-making literature: Classical Decision-making (CDM), Behavioural Decision Theory (BDT), Judgement Decision-making (JDM), Organisational Decision Making (ODM), and Naturalistic Decision-making (NDM). We refer to Lipshitz et al. (2001) for a detailed discussion of these accounts and distinguish them in terms of well-known associated studies, representative models, decision-making attributes, and the agency involved (Table 4.1).

Table 4.1 Existing accounts for decision-making

	CDM (Classical Decision-making)	BDM (Behavioural DM) and JDM (Judgement Decision-making)	ODM (Organisational Decision-making)	NDM (Naturalistic Decision-making)
References	Bernoulli, 1978; Savage, 1954; Von Neumann and Morgenstern (1944)	Edwards, 1954; Meehl,1954; Kehneman and Tversky, 1979)	Simon, 1957; March and Simon, 1958; Cyert and March, 1063	Klein et al., 1953; Lipshitz, 1993; Orasanu and Connolly, 1993
Some models, accounts	Rational choice model[lix]	Elimination by Aspects, Prospect Theory, Ambiguity Model	Bounded Rationality, Garbage Can	Several Heuristics (such as Recognition-Primed, RAWFS)
Attributes	Comprehensive choice, input-output orientation, context–free modelling	Variations from 'errors'	Organisational goals and structures, coupling and coincidence	Situation –action matching Process orientation Context-bound informal modelling
Agency	Individual	Individual /Group	Organisation	Individual

As we see later, compared to the other accounts (BDT/JDM, ODM), NDM puts special emphasis on the basic assumption of this work (i.e., to provide adequate decision support for situated method development one needs to understand the decision-making underlying it) and incorporates essential features of situated method development in the treatment of decision-making. We discuss how NDM regards decision-making in compared to other accounts and how it incorporates the features of situated method development from decision-making perspective.

In this respect, the five following dimensions of NDM are useful to guide our discussion.

- *Proficient decision maker*. Compared to others (especially CDM and ODM), NDM considers the way people use their experience to make decisions in a field setting as the essential determinant for the decision-making process. In situated method development, the *agency* feature (similar to proficient decision maker) deals with situated method development and being experienced with the method is at the heart of decision-making.
- *Process Orientation*. As opposed to descriptive facet of models in Classical Decision-making (CDM), NDM models aim to describe cognitive processes regarding what information decision makers actually seek, how they interpret it, and which argument they use. This dimension refers to the *interaction* features of situated method development where cognitive processes are acknowledged as part of situated method development.
- *Situation-action matching decision rules.* As opposed to best assessment and concurrent choice in CDM, options are considered based on their compatibility with the situation (a typical saying would be: "Do X because it is appropriate to the situation Y") and the decision maker's own contention. The process of matching also relies on patterns and informal reasoning. This dimension refers to the *adaptation* feature of situated method development where matching, adjustments, and transfers of cognitive processes take place.
- *Context-bound informal modelling*. Expert knowledge as domain- and context-specific is formed along with reasoning, argumentation, and heuristics. This dimension refers to the *setting* feature of situated method development where setting is akin to the meaning of context as used in NDM.
- *Empirical-based prescription.* As opposed to Judgement Decision-making (JDM) and Behavioural Decision-making (BDT), where

> prescriptive models are derived from normative models, NDM models can be prescriptive because their empirical-based prescription depends on descriptive models of expert performance. They note that, "…decision makers in natural settings use situated content-driven cognitive processes to solve domain-specific problems by taking concrete actions" (p. 335). This dimension refers to the setting and interaction features, but is also related to research methodology as we refer to it in chapter 5.

Although NDM helps us relate essential features of situated method development to the dimensions of a naturalistic decision-making process, it does not provide a specific account for theorizing situated method development. This is the topic of the next section where we introduce method adaptation for establishing the foundation of situated method development.

4.4 Theorizing Situated Method Development

An introduction of *method adaptation* requires understanding four essential notions: *situation*, *context*, *agency*, and *method fragment.* These have already been studied partially in the core cluster literature (e.g., situation-specific method engineering, ISDM), but their treatment in this work is fundamentally distinct from other relevant studies. As such, the four notions are considered essential building blocks for theorizing situated method development. The conjectures about method adaptation are based on their articulations within the discourse of the orientation held, which presupposes that situated method development can be best understood as human decision-making. Their articulations eventually lead to the basis on which a generic model for situated method development is introduced.

Articulation of Key Notions for Theorizing Situated Method Development

In this section we examine what grounds are appropriate to the notions of situation, context, agency, and method fragment mainly in the supportive cluster (cognitive psychology, philosophy, sociology, and linguistics). We first explain how this examination has been carried out, which has to do with the adopted research approach and the technique discussed in Chapter 2. By examining we mean to understand how the notion is treated in its corresponding research domain and thereafter incorporate its meaning into our research context. For instance, to understand how the notion of situation is treated in literature, we have identified and discussed three relevant studies in the research domain of linguistics, cognitive psychology, and

sociology. For the notion of context, we have discussed relevant studies in the research domain of pragmatics, decision-making. For the notion of agency, by referring to Assumption 4.2 and Proposition 4.3, we have examined the theory of intention as underlying account for studying the idea of agency in method adaptation. The treatments of these notions are provided in their own discourses and at different levels of detail. It should be noted that to avoid any misunderstanding on the adopted notions we stick to their original meanings and remain clear about how relevant their meanings are to our subject. After the articulations of these notions in the following section, we will incorporate our conceptions of these notions for building the basis of method adaptation for theorizing situated method development in the next section.

The Notion of Situation

The term situation refers to, "the way in which something is placed in relation to its surroundings" (Merriam-Webster, 2005) or "a set of circumstances in which one finds oneself, or location and surroundings of a place" (OED, 2005). The key words are here circumstances, surroundings, and placing them in a certain way. This placement has to do with cognitive activities (i.e., making sense of surrounding, circumstances, and relating with a cognitive scheme) and/or physical activities (performing an activity to do so). In Latin the term *in situ* as an adverb or adjective indicates a similar meaning stating that "in the natural or original position or appropriate place" (Merriam-Webster, 2005).

The term has been used extensively in IS research in different ways[lx], but its meaning is often reduced to a number of factors without articulating its essential features or their interplay in relation to human knowledge and action tied to its philosophical treatment. In this sense, we briefly discuss its use in sociology, linguistics, and cognitive science, and aim to come to its essential features (Table 4.2).

Perhaps the most comprehensive exposition of the term to appear so far in linguistics is in Barwise and Perry (1981) titled "Situation and Attitudes" and associative studies that deal with situation semantics and propose a mathematical theory of situation. In sociology, it is the work of Suchman (1987), entitled "Plans and Situated Action" which introduces "situated action". In cognitive science, especially in connection with artificial intelligence, Endsley (1988) and her colleagues introduce "situational awareness" to emphasize "the knowing of what is going on". Three studies in this work are representative studies which help us find three complementary[lxi] views on the notion of situation. In doing so, we have been

able to reason about the underlying features of situation in connection with the idea of situated method.

Table 4.2 The very notion of situation in three complementary studies

Representative study	Associated Disciplines	Essential features of the very notion of situation
Theory of Situation	Linguistics	Partial reality Realism Relations
Situational Awareness	Cognitive Psychology	Employment of cognitive mechanisms and relevant factors for human knowing
Situated Actions	Sociology	Interactions Partial plans and other resources subsumed and produced

Regarding the theory of situation (Barwise and Perry, 1983), which has been applied in various areas including design theory, linguistics (Akman and Surav, 1996), and artificial intelligence (Cohen and Levesque, 1987), it aims to incorporate intentions and circumstances of the agents in the communication process. Perry (1987) recognise the need to rethink the foundations of situation semantics and provide the following definitions:

> Situations are contrasted with worlds; a world determines the answer to every issue, the truth-value of every proposition. A situation corresponds to the limited parts of reality we perceive, reason about, and live in. What goes on in these situations will determine answers to some issues, but not all. (p. 1)

The central ideas with the notion of situation and their theory are based on:

- *partiality*, a notion of situation implying that situations are partial models.
- *realism*, which asserts that basic properties and relations are taken to be real objects, uniformities across situations, and not bits of ideas, sets of n-tuples, or functions.
- *the relational theory of meaning*, which means that the meaning of an expression is conceived as a relation between a discourse situation, a connective situation, and a described situation.

Regarding 'situated action', Lucy Suchman introduces this term to underscore that actions take place in the *context* of particular, concrete, and possibly *material* and *social*, circumstances. She contrasts her account with the traditional view of human actions, specifically goal-directed behaviour as studied in cognitive science, asserting that plans are taken to be either formal structures that control a purposeful action or abstractions over its

instances. Alternatively, her account as drawn from ethnomethodology contends that:

- plans are representations of actions,
- in the course of situated action, representation occurs when otherwise transparent activity becomes problematic in some way,
- because of the objectivity of situations our action is achieved rather than given,
- a central resource for achieving the objectivity of situations is language, which stands in a generally indexical relationship to circumstances that it presupposes, produces and describes,
- as a consequence of the indexicality of language, mutual intelligibility is achieved on each occasion of interaction with reference to situation particulars, rather than being discharged once and for all by a stable body of sharing… (As she acknowledges, this proposition is in fact drawn from (Barwise and Perry, 1983)).

The third representative study which introduces 'situational awareness' (SA), employs the models of human thinking proposed in cognitive science (Endsley, 1989). By 'situational awareness' Endsly (1989) means,

> …perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and projection of their status in the near future.

She argues that although the elements of SA vary widely in several disciplines, the nature of SA and the mechanisms used for achieving it are common (for instance, perception, comprehension and projection are proposed as three 'levels' underlying SA and blended with, but different from, the decision-making perspective that SA is aimed to facilitate decision-making). By drawing on associated empirical studies, they argue that certain elements (goals, expectations[lxii], mental models[lxiii], schema, and automaticity) influence SA and are vital for the agency's internal representation of state. It should be noted that SA is concerned about the state of knowledge that has to do with the references to confirmed schemas and the 'yet-to-be-tested' hypothesis, rather than the process of achieving this. Many factors (e.g., task under or overload, fatigue, psychological stress) may also degrade SA, but they are, as claimed, independent constructs. It is suggested that other terms like shared situational awareness, shared understanding and distributed /shared cognition should be used for a collective version of the SA as it has an originally individual focus. It is also

suggested that factors like culture, experience, personality, sex, and age as 'structural factors' are different from 'situational factors' such us mood, time pressure, stress, ambiguity, etc.

Our understanding of the term situation has some commonalities with the three representative studies. That is, situation is about:

- A limited portion of the world - partial reality - as emerging over location and time
- Characterization (confined and yet-to-be-tested hypothesis)
- Subsumed and produced partial reality for planning (concerning future- and present-directed act)

An important corollary of partial reality is that a situation as constructed by the agency is about *knowing of the agency* and it is in the head of an agency. This view is in line with what Von Glasersfeld (1997) called "radical constructivism" which is developed following Kant (1724-1804), Vico (1668-1744), and Piaget (1896-1980). This view employs the following principles of radical constructivism:

- Knowledge is not passively received either through the senses or by way of communication,
- The function of cognition is adaptive, tending towards fit or viability,
- Cognition serves the subject's organisation of the experiential world, not the discovery of an objective ontological reality.

By drawing on the principles of radical constructivism, a constituent of a situation is not a thing-in-itself, but something that the cognizing subject has constructed by making distinctions and coordination in his or her perceptual field (Piaget, 1937). For the purpose of an analytical examination however, we see the three constituents as distinct elements ('things-in-themselves') though each of them construes and includes the other two.

The Notion of Context

In a broader sense the term *context* refers to a collection of relevant conditions and surrounding influences that make a project situation unique and comprehensible (Hasher and Zacks, 1984). The complexity of context as a subject has been acknowledged by many scholars, including Akman and Bazzanella (2003). Andler (2003) argues that relevant discussions on this subject in philosophy evolve from its narrowest meaning about the consideration of texts in linguistics, to its broadest meaning, something to do with 'situated cognition'[lxiv]- that is invariably situated, as elaborated in the field of pragmatism. In particular, a traditional view of the notion of context suggests that contexts are pre-existing and stable environments that perhaps include unobservable factors that cause agencies to behave in partly unpredictable ways (Rogoff and Lave, 1984). This view appears to be akin to

what Andler (2003) calls the optimistic claims stating that for all classes of cognitive tasks and processes, there is a uniform context matrix - whatever the features or factors are granted, such that for all situations in the class, the outcome of any process in the class is determined by the values taken by the matrix in the situation.

This is often contrasted with the contemporary view which asserts that all contextual regularities, conditions and any other relevant features, are assumed to be dynamically activated and accomplished in the situation (Linell and Thunqvust, 2003). Context has also been studied as a central notion in human decision-making. Pomerol et al. (2004) illuminate the dynamics of context and the employment of reasoning for 'practical' decision-making. Practical decision-making, as discussed by Pomerol et al. (2004), is reminiscent of naturalistic decision-making, an adopted orientation in this work.

Different kinds of context are introduced with a duality character (Schegloff, 1992) such as 'immediate' or 'proximate' contexts. These include features pertaining to actual surroundings in situ versus 'distal' or 'mediate' contexts which cover background knowledge, cognitive frames, or assumptions about on-going, up-coming, or even priori activities relevant in situ. Another distinction is made between so-called primary and secondary context, the extent to which influencing characteristics are stable (Pomerol and Brézillon, 2001). In relation to this duality character, Andler (2003) defends a 'mixed model of inquiry', which combines rationalist reliance either on fact or principles with a consideration for appropriateness to the situation at hand. This is indeed where the pragmatics view of context stands and of which several accounts are proposed. Mey (2003) for instance, advocates this view and argues that ambiguity is inherent in contextualization, decontextualization, and recontextualization (hereafter called 'contextualizing') through which one may effectively marginalize certain agencies and their legitimate interpretations by virtue of an institutionally embedded context.

But what does context then include? Or to say it differently, what is included and excluded in this contextualizing? Brézillon and Pomerol (2002) suggest focussing on the dynamic of context, rather than things included and excluded in contextualizing and proposes three types of knowledge for contextualizing: *external*, a part of knowledge not used in a specific situation at the moment contextualizing occurs; *contextual*, a part of knowledge relevant for contextualizing, and *proceduralised*, a part of knowledge invoked, structured, and effectively situated in contextualizing. Perhaps a more provocative question would be: who excludes what, and on whose

premises? These questions have to do with the roles of agencies in this contextualization. Andler (2003) states that,

> …the ultimate goal of a general theory of context would be an account for regularities, if any, which can be observed in the effects of context on cognitive process. If there are indeed such regularities, the context problem, relative to the class of situations and processes at hand, has an in-principle solution, consisting in refining and otherwise modifying the state space. (p. 354)

Human agency is central to contextualization. In connection with this work, of course, method fragments are also considered during this contextualization. But exclusion of the agency and method fragments is in effect when the context is framed and reframed along with the cognitive structure and processes (Piaget, 1983). After successive approximation, this eventually leads to an appropriate context under consideration with respect to, upon, and in which the decision is made. Accordingly, cognitive structures change through the process of adaptation by assimilation and accommodation. This is boldly marked in the radical constructivism along with the principle stating that the function of cognition is adaptive and serves the agency's framing or organizing of the experiential world, not the discovery of an objective ontological reality (Glasersfelds, 1997). We employ the ideas of 'contextualizing', 'framing', 'appropriation' in relation to the very notion of *context*.

The Notion of Agency

Cognitive elements come into place at the outset of situated cognition when contextualizing takes place in situ where the agency is supposed to make a decision and to perform actions. But what cognitive elements are manifest in human thinking and actions? It has been argued for a long time that desire and belief are the elements that have certain direct impacts on human thinking and actions. There is no doubt that beliefs and desires are always present in the cognitive structures and process with some effects, but contemporary studies in the field of the philosophy of mind, including Bratman (1987) and his associates, have questioned their direct effects in the course of actions and corresponding decision- making.

Granting that human knowing, more broadly thinking, and actions are inherent situation determinacy, we turn our discussion to what cognitive elements are necessary for situated method development. In principle, human thinking is subject to the complexity of interplay between many cognitive elements such as beliefs, norms, motives, goals, and intentions. The accounts on each term or their combinations along with counter

arguments are readily available in philosophy as a reference discipline as well as in certain applied sciences (management science, IS research, organisational science) where the prospective accounts are adopted. By drawing upon the works of Bratman (1987) in the philosophy of mind and Husserl (1859-1938) and proponent scholars in the philosophy science, our aim in this section is to show that as a cognitive element, the notion of intention serves best to explain the interplay between the method fragments, the agency, and the context.

In the dictionary (Merriam-Webster, 2005) and every day language, the term intention is synonymous for volition, purpose, and significance, and indicates "a determination to act in a certain way". Other derivations and uses of the term appear as intent, intentionality, doing with an intention, or doing something intentionally. To ground explanations concerning their differences would require a long philosophical treatise which belongs to the philosophy of mind, but the treatment of intention and intentionality in Bratman (1987) and Morison (1970) is relevant to our subject. We also acknowledge other studies (Ajzen and his associates (1975; 1980)) that extensively used these notions.

The treatment of the terms intention and intentionality should be separated as the former has been articulated in relation to action, planning and practical rationality (Bratman, 1987), and the latter is proposed in phenomenology, a particular school of thought in the philosophy.

Intention is considered a state of mind (what it is to *intend to something*) and a characteristic of action (*having an intention* to do something or doing something *intentionally*).

'Intentionality' derives from the Latin verb 'intendere', which means to "to point to" or "to aim at", and Brentano (1838-1917) accordingly characterized the intentionality of mental states and experiences as their feature of each being 'directed toward something'. Intentionality in this technical sense then subsumes the everyday notion of doing something "intentionally": an action is intentional when done with a certain "intention", i.e., a mental state of "aiming" toward a certain state of affairs.

One of the most comprehensive expositions of the term intention is in the work of Michael Bratman. His treatment reveals complexity and the essence of its characteristics and functions along with two forms (future- and present-directed[lxv]). Bratman (1987) extensively discusses his account in relation to planning theory and agent rationality, for which we cannot condense the body of literature he employs in a few pages. The forms and kinds of intention he proposed however, are especially useful for characterizing the agency action in method adaptation. Some preparations

on the background of the notion of intention will facilitate our discussion of the subject.

Upon the deeper examination of the idea of intending to act, which channels a future-directed form of intention, or having an intention to act, which is present-directed action, he contends that intentions are neither desires nor beliefs but plans, and that plans have an independent place in practical thinking. One of the central facts about intentions essential for this work is that they are conduct-controlling pro-attitudes and serve as inputs for further practical reasoning. According to Bratman (1987), distinct from normal beliefs, both desires and intentions are pro-attitudes, which have a motivational function for an act. As distinct from desires or other weak proposition attitudes such as beliefs and goals, (considered *potential influencers of action*) intentions are *conduct-controlling* pro-attitudes. As such, intentions are parts of partial plans for action, required by an agency that must make complex plans but cannot make the plans complete. The partial plans play a central role in practical reasoning, aimed at adjusting and completing prior but partial plans, and help extend the influence of deliberation beyond the present moment and facilitate coordination within the agent's life and, socially, between agents. Cohen, Freeman and Levesque (1996) provide formalism for relationships between the agent's intention with a number of important properties and relative propositional attitudes (beliefs, desires, and goals). They adopt three functional roles ((1) intentions pose problems for the agent who needs to determine a way to achieve them; (2) intentions provide a "screen of admissibility" for adopting other intentions; (3) agents track the success of their attempts to achieve their intentions and four basic properties of intention. The four properties are, if the agent intends to achieve x: (4) the agent believes x is possible, (5) the agent *does not* believe she will *not bring* about x, (6) *under certain conditions*, the agent believes she will bring about x, (7) the agent need not intend all the expected side-effects of their intention. (1), (2) and (3) are directly related to partial planning and practical reasoning, (4), (5), and (7) can be linked to propositional attitudes and (6) is especially of interest to this work as to it is tied to the notion of context.

Three kinds of intention are also mentioned: deliberative, non-deliberative, and policy-based. To explain these, consider the following example. Suppose that I decide in the morning to go home after the research meeting in the late afternoon. Just before the meeting I continue to intend and say "I intend to go after the meeting", which is deliberative future-directed intention. But after the meeting, my intention will be temporarily updated, which is expressed as "I intend to go home now" indicating non-deliberative intention because I do not necessarily reform it. While I am

walking I do it with an intention of going home, which is present-directed intention. What about policy-based intention? It is the formation of intention, which is effective under certain circumstances. Suppose that it is also due to my general policy that I go home in the case of a late afternoon meeting. At the end of meeting, I am invited to go to a coffee house. In this case, as matter of policy-based intention, I may not join and be committed to go home.

In addition to scholars in the philosophy of mind, other behavioural science researchers share similar ideas about the effect of intention and other relevant elements (desire and belief) on human behaviour. Fishbein and Ajzen (1975) also treat the intention in theory of planned behaviour,. A central factor in planned behaviour is the individual's intention to perform a given behaviour. It is also noted that,

> …intentions are assumed to capture the motivational factors that influence a behaviour; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour.

Accordingly, the stronger the intention to engage in behaviour, the more likely its performance should be. Fishborn and Ajzen (1975) defend that the role of intention holds effectively in the theory in the case the behaviour in question is under volitional control.

The Notion of Method Fragment

Philosophical treatment of the term method is often done implicitly while discussing the matters about, for instance, rationality of agency, reasoning in the formation of thinking and action. In fact the definition of method holds a very strong affinity with these matters, but its elaboration is beyond the scope of this work. We therefore turn to the core cluster literature to articulate the notion of method and method fragment. Recall the definition of (ISD) method: an explicit way to structure one's thinking and actions. It is the *one,* as we term agency, that has some affinity and involvement in a project. The method does not do anything itself though there are certain parts of method that perform some activities together with an agent (modelling, testing, coding, etc.). What is interesting to see is that a method structures or helps someone to structure other agencies' thinking and actions. This is done together or without[lxvi] the others agencies at the time (t1) which occurs before the actual execution (t2) of the structured thinking and actions. That is where an intriguing relation with t1 and t2 begins because,

- It is very optimistic to think that the context at t2 is truly taken into account in this structuring at t1;
- It is too idealistic to consider that the agent who makes use of the method to achieve this structure has the same intention embedded in the methods (i.e. incongruence of the agent's perceived situation with the situation held by the method);
- It is too strong, and possibly incorrect, to surmise that the agents who hopefully hold and practice in the context at t2 will have the same intentions as presumed.

We argue that structuring at t1 and under the context c1, one's thinking and actions to be executed at t2 under the context c2 is a yet-to-be-tested hypothesis. Namely, neither the method to be situated nor the agent who wishes to achieve a situated method can justify or even claim the structured thinking and actions will be realized as intended and contextualized. But, if this is so, what is the rationale behind a situated method?

First and foremost, a meaning of situated method is revised in that it is not with a fine-grained description of the method that we are concerned, but instead the intentions attached to a number of key deliberative actions to be appropriate to the contexts under consideration. We also note that method as inanimate agency holds 'frozen-rational' of its producer. It is necessary to explicate how this frozen-rational with its collectives are proposed to be situated, when present. If it does not include this aspect (i.e. how it is to be situated), it fails to hold the very idea of situated method. (Jayaratna, 1994) criticize methods on this matter, and proposes a framework containing four essential elements: the 'problem situation' (similar to the term context we use), the intended problem solver (methodology user), the problem-solving process (the method), and the evaluation of the above three. The proposed framework has certain interesting features pertaining to the goal, as opposed to forcing the method user to use the method, that *facilitate* the designer to come to her own method. For this purpose, the designer and user are encouraged to ask a number of questions and critically examine the intention of every action needed. Some examples:

> What are the methodology users' value sets? What believes do they hold as being "good"? For example, which of the economic, political, cultural, or technical values do they the methodology users consider as uppermost? In this context what values do the methodologies advocate? How congruent are these with methodology users' values? (Jayaratna, 1994, p. 119).

The examples indicate that the method producer should be transparent about what intentions are held for actions and under which circumstances she would act. Klein, Meadows, and Welke (1981) and Kumar and Welke (1984) attempt to reflect users and developers intentions into method fragment selection. We suspect that very few methods attain, or even aspire to this and most of them either endeavour or totally lack this. Consider for instance, PRINCE 2 (**PR**oject **IN C**ontrolled **E**nvironments), recognised as a de facto standard for project management in the public sector and which goes back to 1975 in UK. Here is the extract from PRINCE 2 (1998) concerning arriving at a situated method:

> PRINCE is designed to be used on any type of project in any environment. It contains a complete set of concepts and project management processes that are the minimum requirements for a properly run and managed project. However, the way PRINCE is applied to each project will vary considerably, and tailoring the method to suit the circumstances of a particular project is critical to its successful use (p. 9)

Notice that the above quote is a method fragment from PRINCE 2. With this statement, the point is touched upon, but there is no systematic description anywhere in the method which indicates the transparency of the method for its appropriate use. The only thing provided is a list of 203 questions in the appendix of the manual, entitled 'Healthcheck'. These are grouped into stages of the project (start up, initiation), or areas of concern (business case, organisation, quality). Although these questions are useful to characterize the situation at hand and raise awareness of the method designer to decide on appropriateness of the method to the project context, they do not have any affinity with the intentions held by the method. There is also no guidance in case answers to questions are negative and what the effect will be on the intentions formed and associated fragments in the method. They appear to be similar to typical risk factors mentioned in the literature, which do not contribute to achievement of situated method per se.

Incorporating the Four Essential Notions into Method Adaptation Process

As we see in chapter three that the four essential notions are often conceived from what we call a basic or simplistic view, they need to be extended to comprehensive and possibly richer meanings.

We consider the notion of 'situation' a phenomenon with which the agency perceives, reasons about, and lives in at certain time. Three complementary views on situation -Theory of Situation, Situational

Awareness, and Situated Actions, summarized in Table 4.2- indicate underlying features of this construct, which is essentially a composite one (Table 4.3). By employing the theory of situation (Barwise and Perry, 1981) we contend that situation is partial reality at best which has to do with the relations among the collectives under consideration. By employing the idea of situational awareness (Endsley, 1991), we argue that the agency needs to use all kinds of cognitive elements and mechanisms to be aware of the position held on and reason about what we intend to do. By employing the idea of situated action (Suchman, 1997), situated method is enacted by interactions among its collectives along partial plans.

Table 4.3 An extension of four essential notions

Four essential notions	Basic View (Simplistic)	Modest Extension
Situation	characterized by a number of factors that influence or are being influenced by a method fragment	the limited parts of reality that the agency perceive, reason about, and live in
Context	described in terms of aspects or collectives in the process	dynamic interplays among collectives of work practice as situated and characterized by the agency
Agency	adheres to enactment of proposed fragment in the work practice	interplays among fragments with a certain intention in and for the context
Method fragment	description of a methodical artefact or any coherent part thereof	comes into play with the agency in the context when structuring one's thinking and actions

By drawing on the conception of situation we conjecture that agency, context, and fragment are essential for situated method development. Situated method is regarded as a phenomenon because it is:

- based on partial reality construed by the agency that forms the intention in the context at a certain time and in place,
- enacted and re-constructed for the context in which the agencies' thinking and actions are structured and referred thereof.

The following summarises our conceptions of three notions:

Regarding *context,* Adler's account gives a hint about two aspects of a context: On the one hand it is perceived, and perhaps influenced by means of the agency's own fragments (fragments already used a priori by the agent)

and proposed fragments (the fragments not used a priori by the agent). On the other hand it influences the agency's fragments and proposed fragments. It has then a duality character on 'to influence' and 'being influenced', which is manifest in the process of contextualizing, de-contextualizing, and re-contextualizing. In other words, this process is about 'characterization of context for situation awareness'. This characterization includes, as referred to in Endsley (1987), perception, comprehension, and projection. It is this characterization that uses a number of factors considered salient to the situation at hand. Most of these characteristics are nothing more than subjective views of the situation. By drawing on the literature of social cognition and using the empirical findings of the work, we contend that characterization remains effective when the relations among the characteristics of the situation can be present to achieve a 'yet-to-be-tested hypothesis', sometimes represented as heuristics. As time progresses in situated method development and more insights are gained along emergent attributes of the context, relations among the characteristics are subverted and (re)formed as the meanings and their importance is characterized again.

Agency, is at the heart of situated method development where it interacts with the fragments (owned and proposed) in and for the context. The agency conducts characterization of the context in which all collectives (other agencies having one of the roles as identified, methodical artefacts as shall be elaborated below), and other constituents of the situation are considered. At any moment during this characterization the agency may need to determine what to do with the fragments owned and proposed (i.e., how to structure the agents' thinking and actions in the situation foreseen). This determination is an intentional action of the situation at hand and involves a human decision-making process. We argue that the concept of intention, along with its main functions and forms (future- and present-directed), paves the way for an account of the agency theorizing the way an agent structures his own and/or the user's thinking and action for constructing a situated method. Accepting that the situation at hand and that which is foreseen (where the actions are performed intentionally whether or not the associated intentions agree with the proposed one) are partially construed and relative to the agency, uncertainty is always inherent in situated method development and in determination of the fragments. Therefore, a body of knowledge concerning 'decision-making under uncertainty' is used to understand how decision-making is achieved in situated method development. In particular, naturalistic decision-making accounts are found to be appropriate as their particular view on decision matters fits our orientation on the subject matter.

Regarding *(method) fragment*, which is of course, present in situated method development and is a cognitive element that presupposes agents' future-directed intentions and is materialized in different forms (template, procedure, technique, etc.). Due to this cognitive aspect, a method fragment influences the way a designer structures her thinking and actions that affect the way the user structures and realises her thinking and actions[lxvii]. Various intriguing interplays occur between the agency and method fragments that will be elaborated later on, but to give an example, consider a simple case where the designer adopts the fragment without any change (i.e., the designer role is not effective). In this case, the fragment becomes more dominant in situated method development (i.e., it directly structures its user's thinking and actions). But that is only one direction of the influence; the other manifested as the method fragment is subject to change in the execution of the proposed fragment (i.e., the proposed fragment is enacted and modified in a context). These two aspects of fragment, similar to context, show a duality of method fragment (simply, 'to influence' and 'being influenced') which manifests the process of contextualizing, de-contextualizing, and re-contextualizing of the fragment. In other words, this process is about 'characterization of method fragment for situation awareness'.

Proposition 4.4 Adaptation Underpinning Situated Method Development. Adaptation is essential to situated method development because the agents in a 'perfect' sense cannot arrive at matching, adjusting, and/or transferring elements of a situated method where the context is unique and relative for each agency.

Conjecture 4.1 Method Adaptation Process (MAP). Given that three concepts (context, fragment, and the agency) emphasise the idea of modifications, changes on, and interplays among them, we conjecture that the 'Method Adaptation Process', in short 'method adaptation' or 'MAP', is:

> a process or capability in which agents holding intentions through responsive changes in, and dynamic interplays between, contexts, and method fragments develop a situated fragment for a specific project situation.

Proposition 4.5 Agency Roles in MAP. Regarding agency roles involved in MAP, we distinguish four generic roles: a *proposer* that produces method fragments, a *designer* that modifies the proposed fragments, a *mediator* that intervenes the development process, and a *user* that just employs method fragments in the project.

The agent can play all the roles mentioned above, but usually different agents have these roles. Consider a project manager who usually uses the fragments for project management activities such as reporting, budgeting, or risk management. In case she thinks the proposed fragments are insufficient for certain reasons concerning the project, she might implicitly or explicitly propose her own fragments to herself and it might be the case that she would consider it a template for future cases and modify it to the situation at hand. In this modification she might be influencing this modification to arrive at her own fragments.

We can also consider a project manager as a designer, who is responsible for configuring the method fragments proposed by anonymous or known agents, as a proposer in the setting. Usually a so-called expert or a consultant, a mediator provides the project manager with some ideas about the proposed fragments and how to configure them. Finally, a project member as a user will employ it during the development of an IS.

Having articulated the four notions and stated the theorem of MAP, we now provide a generic model for MAP.

4.5 A Generic Model for Method Adaptation Process

By providing a generic model in this section, we articulate further dynamic interplays among the three essential concepts underpinning the method adaptation process (Figure 4.3). We use certain symbols to simplify and reduce ambiguity in representation of the model. This also provides us certain shortcuts referring to certain statements while discussing MAP.

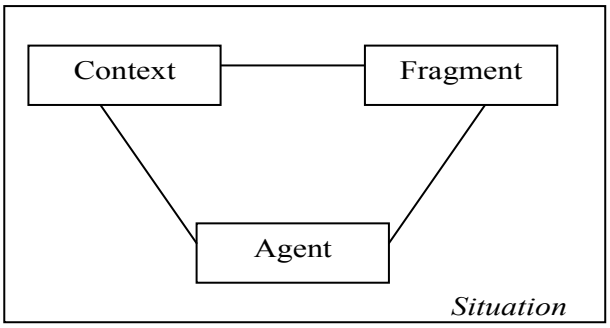


Figure 4.3 A generic model of MAP: The essentials of situation as things-in-themselves

To better articulate the details of MAP we consider three stages of development of a fragment: design, enactment, and after-use. This distinction is made for simplification of the stages of situated method development that are of interest to us while discussing MAP later on in this

section, not for describing the occurrence of MAP. The occurrence of MAP is the moment at which a fragment is under the consideration of an agency in a situation. Depending on the case, these stages can occur at very short (seconds) or long intervals (days, months). We use certain scenarios to cope with complexities related to MAP.

We begin with Situation.

Situation (S): In this work we consider a situation as a collection of three essential concepts: *Agent*, *Context,* and *Fragment*. A situation 'out there' at a certain *time* is subject to the stages of situated method development including design, enactment, and after-use of a situated method fragment.

Agent (A): The agent is situated at a certain *time* and plays one or more *roles* in situated method development. These roles are *proposer*, *designer*, *mediator*, and *user*.

Context (C): The context characterized at a certain *time* includes all kinds of *socio-technical collectives and their relations*. These collectives include people, all kinds of artefacts (e.g. technology, documents describing rules, formal structures, procedures, data), non-codified elements (values, norms, relations), which are regarded as relevant to its characterization. Two important remarks are worth to mention here. First, method fragments are separated from these collectives as they are specifically considered for IS development. Second, in the literature, one can find several classifications of the characteristics for the collectives (for instance, environment, target and project organisation; also see chapter five where we provide an alternative classification along with a number of well-known characteristics). We should note that certain characteristics are readily available in the literature, but as they are all relative to the agent (see the discussion on the notion of context) they are far from complete. To give an example of certain characteristics, consider clarity of the problem addressed and the solution proposed, formality and stability of the business processes to be supported, clarity of the business case, commitment status, organisational impacts of the solution proposed, scope of the problem and solution, complexity inherited in the problem and solution targeted, complexity of development environment.

Fragment (F): A method fragment induced at a certain *time* by the agent A is constituted in terms of three dimensions: *characteristics* , *intention* , and *actions* .

The resultant *situated method* is denoted as ***S(F)***. As examples, we provide certain fragments of an agile method in chapter five.

Intention (I): *Intention* held by the agent A at *time* can be *presented* d*irected*, which is formed by the agency that has one or more *roles* at a certain *time* (see the previous section for an elaborative discussion on presented and directed intention).

Action (a): Action(s) can be planned for or enacted in the action domain at time. These actions are related to ISD and describe how and what to do about a certain fragment. For instance, consider an iterative development strategy fragment provided for certain project characteristics. The actions dimension of the fragment describes how to realize and what to do about development strategy. In other words, this dimension indicates a full-fledge procedure to use a fragment in certain context with a certain intention at hand. The intention dimension of this fragment, as discussed later on in chapter five, may refer to the achievement of fitness for business purpose because it is with this fragment that the system development is enhanced by incorporating various feedback from end-users and/or a business representative.

At the moment MAP occurs, which eventually leads to a situated method, the agent is effective in cognising a situation. During this cognising a situation is framed and reframed many times, which becomes the so-called situated 'thinking and actions' and is materialized as a situated fragment ***S(F)***. In this cognizing certain situated fragments are induced by cognition through:

- The *context out there*:*(C)* (present as independent from the agent)
- *The fragment out there*:*F* (proposed as independent from the agent (i.e., the fragment not used a priori by the agent)
- *The agent's own fragment*: *A* (as used already a priori by the agent)

Induction of the fragments as cognized through *C*, *F*, and *A* can be thought as the following cognitive *process(es)*, $\mathbf{p_C, p_F, p_A}$, (Figure 4.4):

- Characterization process for the context out there: $\mathbf{p_C}$
  where $\mathbf{p_C}$ (Characterizing): C → A(F_C). It is with this process that an agent takes into account project characteristics and considers suitability of a fragment proposed or owned.
- Characterization process for the fragment out there: $\mathbf{p_F}$
  where $\mathbf{p_F}$ (Characterizing): F → A(F_F). It is with this process that an agent determines suitability of the proposed fragment.
- Characterization process for the agents' own fragment: $\mathbf{p_A}$
  where $\mathbf{p_A}$ (Characterizing): A → A(F_A). It is with this process that an agent recalls her fragments used a priori.

During any moment at MAP, the agent may perform one or all of p_C, p_F, p_A and the results of these cognitive processes are:

- **A(F$_C$)**: a fragment induced by an agent through cognition of the context out there;
- **A(F$_F$)**: a fragment induced by an agent through cognition of the fragment out there;
- **A(F$_A$)**: a fragment induced by an agent through cognition of the agent's own fragment.

Thus, a situated fragment is developed through performance of the cognitive (characterization) processes (see Figure 4.4). That is, $S(F) \approx IP(p_C, p_F, p_A)$ where IP denotes a collection of the three kinds (p_C, p_F, p_A) of cognitive processes.

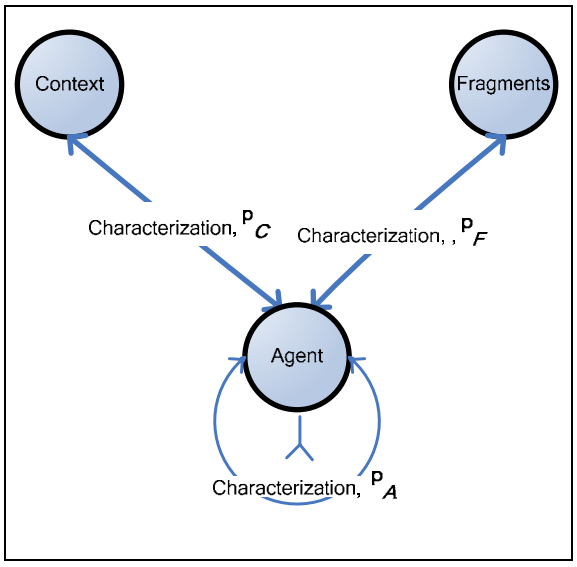


Figure 4.4 Cognition for MAP: The agent cognizing through p_C, p_F, p_A

To explicate MAP further by modelling the interplays between context, fragment, and agent (Figure 4.5), we need to provide certain attributes for context, fragment, and agent.

Regarding context,

- Context includes various collectives in the action domain, the domain where a situated method is enacted.
- As an agent cognizing a context through a fragment, the context is framed, re-framed and induces new fragments.

- Since characteristics are basics of characterizing context, the agent employs them with their possible combinations to relate to or generate new fragments.

Regarding fragment,

- A fragment has affinity with an agent holding certain roles. A fragment can be designed, proposed, mediated, and used by an agent.
- A fragment can be at one of the stages of a situated method development.
- A fragment is in principle always situated because it is crafted in a certain context by a certain agent that aims to realize her intention.
- A fragment has a structure containing three basic elements: characteristics, intention, and action.
- If a totally new fragment is created, we call it innovative; otherwise it is a structured fragment.

Regarding agent,

- As an active agency in MAP, an agent may have several roles.
- An agent may own certain fragments linked to the memory formed.
- No agent will attempt to achieve something forever (idealization adopted from Cohen et al. (1987)).
- At the design stage, the fragments induced from *C, F,* and *A* are dynamically generated, compared with each other to determine a situated fragment.
- Agent interplays among the fragments induced from *C, F,* and *A* by relating to a certain time line (past, present, or future situation).

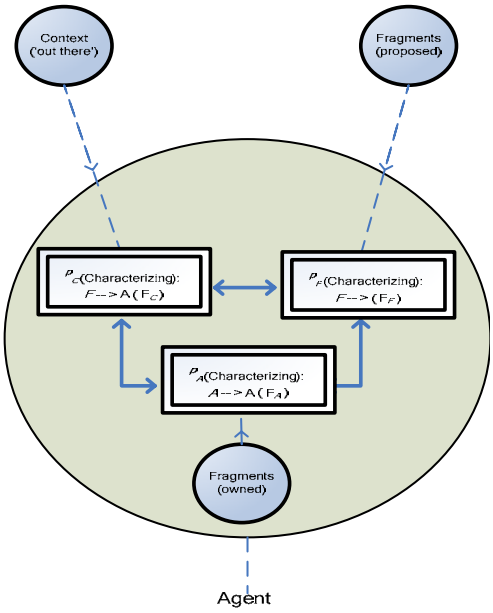


Figure 4.5 Visualization of interplays among the fragments induced from *C, F, A*

Now, we discuss three cases where MAP occurs at the design stage and only the agent's role is designer. We then consider other agent roles involved in and stages of MAP.

Case 0:

i. Only $\mathbf{p}_C$ is effective. In this case, the agent has no relevant fragment in his background knowledge and no fragment is proposed. For this case amethodical ISD is introduced by which innovative (unstructured) fragments are crafted.

This is the case where method fragments (owned or out there) are not readily available for a project manager who might be considered as the designer of a situated method. Put it simply, it is this case where the manager is left alone in achieving a situated method fragment from scratch. Nevertheless, if a situated method is to be achieved, it may emerge through innovations triggered by the context. This is very probable where the manager faces some breakdowns during the project performance (the ISD level).

ii. Only $\mathbf{p}_A$ is effective. This is for a fictitious case where no actual ISD context is present.

iii. Only p_F is effective. This is a case where fragment is an inanimate object; the fragment is ineffective or not cognised by the agent.

Actually, the cases (i) and (ii) do not provide further insights in our discussion as there is no any occurrence of method adaptation in these cases.

Case 1:

i. Only (p_C, p_A) are effective. This is a case where the characterization takes place in the context where the fragment is owned. The interplay between the context and the agent may result towards the context or the agent. If the agent believes that her fragment should hold, but the context challenges this, then the agent can ignore or change the context by intervention. Alternately, the agent can be suspicious about her fragment and go with the fragment induced from the context. This may result in converting her fragment to the fragment induced from the context.

To explicate this case further, consider a project manager who thinks that iterative systems development (as the fragment owned by the agent) is an appropriate development strategy for the project context at hand. By employing the characterization of her own fragment (her past experience with that particular fragment as used in another project context), she might argue that the new context appears to be similar in terms of certain characteristics (for instance, the scope of a proposed solution is not clear, requirements are not frozen), but not similar in terms of others (for instance, in this new context the target organisation is not experienced with iterative systems development and as such, the users are not empowered to get involved in systems development at early stages). If she holds her reasoning (yet-to-be-tested hypothesis) as valid that this fragment is needed and, but the context brings up certain issues, then either she adjusts the context by, for instance, assuring management commitment to get the empowered users involved in the project. If she thinks that changing the context for this fragment is beyond her ability, then she may adjust the fragment by considering other systems development options. This example indicates that the interplays between the fragment owned and the context out there can influence or to be influenced in the development of a situated fragment.

ii. Only (p_C, p_F) are effective. This is the case where the fragment is adopted without any modification. This may be the case if the designer is a novice or has to adopt the proposed fragment. There are some tools aimed specifically at this case (Baan Configurator, or SAP Concept Check). The vision of these tools is replacing the designer with the tool.

It is this case where the characterization process for the context in fact is driven by the fragment. For instance, suppose that the manager is given with a number of options for development strategy (linear, iterative, etc.) as the fragment out there and plus the context out there. Suppose also that along with the provided options certain context related characteristics are known in terms which options are appropriate to which circumstances (as combination of the provided characteristics). In this case 1 (ii), the manager simply checks the characteristics of the project context at hand against the characteristics of the contexts prescribed for the options. Then the manager is expected to make a normative decision on which option is best suited the project context. According to this case, there is no room for the manager to adjust the fragment and she is supposed to adhere to the fragment resulting from a normative decision-making process.

iii. Only (p_A, p_F) are effective. This does not hold in any real case because the context is always present. This can hold where the designer is only interested in the fragment as a reference material for reading or training purposes.

Case 2:

(p_C, p_A, p_F) are all effective. This is the most interesting case where the agent's (designer) decision-making requires processing three different fragments induced from the context, fragment, and agent. In this case, one can expect the following scenarios:

i. One of these fragments induced by p_C, p_A, p_F holds. For example, the agent may go with her own fragment (does not change the fragment) and either reject or modify the context and fragment proposed (change or reject both or one of them).

If the three characterization processes are effective, it might be the case only one or two of them is dominant and we may return back to the Case 0 or 1 (i), (ii), and (iii) respectively.

ii. Configuration of the elements of these fragments occurs such that:

$$S\ (F) \approx IP(p_C, p_F, p_A) \approx IP(A\ (F_C), A\ (F_F), A\ (F_A)) \qquad (1)$$

This case brings up several interplays between the context, fragment, and agent through multitude times of executions of the three characterization processes. By referring to the idealization principle (see p.192), these

interplays end up with a situated fragment resulting from major or minor changes of the fragments induced from the context, fragment out there and agent. To give an example of this situation, consider again the case described in case 0 (i) (the iterative development scenario) and additionally suppose that there is alternative option for this fragment (say waterfall systems development is appropriate to the project context). That is, there are two fragments at hand which appear to be appropriate to some extent. In this case the manager may start questioning whether she should hold her fragment or the proposed fragment. Maybe even the context at hand is in favor of the proposed fragment she might still opt for her own fragment as she is determined and confident that the context out there is changed accordingly. It could be the other way around that even she thinks that her own fragment is appropriate, but given the dominance of the fragment proposed she has to go for the proposed fragment. The latter occurs when the manager is supposed to adhere to that fragment due to, for instance, the system development policy in the target organisation.

iii. A new fragment totally distinct from any of these fragments is induced.

This case refers to necessity of creating a new fragment. After the interplays of the fragments induced, the agent needs to come up a distinct fragment. This is where the context out there enforces the agent to innovate a situated fragment.

Other roles involved in MAP

Notice that the cases are generated based on the view that the agent is active as designer in MAP. In case other roles are involved in MAP, we then have cognition of other fragments induced from for instance, a mediator. The effect of the mediator in MAP can be lesser or substantial. It can be lesser in that the mediator does not bring changes on the cognition of the fragment induced from p_C, p_A, p_F, but rather provides some explanation. The effect can be substantial in that the mediator gives further information about the elements of the fragment induced from both the context and fragment out there. To illustrate the effect of the mediator in MAP consider Case 2 (ii). Think of a new case where there is a mediator involved in the situation of Case 2 (ii) and now we have two situated fragments:

- the one from the designer as discussed in Case 2 (ii), which is:

$$S\ (F) \approx IP(A^d(F_C), A^d(F_F), A^d(F_A)) \approx S(F) \quad (2)$$

where d denotes a designer role as effective and

- the one from the mediator, which is:

$$S\ (F) \approx IP(A^m(F_C), A^m(F_F), A^m(F_A)) \approx S(F) \quad (3)$$

where m denotes a mediator role as effective.

The situated fragments represented by (2) and (3) are expected to be different as long as characterization of the context and fragment out there are influenced in some way. The same arguments can be used for Case 2 (i). Here the mediator has different effects on the fragment induced from the agent, context, and fragment out there at time the time the mediator is involved in MAP.

Other stages for MAP

We now articulate how the interplays in MAP change across the stages of the development of situated method. At the enactment, the central role is the user, the one who is going to enact the fragment in the context that we call the action domain. The interplays in MAP have a similar character; while the user enacts the fragment she needs to again design it and again performs characterization of context and fragment already situated by the designer at an earlier time. The main difference is that characterization of context and fragment is 'richer' than it was before and the form of intention is not future-directed anymore. Similar to the design stage, we have cases similar to Cases 0, 1, and 2 at the enactment stage. The last stage, the after-use, provides reflections on the status of situated fragments across the design and enactment. This stage may include various innovative fragments materialized due to the emergent context, which is characterized after its occurrence.

The logic of inquiry adopted in this chapter along with the line of reasoning and imperatives (assumption, proposition, corollary, conjecture) helps us to establish the foundation and a generic model for MAP.

First and foremost, to start discussing the underpinnings of situated method development (SMD), we have needed to state Assumption 4.1 that a (ISD) method is always present irrespective to its explicitness as long as ISD takes place. The description of SMD by using a theory-neutral language has shown its certain essential features. These essential features are subsumed and incorporated in the form of Propositon 4.2. The description of SDM has also induced Corrollary 4.1 which resulted Proposition 4.1 that SDM involves a human-decision making process. Together with Propositon 4.2 and Corrollary 4.1 we have searched a suitable decision-making account by which SDM can be further analysed. This has lead to Proposition 4.3 that the theory of purposive actions contributes to the foundation of the decision-making process underlying SMD. Having stated this proposition, we have examined and related the essential features of SMD to the dimensions of an appropriate decision-making account, which is Naturalistic Decision

Making. We have further argued that although NDM helps us to illuminate its essential features, but does not provide a specific account for theorizing it.In fact, NDM acknowledges the need for first articulating key notions underpining SMD in a descriptive manner, and then introducing a generic model that embodies possible decision-making processes involved in SMD. This has motivated us to employ existing accounts for articulating key notions for foundation of SMD. Such an articulation has lead to an extension of the key notions as treated in the basic models of SMD and eventually Proposition 4.4 and Conjecture 4.about the foundation Method Adaptation Process (MAP). Having stated MAP and articulated its key notions, we have introduced a generic model as a means to understand the intriguing relationships among the key notions as cognitive processes (p_C , p_F , p_A.) To emphasis the effects of these processes we have discussed several cases with some examples.

This completes our articulation of a generic model for MAP and the modelling of the interplays among context, fragment, and agent. We should note that this articulation stays at a high level where functioning of certain processes is presented. The ordering of these processes and their contents are not detailed in this section. We discuss this point in chapter five and also evaluate MAP in an analytic and empirical manner.

CHAPTER 5: EVALUATION OF METHOD ADAPTATION

"All the world's stage,
And all the men and women merely players,
They have their exits and their entrances,
And one man in hits plays many parts,
His acts being seven ages."
From As You like It (II, vii, 139-143, Shakespeare

Having presented the foundation of MAP, theorizing method adaptation, and proposing a generic model for MAP in Chapter 4, in this chapter we explicate and evaluate the generic model for MAP in two different ways.

First, by using basic models proposed for method adaptation in the literature, we hypothesis that the generic model 'accommodates' these models as specific MAP patterns. By accommodate we mean that MAP incorporates the underlying reasoning for relationships among key constructs embedded in the basic models. In this regard, the generic model is evaluated analytically as it serves as a kind of a meta-model for basic models. In Section 5.2, a detailed discussion is provided of the proposed generic model in relation to basic models in analytical sense.

Second, we explicate and evaluate MAP on empirical basis by using the case study conducted for this work. Explication is done by showing the existence of two forms of MAP identified in the case organisation: static and dynamic method adaptation. The first form considers MAP in a static manner (i.e., the characterization processes of MAP are based on a "prescribed situation"), whereas the dynamic method adaptation employs these processes for "the situation on the move" throughout the project execution. A detailed discussion on the case study in relation with MAP is provided in empirical sense in Section 5.2.

5.1 The Generic Model for MAP in Relation to Basic Models

Our examination and evaluation of the generic model in relation to basic models is structured as follows. First we illuminate the underlying reasoning behind the relationship among the key constructs embedded in each model explicitly or implicitly from the perspective of MAP. In each model, we show

which relationships can be accommodated by the processes of MAP. Second, we provide our interpretation and representation of each model using certain modelling elements to explain the generic model. To better visualize our interpretation of prevailing models from the perspective of the generic model, we provide figures (5.1-b, 5.2-b, and 5.3-b) depicting which processes of MAP are emphasized by a basic model. In our representation, we use solid arrows to depict the relationships referred to explicitly and dotted arrows for those referred to implicitly. It should be noted that the translation of the basic models is always subject to completeness and correctness for its original meaning. To make our reasoning clear, we use relevant studies as much as possible. We begin with the Configuration Process as proposed in Van Slooten (1995).

The Configuration Process and MAP

We should remark here that Kees van Slooten (1995) makes a clear distinction between *method fragments*[s], *route maps,*[s] and *scenarios*[s]. We consider them as certain types of fragment; because we are interested in the reasoning behind the adaptation of these elements, these types of fragment do not effect our examination of the reasoning embedded in the configuration process. The model proposed by Van Slooten (1995) called the configuration process, at the outset, appears to consider 'the context out' there as a starting point, but in fact the process employs possible implications of the enactment of a situated fragment (Figure 5.1-a). In an empirical setting, Kees van Slooten and his associates (1995; 1996) work on the relations between a context and a fragment selection in a descriptive way. For this purpose, two studies reveal the relations in terms of what and how contingency factors derived from context underlie fragment selection such as delivery strategy and realization strategy (Slooten and Hodes, 1996) and also what characteristics of context are found to be "preconditions" for the use of certain fragments (Slooten and Schoonhoven, 1996). We contend that these relations refer to interplays between the fragments induced through the context out there, that is $A(F_C)$, and the fragment out there, which is $A(F_F)$. In other words, Van Slooten and Hodes (1996) reveal that by employing a characterization process for context 'out there' p_C, - that is, p_C (Characterizing): $C \rightarrow (F_C)$, those fragments 'out there' have been modified in their case organisation. Further, Van Slooten and Schoonhoven (1996) reveal that by employing a characterization process for the fragment 'out there' p_C, - that is, p_F (Characterizing): $F \rightarrow A(F_F)$, appropriate context 'out there' has been modified in their case organisation.

In this regard, interplays between context and fragment incorporated in the Configuration Process are accommodated by the generic model of MAP by employing the characterization processes p_C and p_F. The directions of these processes as depicted in Figure 5.1-b and show which of these fragments –either A(F_C) or A(F_F) – is influencing the other. Van Slooten and Schoonhoven (1996) remark that this influence can be treated not only in terms with negative implications, but perhaps also terms with positive implications. They highlight these two by referring to the "behaviour" of the factors in terms of failure or success behaviour. We contend that these behaviours have to do with the intention dimension of a fragment (F) as they indicate what the fragment would bring in terms of project outcome.

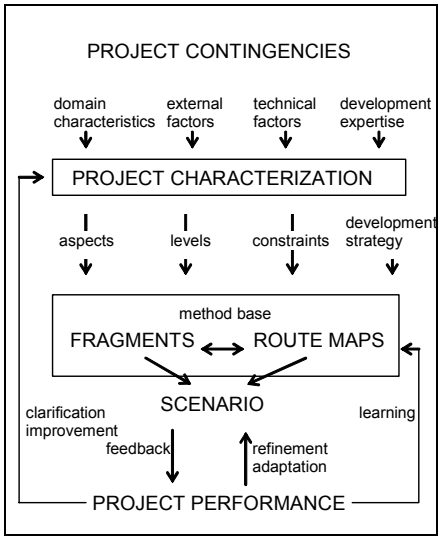


Figure 5.1-a The Configuration Process

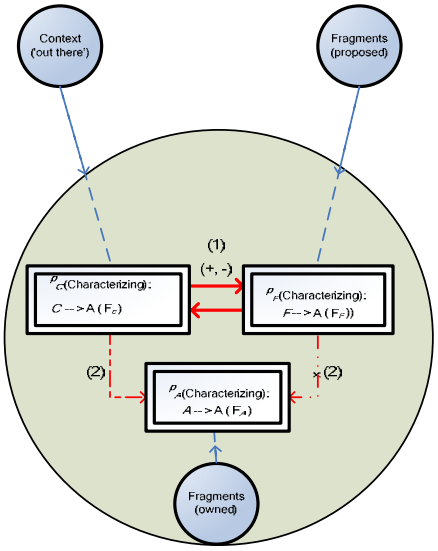


Figure 5.1-b A corresponding pattern of MAP

Another important remark is that the Configuration Procedure acknowledges all stages for method adaptation though its emphasis is on the design and the procedure does not go into details about the enactment and after-use stages for method adaptation. In particular, the procedure does not provide any guidance for the agent on how to extract and employ lessons learned at the enactment stage.

Notice that the discussion above has been about the interplays between A(F_C) and A(F_F)), referring to our articulation of the generic model of MAP especially for the Case 1 (i). The other cases appear to be implicitly referred to in the Configuration Procedure (see arrow 2 in Figure 5.1-b). This

implicit mentioning in the Procedure and the empirical studies of Van Slooten is not surprising because the notion of agency as articulated in this chapter is not central to his articulation of the idea of Situated Method Engineering (1995). The same holds for the configuration process in that the agent is considered the one who will possibly be supported by a knowledge-based support system, what he calls 'method engineering information systems'. The agent's involvement in the configuration procedure has do to with selecting the fragments that fit the context at hand. In line with this reasoning, the configuration process from a MAP point of view does not address dynamics of contingencies, as Van Slooten (1995) puts it "mutual relationships", among them.

MAP in that sense enriches the configuration process by providing further insights into how this characterization of context can be examined. MAP also extends the configuration process in that it establishes the agent's involvement at the heart of the configuration and regards the selection mechanism as part of dynamic interplays among context, agent, and fragment.

In examining MAP in relation to the Configuration Procedure of Situated Method Engineering in Van Slooten (1995; 1996), the procedure can be considered a particular pattern with a special emphasis on the interplay between context and fragment explicitly, and on the interplays between agent and context implicitly.

The S3 Model and MAP

The S^3 Model proposed in Harmsen (1997) includes three essential constructs: *situation*, *scenario aspect*, and *success*. As articulated in Chapter three and four, the notions of situation and scenario are akin to the notions of *context* and *fragment* in our work; while the notion of success is considered a particular intention that the agent may hold in MAP. The S^3 Model seems to be especially appropriate for the design stage of situated method development.

The starting point in the S^3 (Harmsen, Lubbers, and Wijers, 1995) model is a fragment and a context out there. The fragment can contribute to achievement of the intention held by the fragment out there whereas the context may "imply" or "contribute" to achievement of the intention (see Figure 5.2-a). Accordingly, the terms imply and contribute refer to negative and positive consequences on intention achievement. The model adopts the following reasoning for situated method development:

> If a specific situation [context] occurs contributing to or implying negative success [intention], this should be nullified by incorporating a specific project scenario [fragment]" (p. 204).

In other words, when t*he context* is characterized by certain factors (such as low management commitment, high degree of resistance) and the *intention* formed by the agent is to reduce its negative effects to ensure success with respect to certain performance indicators, then certain *fragments* are chosen for the context and the intention out there. The reasoning embedded in the model then appears to indicate that the context is dominant in the selection of an appropriate fragment for a certain intention. In this regard, the S³ Model employs the characterization processes p_C of the generic model, which induces certain A(F$_C$) because of negative or positive effects on the intention (depicted by plus and minus signs in figure 5.2-b). Such a fragment is available as the fragment out there *F* as part of "the preliminary scenario" in his language. In this respect, the notion of agent in the S³ Model is subsumed to the one that performs matching of A(F$_C$) and *F* in a normative way. Harmsen (1997) mentions a need for automated support for performing matching. Accordingly, the congruence between A(F$_C$) and *F* can be achieved by modifying F (see arrow 3). This refers to the use of p_A implicitly in that the S³ Model does not incorporate what will happen if there is an incongruence between A(F$_C$) and *F*. This is exactly what we point out in Chapter 4 as part of an elaborate discussion in relation to Case 1(ii) – that is, only (p_C, p_F) exist - and Case 2, that is, (p_C, p_A, p_F) exist. Can the incongruence be dealt with only modifying F in order to accommodate A(F$_C$)? Do we need to innovative a new F? What about keeping F and changing the context out there? The S³ Model does not consider these questions in its underlying reasoning. Consequently, the agent's own fragment, aside from F, is not considered separate in the S³ Model.

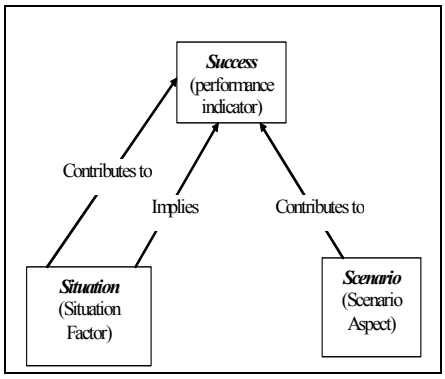


Figure 5.2-a The S³ Model

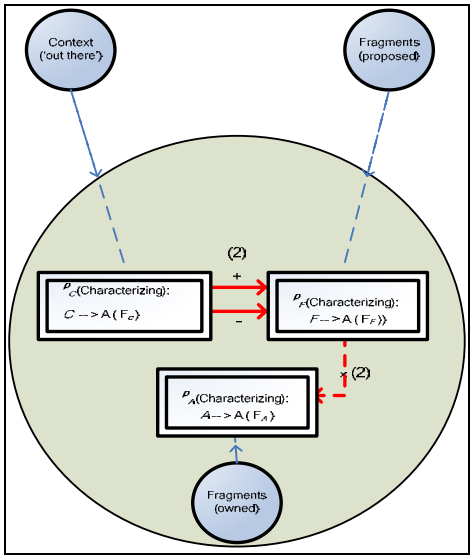


Figure 5.2-b A corresponding pattern of MAP

Another remark on the S³ Model is about the dynamics of characteristics. We contend that these characteristics altogether (with certain combinations and certain relations) generate different heuristics. Harmsen (1997) provides several of these heuristics and uses them to illustrate how the S³ Model can be used further. The provided heuristics do incorporate mutual interplays between the characteristics, but the generic model acknowledges that these interplays are essential for characterization processes (p_C, p_A, p_F).

MAP examination in relation to the S³ Model of Situational Method Engineering in Harmsen (1997), shows that the S³ Model is a particular pattern or model of the generic model for MAP with a special emphasis on the explicit interplay between context and fragment and on the implicit interplays between agent and fragment.

A Social Process for Fragment Adaptation and MAP

As shown in figure 5.3-a, the social process adopts a number of concepts, including method published, innovative method fragment, work setting and the act of selection, invent, practice, and combine. As pointed out in chapter three, there is a lack of clear-cut definitions for some of the concepts and other relevant notions such as situation and condition, and this limits us in thoroughly comparing their concepts with ours. Nevertheless, the notions of

method and work practice appear to be similar to the notions of fragment and context respectively in method adaptation.

Baskerville and Stage (2001) propose a social process for situated method development along with the premise that a method should be situated at the ISD level where ISD activities are carried out. Contrary to those approaches aiming to develop a situated method based on a prescribed context, the social process is employed to realize method adaptation at the moment when the proposed fragment is enacted in the emergent context. That is, the social process focuses on the enactment stage of situated method development. In their work, the user of a proposed method (systems designer in their terms) and the user of the system to be developed are of primary importance to situated method development. According to the social process, the user of the method together with the user of the system may enact the proposed method in a certain context to develop the system. Such a proposed method can be considered the fragment out there ("published method" in their terms).

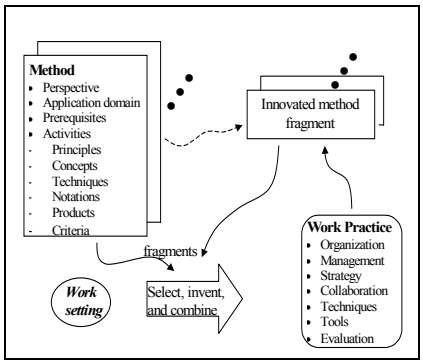


Figure 5.3-a
Components of a Social Process for Method Fragment Adaptation

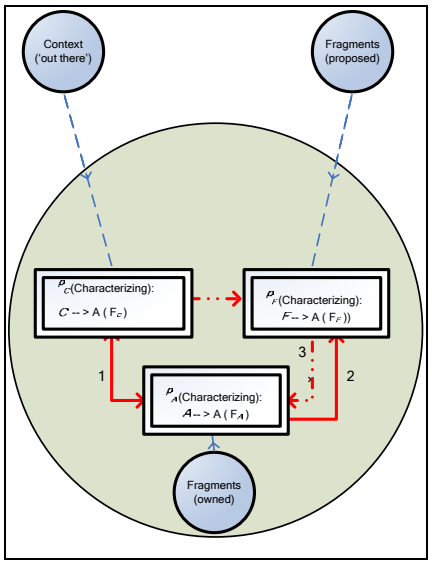


Figure 5.3-b
A corresponding pattern of MAP

According to the model, if the fragment out there (F) is not applicable to context (work practice in general, the user of a system in particular) in a project situation, then the context may force the designer of the method to revise the published fragment or innovate a new fragment; otherwise, the designer holds the proposed fragment and tries to change the context (bidirectional arrow 1). The generic model of MAP accommodates this by the

context characterization process (p_C). Baskerville and Stage (2001) highlight cognitive incongruence between the fragments resulting from characterization processes for the fragment out there as realized by the user of method out there and the user of the system. They do this by using the idea of the Ethnographic Strip discussed in chapter three. In this respect, the Social Process addresses the interplay between the agent and fragment implicitly. These resulting fragments $A(F_F)$ where the agent is $A_t{}^u$, are treated as cognitive schema and have dimensions of goals, frames, and plans similar to the dimensions of a fragment (intention, characteristics, action) discussed in chapter four. Notice that what Baskerville and Stage call proposed method is assumed to be the fragment out there. However, the designer of the fragment might provide it specifically for the context. In other words, this fragment might be already be situated for that particular context, which means that this fragment is not actually "fragment out there", but is situated and not enacted yet. When the social process highlights the cognitive incongruence (in their term, breakdown) it actually aims to reveal the underlying logic of a fragment out there as determined at the ISD method level, but questions its validity at the ISD level. In line with the scope of MAP as discussed in chapter three, MAP embraces mechanisms (p_C, p_A, p_F at the enactment and usage stages) to deal with situated method development at both the ISD method and ISD level.

Similar to the previous two basic models, characterization of a context in terms, a number of elements are suggested though their mutual relations are not addressed in such a characterization. MAP on this matter acknowledges their mutual relations through the characterization process.

In examining MAP in relation to the Social Process for Method Fragment Adaptation in Baskerville and Stage (2001), the process can be considered a particular pattern of the generic model for MAP with a special emphasis on the explicit interplay between agent and context and on the implicit interplays between agent and fragment.

To conclude with the examination of MAP in relation to the basic models, we contend that as they correspond to specific patterns of the generic model, they put special emphasis on the interplays between agent, context, and fragment with different degrees and explicitness. These patterns reflect two perspectives on MAP patterns. We call them the *engineering* and *socio-organisational perspectives* and explain below that the first represents the positivist views of natural science and the second represents interpretative views of social science.

The Two Perspectives Relating Specific Patterns of MAP

Of interest to the school of method engineering, the engineering perspective emphasizes the 'structural' aspects of the method and usually employs contingency-based models for method adaptation. The latter appears to be concerned with better understanding how a method and its components are invented on-the-fly and are actually used in an emerging work setting, and is reflected in the socio-organisational literature (Baskerville and Stage, 2001).

Table 5.1 Two perspectives relating specific patterns of MAP

Key perspectives on method adaptation / The constructs of MAP	The engineering perspective	The socio-organisational perspective
Agent	- Method proposers and designers as dominant actors - Static and dynamic use of factors mediated by an intention, often in terms of risk and success factors	- An interplay between method proposers, users and the user of system - An ill-structured, complex organisational phenomenon
Context	Factor-based characterization of context	Emerging context in ISD setting
Method fragment	Coherent and structured parts of a method	Innovated (unstructured) fragments separated from a prescribed method
Representative Basic Models as Specific Patterns of MAP	The Configuration Process (Slooten, 1995), S^3 Model (Harmsen, 1997)	A Social Process (Baskerville and Stage, 2001)

These two perspectives adopt different levels of abstraction for method adaptation. The engineering perspective stays at a conceptual level with a focus on models of the "real or empirical world" rather than the "real world" itself (Harmsen, 1997). In comparison, the socio-organisational perspective looks into the empirical world and tries to understand method adaptation in practice, examining real, concrete development processes.

Both perspectives discussed above use various kinds of factors to understand the context. Even though the proposed list of factors in the domain of method engineering is supposed to be lengthy, it is apparent that social and organisational issues are not the focus of attention. The socio-organisational perspective, however, does put more emphasis on social and organisational elements of the context. In addition, this perspective considers context as an emerging ISD setting rather than as a prescribed project situation.

From an engineering perspective, a method fragment is a description of an ISDM, or any coherent part thereof. It is usually prescribed, and structured in terms of fragment properties (Harmsen, 1997). On the other hand, the socio-organisational perspective pays more attention to those fragments which are distinct from a prescribed method. This perspective sees fragments as follows:

> Under [this] concept, each systems development project is a moving pastiche of miscellaneous parts; bits of external methodologies, internal methods, innovative, unique techniques invented on-the-fly, etc. (Baskerville and Stage, 2001, p.18).

To differentiate between the two meanings of this concept, we consider two types of fragments and use the terms 'structured' and innovated (or 'unstructured') to refer to the meanings in the engineering and socio-organisational perspectives respectively.

Fragments can be principles, fundamental concepts, products to be delivered, activities that need to be performed, job aids - techniques, tools, hints, tips - to be used, etc. Some of them are essential to ISD approach determination, which is concerned with a high-level description of the method, including the goals and the guiding principles, and the beliefs, fundamental concepts, and principles of an ISD process Iivari et al. (2001).

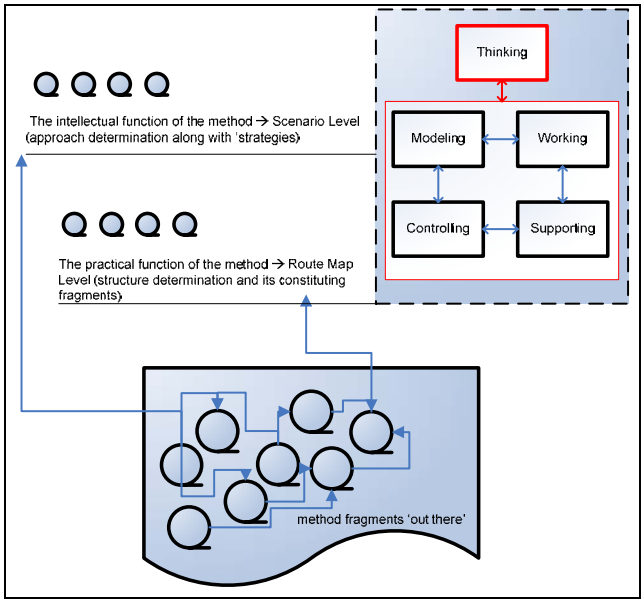


Figure 5.4 Visualization of relating fragments to the scenario and route map levels

In this regard, fragments can be related to aspects of method such as the way of thinking, modelling, controlling, and controlling and supporting (Wijers, 1991) (see Figure 4). We are interested in those fragments related to the way of thinking, and to some extent to the way of modelling and working. The terms 'principles' and 'assumptions' used in published methods often refer to this kind of fragments. These are called strategic fragments in that they have strategic orientations or effects on the way of thinking on ISD and IS and reflect intellectual function of the method. They are concerned with, for instance, modelling aspects and scope, development strategy, and deployment strategy. As such, they are often referred to as building blocks of scenarios or planned approach in literature (Slooten 1995; Harmsen, 1997).

So, we propose the following fragments and corresponding decision variables related several aspects such as modelling aspect, design-development aspect and user engagement aspect. Consequently, we have the following:

Strategic fragments which are related to modelling aspects:

- Modelling scope (the boundary of target system and dimensions): the extent to which the approach considers tracing of several perspectives such as functional, information, process, organisational and operation (see (Curtis, Kellner, and Over, 1992) and (Jablonski and Bussler, 1996).

- Approach orientation (the orientation of problem-solving system): (problem or solution orientedness) and social aspect (technical-administrative or social-organisational) (see (Offenbeek and Koopman, 1996))
- The analysis starting point (knowledge acquisition strategy): current situation or future situation (direct acceptance of user requirements, actual system is a starting point, possibly from the point of view of the old system, determining information requirements from scratch (starting from perspective of the object system)
- Re-use (design) strategy: using a reference (architecture) model, or a new architecture or combination of both.

Strategic fragments which are related to design-development aspects:

- Dividing strategy: increment strategy (how to partition problem and/or solution space)
- Realization strategy: the way to realize a number of increments: at once (no subsystem), concurrently (parallel), overlapping, consecutively (subsystems are developed one after another, incremental)
- Development strategy: linear, overlapping, throw-away, keep-it prototyping, evolutionary or reverse engineering
- Delivery strategy: the way to deploy a solution in a organisational setting; big bang (at-once), incremental, evolutionary

Strategic fragments which are related to 'stakeholder engagement' aspects:

- Validation strategy: immediate acceptance, definition of norms and test cases, by means of which assessment takes place whether the chosen solutions meet the requirements; prototyping; validation by usage
- Engagement strategy: based on the interaction model of Van Offenbeek and Koopman (1996) and in particular on the user engagement (degree of user involvement and responsibility)

To make a scenario complete, we need a route map describing other required fragments to refine a method further. In this respect, they reflect the practical function of the method.

The socio-organisational perspective does not specify any specific roles in MAP, yet the emphasis is on the practical interplay between people at work. The socio-organisational perspective considers MAP as "an ill-structured, complex socio-organisational phenomenon" (Baskerville and

Stage, 2001, p. 14). Anthropology is referred to as a potential reference discipline to study such a process, and Agar's practical ethnography and its four major units of analysis (Agar, 1986) are used to explain how the process develops in practice.

The engineering perspective regards method proposers and designers as the dominant actors in method adaptation. Their role is to carry out the process leading to a situated method. Such a process usually employs contingency-based models. As (Offenbeek and Koopman, 1996) note, the factors taken into account in these models can be numerous, or limited to certain IS views and used in a static manner. These models ignore possible bilateral interactions between the context characterized by the factors, and the approach, and also lack dynamic interactions among the factors. Van Offenbeek and Koopman (1996) propose the concept of a dynamic fit between context and approach as a solution to the static use of contextual factors, the approach, and the corresponding method fragments. They state,

> To a certain extent the dominant actors cannot only choose their approach but also their context, whether by definition or by intervention, that is by deliberately changing the context (1996, p. 257).

It is important to note that both the context and the approach are subjects for adaptation, and a form of mediating construct is needed to facilitate this adaptation process. Such a construct, in this work, is called an *intention*, and has been referred to using different terms in the various models proposed for method adaptation (see, for instance, *risk* in conventional contingency-based models as listed in Van Offenbeek and Koopman (1996), *success* in (Harmsen et al., 1994), *goal* in (Baskerville and Stage, 2001), and *mediating factors* in (Slooten and Brinkkemper, 1993)).

To wrap up the discussion with two perspectives, we contend that these two perspectives are complementary and even necessary if one considers the specific patterns of MAP as analysed above. We discuss this contention in the light of the case study as provided below. We should remark that since the case was conducted before the foundation of method adaptation is complete, the description of the case findings below does not use the processes of MAP explicitly. Once the findings are described without using the generic model of MAP independent, we use them to explicate specific patterns of MAP relating to the two perspectives. In the following section we use our case study findings to:

- explicate how situated method development has been realised in practice,

- illuminate certain forms of MAP (dynamic and static adaptation) in relation to specific patterns and with two perspectives (the engineering and socio-organisational perspectives),
- provide insights and an instrument that the case organisation uses to deal with static and dynamic method adaptation.

5.2 Explication of MAP in an Empirical Setting

In the first sub-section, we introduce the case organisation, the research method applied especially to conduct this case study, and the method under investigation in a nutshell. In the second sub-section, we present in detail two forms of method adaptation realized in the case organisation. The final sub-section includes a discussion of the findings in relation to the two forms of adaptation.

About The Case Organisation, Research Method and ISD Method

The organisation we investigated is one of the leading financial institutions in Europe and operates in a dynamic business environment., Consumer & Commercial Clients (C&CC) is one of the global strategic business units and focuses exclusively on services for individual clients and small to medium-sized businesses. The Netherlands Business Unit (BU) is one of five BUs under C&CC. IT Development is one of the departments within the Netherlands BU and employs 2000 people involved in systems development projects. Such a large IT department was chosen because it enabled us to investigate method adaptation in various project contexts.

It is worth noting that the organisation has considerable experience in information systems development (ISD) method use. The organisation's identity goes back ten years to the merger of two organisations, both of which were familiar with conventional methods. One had been using a method developed in-house, and the other a brand-named method. Until the introduction of an agile method just two years ago, a lot of effort had been put into achieving a standard method influenced heavily by previous development procedures, processes, and templates.

Research Method Adopted for this Case Study

The research approach adopted in this study is an interpretive field study. Many researchers, including Fitzgerald et al. (2000) and Sauer and Lau (1997), have used this approach for the study of method use in practice. It has been suggested as an appropriate research method for explorative and descriptive types of research; according to Klein and Meyers (1999, p. 69),

> …interpretive research does not predefine dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges; it attempts to understand phenomena through the meanings that people assign to them.

The field study was conducted in the form of a research project in the organisation and carried out by a research team consisting of people from the university and the case organisation. The appendix two summarizes the characteristics of the research method applied, such as the use of multiple study stages, various sources of knowledge, an iterative process of data analysis (Walsham, 1995), a collaborative style of the research team involvement, "engaged" data gathering (Jones and Nandhakumar, 1993), and the use of different feedback mechanisms for the validity of the data analysis. One can see that the mentioned characteristics are indeed related to the principles of interpretive field research (Klein and Myers, 1999) (e.g., the use of various sources of knowledge is related to the principles of multiple interpretations, suspicion, and contextualization). By referring to the hermeneutic cycle (Klein and Myers, 1999), we have investigated how method adaptation has been realized in various contexts where the context refers to different individuals, project types, coaches etc. Thus, we have tried to enrich our research context so that the phenomenon investigated could incorporate many interpretations. In doing so, we have captured the practitioners' understanding of method adaptation. Notice that this has been done throughout the rounds of interviews, analysis of various data (see for instance, the extended suitable risk filter as discussed later on) in iterative manner. Regarding the principle of abstraction and generalization, we have used a questionnaire to identify which fragments were of most interest to practitioners (see Appendix 2.1). The principle of suspicion has been effective from the beginning of the conduct of the case in that we have considered basic models as alternative theoretical lenses. The principle of multiple interpretations has been achieved by incorporating various feedback from different parties as mentioned in chapter two.

The field research consisted of three stages: the preliminary study stage, the actual research stage, and the posterior study stage (for the details of the research method applied see Appendix 2). During the actual research stage, the primary investigator of the research team worked with a group of method engineers on tooling activities concerned with method adaptation. Another member of the research team had already been involved in the organisation-wide deployment of an agile method for more than two years. The other two authors were subject matter experts from the academic

side. A sponsor and a method engineer from the company also participated in this research.

In this empirical setting the sources of knowledge were informants, direct observations, and documents. Since the information needed was partially available in the organisation, the team concluded that several rounds of formal and informal interviews, direct observations in the form of attending meetings, and in-depth documentary analysis were the most appropriate ways to collect data. Three rounds of interviews were conducted, each at a different level of detail in different forms, with different informants (i.e., embedding different levels and roles). In some interviews, a list of questions was used to ensure that all the important subjects were covered but, at the same time, room was left for emerging issues (see the Appendix 2 for the interview questions and details of the research method).

In this interpretive case research approach, we preferred "engaged" data gathering methods to "distant" ones as they allowed us to gain rich insights into method adaptation (Jones and Nandhakumar, 1993). However, some limitations of this approach have been identified. One of the problems frequently cited in the IS literature (Klein and Meyers, 1999), was the difficulty in controlling interactions between the researchers and the subjects, especially in a large IT development department. Another problem was the level of abstraction needed and the degree of generalization achieved. To assess these problems, the research team members organized three 'checkpoint' meetings in which up-to-date research findings were discussed and the scope of the future stages of the research determined. In these meetings, the 'depth' and 'breadth' of the research scope was elaborated and found to be satisfactory for all the parties involved. Another type of feedback mechanism used to check the validity of the analysis was to present and discuss the research findings with other interested parties in the case organisation. This involved twelve method engineers, six project managers, one change manager, one chief domain architect, and two quality assurance leaders. The feedback from such a broad audience was useful to justify our findings.

About the Agile Method - DSDM in a Nutshell

Dynamic Systems Development (DSDM) is an agile method because it has the ability to be adaptable to a variety of development situations (Abrahamsson et al., 2003). In the UK and the Benelux countries, DSDM, supported by a consortium of over 600 organisations, has become the de-facto market standard. The method strongly emphasizes the concepts of suitability and adaptability. To a certain extent DSDM will be suitable for a project or an organisation, and is adaptable if not completely suitable.

For a description of the method, we considered three components of DSDM: its underlying philosophy (captured in nine principles as related to strategic fragments), its framework (stages, activities, and products as related to process and product fragments (see Table 5.2)), and its essential techniques as related to technical fragments. In practice, each of these components can be applied separately, and subsets of the components can also be applied on their own.

Table 5.2 Examples of product and process fragments of the DSDM used at the Business Study Level

Business Study Level		
Product fragments		Process fragments[b]
Main products	Models	
Business Area Definition	Business Functions	Visionary
Outline Prototyping Plan	Data/Relationships/Rules	Ambassador user(s)
System Arch. Defn.	Business Events	Project Manager
	Business Scenarios	
	Business Architecture	
	System Locations	

[b] Only roles related fragments are provided here. See the complete list of fragments in (DSDM, 2000)

The principles of the method are active user involvement, frequent delivery of products, iterative and incremental development, an empowered team, fitness for business purpose, reversible changes, requirements at a high level, testing throughout the lifecycle, and co-operative approach. The DSDM framework suggests a complete project approach that includes key phases, products, and roles that should be customized according to the project situation. Modelling techniques are not included in DSDM since they are often part of modelling tool sets which are not part of the method. In this way, DSDM is highly adaptable; it is possible to use full-fledged DSDM, but individual techniques or just the terminology are still valuable on their own. To this end, an instrument called a 'suitability filter' is available in the manual (DSDM, 2003). The filter considers the critical success factors for DSDM, and the characteristics of projects that will make DSDM especially effective. Each potential project should be judged individually using the filter. If the project provides a good match, then DSDM can be considered. If the criteria results are not satisfied then the method can be modified.

Important DSDM techniques are timeboxing, facilitated workshops, prioritization, and prototyping. Timeboxing refers to setting a deadline by which a predefined objective must be met, rather than describing when a task must be completed. To prioritize requirements of the system the MoSCoW technique is used - an abbreviation for must, should, could have,

and want to have but won't have this round. We assume that the concepts of facilitated workshops and prototyping are known. For more details of DSDM one should refer to the DSDM consortium document (DSDM, 2003).

The Situation at Hand

DSDM has recently become the method of choice for all information system development projects in the department. The main motivation for this decision was to ensure 'time-to-market' systems development, in order to achieve substantial product and process improvements, and to use one terminology in all projects. The DSDM implementation in the department focused on coaching project managers in adapting the method in the organisation and at project levels with the help of experts. The experts, known as coaches, had extensive project experience and were subject matter experts in DSDM use. They coached project managers on how to make better decisions on the suitability of DSDM and on the degree of adaptation DSDM would require for each project. Basically, there were two essential roles in DSDM adaptation: the project-coaching role and the project management role. The DSDM coaches assisted project managers in adapting DSDM to their project context, whereas project managers were fully responsible for the project execution. They were the final decision makers in terms of the use of DSDM fragments.

In terms of the level of method adaptation, we identified static and dynamic method adaptations as two distinct ways of carrying out method adaptation in the department. Below we discuss each of them separately.

The Forms of Method Adaptation

Static Method Adaptation

Static method adaptation refers to selecting and assembling structured fragments based on a predefined set of criteria. In the case organisation, we found that the type of development or target environment (i.e., technical infrastructure, the platform an application will be designed and built upon) and the nature of the solution (i.e., a packaged or a custom-made application for business change (Gibson, 2003)) were two of the dominant factors used in static adaptation. Static method adaptation resulted in several route maps. A route map is an established plan prescribing which structured fragments should be used in a project. Examples of route maps are Packaged Solutions, and Component Based Development (CBD) (Dahanayake, Sol, and Stojanovic, 2003). In choosing a route map for a project, the project manager could see only the relevant structured fragments, including stages, activities,

products, techniques, and modelling tools for that project. It was interesting to note that the relevance of principles and essential DSDM techniques were not specified as part of these route maps. This encouraged us to look at the second adaptation level to investigate how unspecified fragments were adapted in practice.

Dynamic Method Adaptation

The second adaptation level, which we refer to as dynamic method adaptation, takes place during the process of developing an agile system. At this level, the role of the coaches is essential to adapt both structured and unstructured fragments to the contexts or vice versa. In practice, the coaches in the department were facilitating project managers to choose, modify, or innovate fragments for each project. As a consequence, we decided to focus on coaching activities and studied the means used in method adaptation. Figure 5.5 summarizes the key activities performed by the coaches. Two decisions had to be made in this coaching activity diagram: "Use DSDM or not?" (in the suitability analysis) and "Adapt or directly use parts of DSDM?" (in the adaptation analysis). Note that the output of the 'characterize the project' activity was used with both decision points. Next, we discuss the ways and means that can be used to characterize a project.

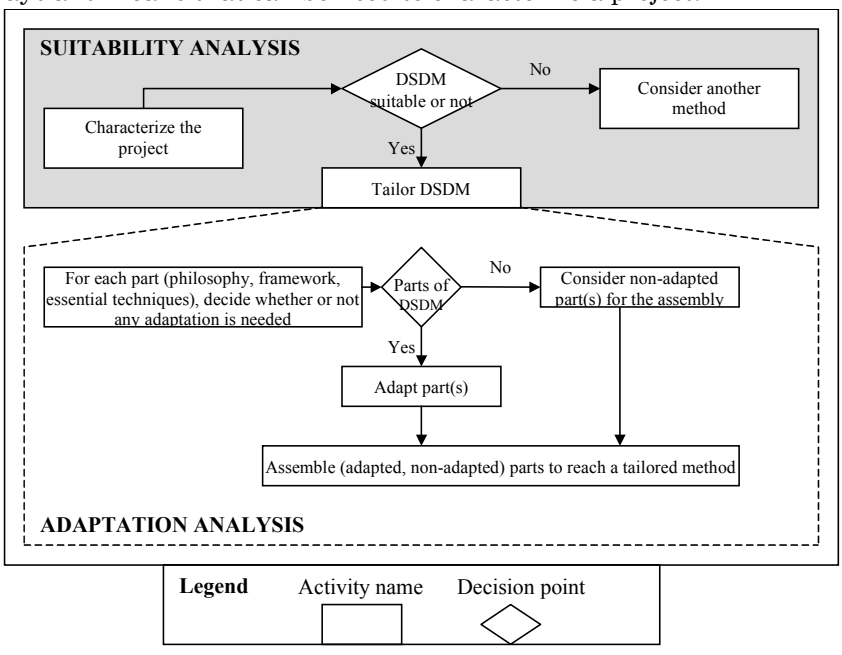


Figure 5.5 Overall coaching activities regarding method adaptation

We noted that coaches were using an instrument, the so-called Extended Suitability/Risk List (ESRL), for characterizing a project. During the early stages of DSDM use in the department, the coaches had used the questions in the original DSDM suitability filter (DSDM, 2003). Later, as they gained experience with DSDM, some questions were extended and clarified, and for each question, working instructions, measures, useful hints, and tips were added (Table 5.3).

Table 5.3 The extraction from the ESRL

Applicability Factor	Suitability (Y/N)	Explanation	Management Measure* (P=Preventive, C=Corrective)
Problem ownership: the identity of the problem holder, or customer for the project, is clear.		Is a champion (proponent/leader) present and able to ensure that resources are released?	P1. Do not start project. P2. Determine who actually holds the purse strings and who ultimately makes decisions and carries the responsibility. Who will have problems if the system is not built? C1. Look one level higher in the hierarchy.
The end-users with the delegated authority to make decisions are capable of making decisions.		End users may have the required authority, but may fail to use it. Essential characteristics of the iterative approach must be present so that the process can proceed with the necessary speed.	P1. Tell the users in advance that they have the authority to make decisions within the specified boundaries and that they must indeed make these decisions. P2. If the decision-making authority is not delegated to users, management must also participate in the team. C1. Make agreements with management regarding availability, e.g. questions submitted by the teams must be answered within x days, x hours, or the manager must keep a half an hour free every morning for questions (e.g. 8:30-9:00).

* Preventive measures are aimed to avoid possible issues or risks concerned about certain factors and corrective measures are about possible reactions to be made in case one might face certain issues

The ESRL became an instrument that provided a baseline for the written advice to be produced for each project. In our interviews with both the coaches and the project managers, they emphasized the significance of using the ESRL in method adaptation. They commented on the high relevance of the factors in the ESRL for better understanding the project situation in hand. In Table 5.3, one can see an excerpt of the instrument.

The applicability factors represent the preconditions and principles that need to be taken into account for the effective use of the method. These reflect most of the success or risk factors often cited in IS literature (Schmidt et al., 2001). To clarify the meaning of each factor, the instrument includes further explanations with some follow-up questions and examples (see the 'Explanation' column in Table 5.3). The instrument accepts the following assumption: the inapplicability of the factors to the context in hand can cause a discord between the preconditions for effective use of the method and the project context. To mitigate the discord and related issues, suggestions are provided in the form of preventive and corrective measures in the instrument (see the 'Management Measure' column in Table 5.3). We noted that the coaches considered the measures suggestions rather than directives for method adaptation. They had discussed the appropriateness and applicability of the measures with project managers. The coaches and project managers had discussed the implications of method adaptation in terms of conformance to time and budget (the degree to which the desired functionality could be realized within an agreed time or budget) and customer satisfaction (the degree to which the project outcomes would fulfil the expectations of the sponsor and users).

Table 5.4 The extraction from the sample advice

About the project context	About the appropriate DSDM development strategy
'… If we know that the requirements are almost clear, stable, and that it is hardly possible to prioritize them, that there is no clear user interface, that there is high computational complexity, that the timeline is not clear, and that the resource availability (in terms of developers, end user) is not known, yet the total resources can be fixed, then we would like to know which development strategy is most appropriate and what kind of consequences we may anticipate in the later DSDM phases.'	' … It *seems* that a hybrid development strategy is more appropriate than the other options. The reason is the following: even though all requirements are 'must haves', we can still partly prioritize them and for those requirements that are stable we may plan one increment for the DSDM phases covered in a more linear way (i.e. no iteration for this increment). For the rest of the requirements we may plan other increments for which many iterations will be needed.*'*
	About some issues related to two techniques of DSDM and related risks
	'… as the case indicates, the MoSCoW (a DSDM technique) appears not to be very suitable for this situation due to the difficulty of prioritizing requirements. The same holds for timeboxing, for which there must be a fixed date for the project, or for an increment, or for an iteration. For both anticipated issues there may be some opportunities to use these two techniques in different ways. Indeed, DSDM coaches have had some experience with such ways and they successfully use the philosophies behind MoSCoW and Timeboxing in real projects situations'.

Once a coach had used the ESRL and discussed the implications of method adaptation with project managers, they would write down their advice on how best to use the method for a successful system development in the perceived project context. To give some idea of such advice we provide Table 5.3; with this we illuminate the notion of structured and unstructured fragments.

Let us focus on the 'About the appropriate DSDM development strategy' part of the advice. The recommendation given is closely related to the principle of iterative and incremental development, which simply states that 'many increments with iterations is an ideal development strategy for agile systems development' (DSDM, 2003). Using increments means that a solution can be split into components based on prioritized requirements (Slooten and Hodes, 1996). More formally, an increment is a part of the system that is delivered to, and used by, a user before the total system is operational. Having iterations however, means that some stages and corresponding activities need to be repeated through incorporating continuous feedback from the user. Such an iterative aspect of a development strategy contributes to the achievement of fitness for business purpose, another principle of the method.

The hybrid development process recommended in the sample advice shows how the principle of iterative and incremental development can be adapted to the project context described in Table 5.4. It suggests that a project manager should realize some increments in an iterative manner, and achieve the rest without iterations (i.e., by applying a linear or "waterfall" systems development strategy). The term hybrid underscores the mixture of typical DSDM development strategy (iterative and incremental systems development) and a linear development strategy in such a project context.

The other part of the advice, 'About some issues related to two techniques of DSDM and related risks', addresses structural parts of the method (i.e. two techniques: MoSCoW and timeboxing) and points out an unstructured innovative fragment by noting that,

> … Indeed, DSDM coaches have already experienced such ways and they have successfully used the ideas behind MoSCoW and Timeboxing in such a project context.

The innovative fragment here is to use timeboxing in a different way to that prescribed in a given project context. One coach explained how to do this:

> It is true that you usually use timeboxing when the deadline of a project is known and then you can split a fixed timeline into "boxes", but you can also do it by using budget as a criterion. Namely, if the human resources to be used in

> your project are known, you can calculate total available human resources in terms of man-hours and then you can convert this into a fixed budget and apply the idea of timeboxing as "budgetboxing".

In fact, we identified many such structured fragments that needed to be adapted and these resulted in innovative fragments in the case organisation. But since the focus was on understanding the way the fragments were adapted we consider and present here a few examples of certain fragments.

Characterization of Project Context Using Dominant Factors

Figure 5.6 provides an overview of the factors used to characterise a project context. Factors are clustered under two notions: capability and solution. This clustering is in line with a resource-based approach of the firm in the strategy field that explains how an organisation's resources drive its performance in a dynamic competitive environment (Collis and Montgomery, 1995). This approach builds on two established broad approaches to strategy by combining internal (Wernerfelt, 1984) and external perspectives (Porter, 1980).

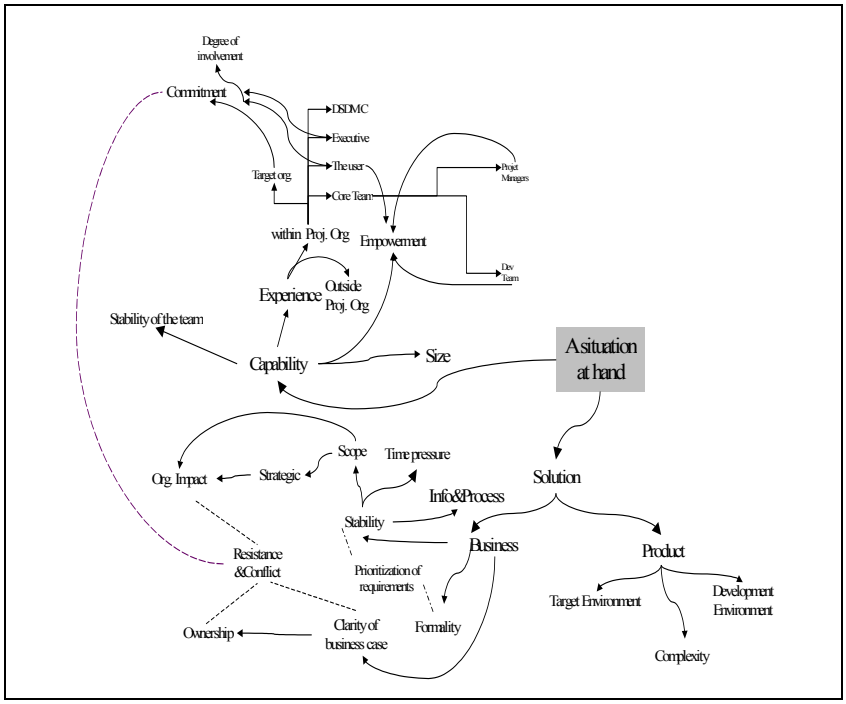


Figure 5.6 Visualization of characteristics for context

Capability indicates the degree of ability a project organisation possesses to deliver a desired solution. The second notion is related to the desired solution. There are two views: the business view indicating the business value added aspect of the solution and the product view that refers to application characteristics or the technical aspect of the solution.

Both notions can be analysed in terms of several concepts and related factors. Most of the factors are self-explanatory and one can find more details about these factors in Harmsen et al. (1995). Some factors can be further refined by sub-factors and several questions can be asked to get a clear view on a project situation. Furthermore, a starting point for the use of factors varies from one coach to another. For the full operationalisation of these factors we refer readers to Harmsen et al., 1994.

Notice that figure 5.6 depicts only a visualization of the relationships among the ESRL factors. We should remark here that the relationships discussed below reflect the opinions of coaches, project managers and some hypotheses proposed in literature (see chapter three), and as such they are subject to further investigation for their external validity. Let us give some indications of possible arguments reflected in the relationships. We also

make use of coaches' comments to support such arguments as much as possible.

For the use of factors under the notion of capability some coaches commented that a degree of experience related to rapid application development, particularly DSDM, could be one of the starting points to analyse the situation. Related to this factor coaches intended to understand the experience within and outside the project organisation. Coaches were looking into the degree of the user's and the target organisation's experience related DSDM use. This experience was especially important to understand whether the target organisation could accommodate the frequent delivery of increments or not. Experience of a project manager and domain knowledge of development team members should be analysed thoroughly as well. In case there was no available DSDM experience in the project organisation, coaches needed to understand a required change in mind-set of the development team members and the executives. In some projects, project managers were reluctant to use DSDM since they were used to applying typical waterfall system development approaches.

To see how the factors related to the notion of solution have been used by coaches and project managers, consider commitment, empowerment, and a degree of the user involvement in a project. These three factors are also referred as DSDM principles in the manual.

Commitment needed to be taken into account from executives', user's, and the target organisation's perspectives. Commitment of the user was linked to a degree of involvement of the user. Four user involvement variants were often considered: 'no user participation', 'consultation (advisor)', 'representation and consensus (ambassador)', and 'end-user computing'. Related to the linkage between commitment and the user, involvement coaches wanted to know whether there was a senior user commitment to provide the user involvement or not. Empowerment, as another sub-factor, was used to point out whether project managers, the development team members, and the user would be empowered to make decisions on behalf of their communities.

In terms of business view on the solution, project managers were supposed to clearly demonstrate a business case behind the project. Clarity of business case, and the stability and formality of business processes to be analysed were other factors related to the business view of the solution. An important factor was the level of resistance and conflict. This factor cannot be isolated from a degree of impact of the solution at the strategic and operational level. To get a richer understanding of the degree of resistance and conflict, coaches looked into a level of commitment that could be

secured. Commitment acted like an intermediate factor for better understanding a degree of resistance and conflict.

In terms of product view on the solution, coaches were analysing the suitability of the target and development environment for DSDM. They specified whether there was highly demonstrable user interface or not. To understand the complexity of the product, they were analysing for instance, a degree of computationally complexity and a number of function points to be required, and a degree of dependency to other systems. If the computational complexity was high, then they were criticising whether the system could be decomposed or not. Development environment was analysed to understand whether it is suitable for prototyping or not, and whether the project would call for the use of technology that were not been used before.

ESRL provides a means to use a number of relevant factors to elicit context characteristics (see a complete list in Appendix 2). Factors clustered under the notion of solution are especially useful to understand the business essence and the application essence of IS.

To understand how these characteristics were applied for situated method construction at the ISDM level we analysed existing route maps used in the organisation. A route map[lxviii] is an established plan described in terms of well-defined conceptual method fragments[lxix] including strategy, process, product, and technical method fragments.

We found that the route maps in the organisation were built upon the product aspect (view) of solutions, particularly on the nature of the product and/or the type of development or target environment. Existing route maps were the Component Based Development (CBD) route map, the package solution (PS)[lxx] route map, the mainframe route map, the classic route map, and the tool independent route map. When one chooses a route map it is possible to find specifications of the process, product, and technical fragments for that route map. For instance, in choosing the mainframe route, one can find a list of tools or techniques per phase for the specifications of technical fragments.

Notice that these route maps are a prescribed form of the method and their further adaptation is left to practitioners. In other words, once a route map is chosen one could further adapt it to a specific project situation. We noticed that the specifications of the process and the product fragments were more or less the same in all route maps. For the technical fragments, a further adaptation was very limited or not possible in certain phases. For instance, the specifications of technical fragments in the business study phase were exactly the same in all route maps (i.e. there was only one tool available for that phase). Consequently, we wanted to focus on the strategy fragments to further investigate their variations across the route maps.

The strategy fragments can be easily linked to the principles of DSDM. For instance, the principle of iterative-incremental development is a preferred development strategy of the method proposer. Similarly, the user involvement strategy fragment is related to the principle of active user involvement.

Having stated a relationship between strategy fragments and principles, we now discuss,

- how the strategy fragments had been adapted,
- what variations of certain fragments were present and,
- which of these variants was used for which route map(s).

Variations Captured in Certain Fragments of the Route Maps

During our investigation it became clear that it was not feasible to cover all strategy fragments due to time limitations and a high complexity of the problem description. Therefore, we handed a questionnaire to practitioners to get a quick response to critical strategy fragments. The term criticalness was measured in terms of fragments' impacts on project execution, dominance over other strategy fragments, and relevance to practitioners' actual needs. The following were perceived as the most critical fragments: active user involvement, fitness for business purpose, iterative-incremental development, and requirements baselined at a high level (see Appendix 2.1). Again due to time, complexity, and the research rationale (illuminating variations for a strategic fragment), we focus on the iterative-incremental development strategy fragment.

The meanings of increments and iterations are worth noting. Having increments means that a solution can be split into parts based on prioritised requirements. More formally, an increment is a part of the system delivered and used by the business before the total system is operational. This means that partial solutions can be delivered to satisfy immediate business needs. Having iterations means continuous feedback can be gained from both the user and the business sides to improve the solution to be delivered. Such an iterative development contributes to the achievement of fitness-for-business purpose.

This fragment basically indicates the need of selecting appropriate increment and iteration strategies. For the increment strategy, there were basically two options: the one-increment strategy (no subsystem, only a single system will be developed) or the many-increments strategy. Similarly, for the iteration strategy you could choose either the no-iteration strategy or the many-iterations strategy.

A combination of options regarding these strategies generates several variants of the DSDM life cycles. These are similar to DSDM paths presented in the DSDM manual (DSDM, 2003) and can be referred to as:

- The linear DSDM (one increment without iteration).
- The 1-pass DSDM (one increment with several iterations).
- The hybrid DSDM (many increments, some with several iterations, others without iteration).
- The full DSDM (many increments with many iterations).
- The Phased DSDM (many increments without iterations).

In principle, the full DSDM has been encouraged to be used in the route maps to realise the iterative and incremental development principle of DSDM. However, the interviewee commented that the full DSDM is less appropriate for some route maps. For instance, for the mainframe route map the linear and the phased DSDM had been often used. For the CBD route map, almost all lifecycle variants have been applied, yet the hybrid and the phased DSDM lifecycle had been most used. The mainframe route map has been used for projects where business processes and information requirements were stable, clear, and formal and where clarification of business case was not easy. This situation sounds like prioritisation of requirements for this kind of project is almost impossible. To challenge this situation, project coaches attempted to deliver solutions in increments by illuminating the business view of the solutions. According to coaches even if all requirements are "Must Haves" of MoSCoW, the business implications of requirements can let them prioritise requirements in some ways.

The existing route maps were built upon the nature of product and/or the type of development or target environment. We found certain types of fragments (the strategy fragment) needed more care for their adaptations to a project situation. We have also tried to show that selection of appropriate variant for each fragment was left to practitioners, but coaches were available to provide a second opinion. We now discuss the findings from the two perspectives and relate them to specific patterns of MAP.

Discussion of Static and Dynamic Adaptation Relating Two Perspectives on MAP Patterns

The findings presented in the previous section show that the two perspectives are complementary, and even necessary rather than conflicting if one considers adapting both structured and unstructured method fragments for two distinct approaches to method adaptation in a large-scale IT department (see Table 5.4).

The engineering perspective, embedding the dynamic 'fit' concept of the contingency paradigm, can serve as a sound basis for coping with the adaptation of both structured and unstructured fragments in a static and dynamic way.

In terms of the static adaptation level, we presented the use of two dominant factors in the adaptation of certain fragments that result in various route maps. The route maps are good examples of the models created at the conceptual level. It is easy to see that, for the static method adaptation, the intention is strongly related to managing a system development project while maintaining high conformance to the method (i.e. the high degree of method adherence was driving the process for static adaptation).

In terms of dynamic adaptation level, we show that the agents (coaches and project managers in the department) used a number of factors as reference points to discuss the adaptation of both the context and the fragments. They not only adapted fragments to a specific context, but also adapted the context to fragments.

By considering the explanation in the previous section for the adaptation of the timeboxing technique, one can see how the fragments can be adapted to the context. We showed that even though the technique was not suitable for the project context at first glance, the agents strove to accommodate this technique in a special project context. It was clear that the intention behind this adaptation was partly due to the desire to adhere to the method, but a special attempt was made to see whether the idea behind the technique was still applicable. The idea is not only about the way to split the timeline into timeboxes, but also about how to assess whether the philosophy behind the technique is realizable or not. In this respect, the technique can be a means to achieve some of the principles of the method: a frequent delivery of the system or its parts, or to quickly incorporate feedback from the project stakeholders to the system to be delivered. This is an example of how p_C and p_F processes are effective in determining a situated fragment.

Table 5.4 Characteristics of the static and dynamic adaptations for an agile method in the case organisation

Two ways for method adaptation / The constructs relevant to this case study	The static adaptation	The dynamic adaptation
Key perspectives applied	The engineering perspective	Both the engineering and socio-organisational perspectives
Levels of abstraction	The conceptual level	The empirical level
Agent	Only coaches or other method engineers	The coaches and project managers
Context	Factor-based characterization of context, characterized by the nature of a solution and the type of development or target environment	Emerging context in an ISD setting, characterized by a set of factors in an instrument
Method fragment	Only the structured fragments (stages, activities, modelling tools)	Both structured and innovated (unstructured) fragments
Process/Intention	Only adapting the method to the context. Static use of factors with an intention to adhere to the method (future-directed intention)	Adapting the method to the context or vice versa, with an intention to adhere to time and budget, and achieve customer satisfaction (present-directed intention)

For the adaptation of the context to the fragments one can refer to the 'Management Measure' component of the ESRL tool. This contains some suggestions concerning ways to change the context. For instance, the inapplicability of a factor related to the user as presented in Table 5.4 may require some management measures. In this event, the reaction of the agents can be to change the context and/or the fragment. We have seen that the intention that drove the behaviour of the agents was closely related to the desire to conform to time, budget, or customer satisfaction. This is an example of how ^{p}C and ^{p}A processes are effective in determining a situated fragment.

Even though agents do their utmost to mitigate risks and related issues, a project is not risk free and agents may be faced with some emerging breakdowns resulting from discord between the method and the context. These breakdowns may eventually result in risks for the project. Such breakdowns need to be resolved; possibly by innovating new fragments or

substantially changing existing fragments. The socio-organisational perspective helps to illuminate such fragments, pinpoint the root causes of breakdowns, and describe methodical and amethodical aspects of the breakdowns (Truex et al., 2000). In addition, this perspective facilitates understanding the emerging context in which the resolutions have to be achieved and the fragments invented.

CHAPTER 6: DECISION SUPPORT for MAP

"I am a point in the infinity; each movement takes me another infinity"
- Metin Aydin

This chapter elaborates on decision-making support for the Method Adaptation Process (MAP). Drawing upon the state-of-art knowledge in the decision and decision-making support systems (DSS) literature, we describe MAP support in terms of what it is, why it is useful, and how to achieve it. This chapter complements the idea of method adaptation by proposing a novel approach for MAP support called Naturalistic Decision Support (NDS), and is suggested as an appropriate way to truly achieve MAP support. Finally, we examine the viability of NDS for MAP in an empirical setting and discuss it using relevant elements for MAP support.

This chapter contains two main sections. Section 6.1 is an elaboration of an understanding of MAP support (i.e., the meaning of and approaches to MAP support). We review a number of basic elements of decision-making support and employ them to establish the basis of MAP support.

Section 6.2 presents NDS as a promising approach to MAP support and describes how it has been realized in an ISD organisation. Consequently, we discuss and reflect on the findings of MAP support as practiced in the organisation.

6.1 An Understanding of Decision Support for MAP

As we saw in the description of the foundation of MAP presented in the previous chapter, MAP neither prescribes nor proscribes a specific way of handling a situated method development. That is, MAP is not bound to certain patterns (some of which are explicated by the basic models in Chapter 5), but employs the three essential elements of a situation and their interplays, and reflects upon how the way of handling situated method development is performed. Depending on the meaning of *support*, MAP support might mean different things.

At one extreme, MAP support means to guide the designer of the situated method in performing certain activities based on one of the specific models induced by the generic model of MAP. Or, it may guide the designer to determine a specific model induced by MAP. It may guide the designer to structure MAP (that is, structuring the process of inducing MAP models) by using the critical thinking technique for instance. These three meanings are tied to why, what and how to support MAP. To establish a basis for MAP

support we review basic elements of decision-making support which are grouped into three dimensions: *decision support orientation* (referring to value orientation, decision support paradigm, effect, and effectiveness), *focus of decision support* (referring to MAP layers and levels), *existing means* (types of DSS, techniques, and tools) (Section 5.1.1)., We employ these reviewed elements to better frame our articulation of MAP support (Section 5.1.2).

Basic Elements of Decision-Making Support

In general, decision-making support is directed to the agent involved in and in charge of achieving a successful decision. Notice that in addition to the decision maker, other actors are also taken into account when discussing decision-making support in the literature. Given the foundation of MAP where a single actor is mainly responsible for MAP execution, we narrow our literature review to decision support studies where the decision maker and the decision support provider are considered two key agents in decision support.

Decision Support Orientation

Value Orientation

Generally speaking, providing support inherits and is guided by a certain value-laden viewpoint that the support provider holds. Naturally, decision-making support has something to do with providing help to the decision maker who demands it. Thus, decision-making support is usually deliberate and always geared to certain achievements, possibly and naturally through certain interventions in the decision maker's thinking and actions, which constitute a decision-making process. Of course, in some cases supporting a decision making process is realized inadvertently, but this is an exception and not counted in this work.

Value orientation is strongly related to the why perspective, which simply concerns the rationale behind the decision-making support; why such support is needed. The *why* question necessitates the discussion on *Weltanschauung,* about a world-view on the matter and something to do with the value orientation on the support provider side at the deepest level. Value orientation is as complex a subject as any discussed in the philosophy of science and surprisingly enough, in the DSS literature there are only a few studies that provide an elaborate treatment of this notion (Chae, Courtney, and Paradice, 2004). We remind the reader again that a better treatment can be found in the philosophy of science, but here we intend to

use the notion of value orientation to establish an epistemic basis of MAP support. Recently, Meredith (2004) has attempted to illuminate this notion in the context of rationality by relating it to the 'life world' and 'value sphere' of Habermas (1984) and Weber (1978) respectively. In his treatment, value orientation is linked on one side to normative-affective factors about ethics (e.g., "do no harm" and "do good"), pro-attitudes of human being (such as beliefs and desires), and on the other to logical-empirical factors[lxxi] which underlie deliberate actions (either institutionally or intrinsically formed). In this work, we only bring up the point that we need certain guiding principles to establish the basis of decision-making support irrespective of what the value orientation is to be (e.g., value orientation with logical-empirical emphasis).

Having presented the relevance of value orientation for decision-making support, we need to examine how to substantiate this value orientation. To do this we refer to *decision support paradigm* inheriting particular approaches to decision support and the *effectiveness and effect* ideas of Silver (1991) emphasizing objectives of decision support. Let us start with decision support paradigms.

Decision Support Paradigm

There are three paradigms on decision support distinguished in the literature: the normative, prescriptive, and naturalistic paradigms.

The normative paradigm on decision support suggests that the support provider firmly holds her normative model as a starting point to 'support' the agent. If the proposed support fails, then either the decision making process as described should be modified or the theory is replaced.

According to the prescriptive paradigm, the decision support provider decouples her normative model from a decision-making process and provides support in such a way that the agent should avoid her 'biases' that could eventually cause decision-making errors. The way to correct these errors is to modify the agent's decision making towards the normative ground on which biases are to be eliminated.

The third view is the naturalistic decision support paradigm by which the supporter needs to know the practice of human decision making in its own reality. The starting point should be the agent's own way of performing decision-making and the needed decision support from the agent rather than the supporter side. The supporter, possibly with the agent, gradually builds up a suitable ground on which the value orientations of both sides are congruent, and by which the other dimensions of decision support can be determined all the way down to the execution of decision support by possible DSS – decision support systems. This view in particular

purports augmenting the agent's decision-making along with her preferred and other possible decision-making accounts by means of critical thinking, which shall be discussed in the subsection of existing techniques and tools.

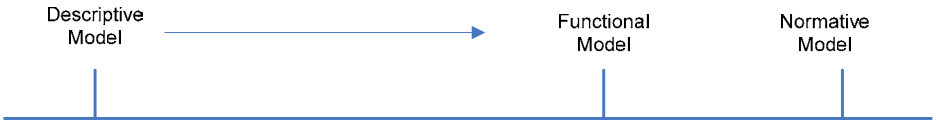


Figure 6.1 Silver's (1990) schematic interpretation of decision support approaches in Gerrity (1970), Keen and Scott Morton (1978) and Stabell (1983)

Besides the distinguishing rationales of the paradigms described above (Figure 6.1), each is concerned about some changes on the agent side with certain *direction.* Silver (1988) introduces two kinds of change in this respect: directed and non-directed change. Directed change is present if the provider thinks that a change will occur and deliberately attempts through several means to force the decision maker on the direction of change, whereas in the case of non-directed change the provider is aware but leaves the user to determine the direction of change with or without suggesting possible changes to be made. These are two options where the support provider is aware of the change; in case the provider is not aware, the change is either non-directed or directed unintentionally. In accordance with directed change, the provider can develop a normative model of how the decision ought to be made. Non-directed change without any suggestions provided can be achieved by adopting a descriptive model of how a decision is being made. In case that non-directed change is targeted along with certain suggestions provided, the provider may develop the functional model of how the decision should be made by drawn upon either the normative or descriptive directions. Consequently, directed change is applied when the normative and prescriptive paradigms are held, whereas the naturalistic paradigm is required to realize non-directed change.

Silver (1990) notes that in DSS literature the tendency is towards one of the extreme positions, either directed or non-directed. But, he argues that in a mixed viewpoint,

> …the fundamental design issue is not choosing between directed and non-directed change, but deciding how much of each underlying philosophy should be reflected in the system (p. 51)

To realize such a mixed viewpoint, decision support should have certain flexibility. Silver's (1991) suggestions about 'system restrictiveness'

and 'decision guidance' appear to be helpful in addressing this matter. By the 'system restrictiveness', he means the degree to which and the manner in which decision support limits its users' decision-making process to a subset of all possible processes, and 'decision guidance' he refers to guiding, with a certain degree and manner, its user in constructing and executing decision-making processes by assisting them in choosing and using its operators. Note in this explanation that construction and execution of decision processes are considered two distinct aspects, which is indeed, an important distinction from the MAP support point of view as shall be seen in the next section.

The restrictiveness can be to a larger extent when models are developed for the purposes of proscribing or prescribing normative models, or if there is room for the user to deviate and even foster structured learning.

The guidance requires a rather elaborate treatment as done by Silver (1991). Here we give a brief description of his treatment of the term by referring to the typology of deliberate guidance, based on the following three dimensions: *targets* concerning which aspects (that is, structuring or executing) of decision-making the guidance addresses; *forms* concerning what the guidance (that is, suggestive or informative) offers decision makers; and finally *modes* concerning how the guidance mechanism works (that is, predefined guidance meaning that the content is predefined by the provider, dynamic guidance meaning without predefined content the mechanism employs content from the user, and participative guidance meaning that the content is built by involvement of both the user and the provider). We adopt these dimensions when we turn our attention to MAP support, but the target dimension is especially useful to articulate the elements concerning the *what* perspective of MAP support.

A final element for decision support orientation is about substantiating value orientation further with objectives of decision support. We use the ideas of effective and effectiveness (Silver, 1991).

The Effect and Effectiveness of Decision Support

The performance of decision support is often examined in terms of its effect and effectiveness. Efficiency is also used to evaluate the extent to which the decision support contributes to the information processing of the agent involved in a decision-making process in addition to these two aspects. By virtue of this criterion, DSS received considerable attention from academy and practice in the 1970s. In the 1980s, a critique rose that DSS lacked validity from the end-user's perspective. Among other researchers who share this criticism, Wijnhoven (1992) comments about the prevailing

claims about the advantages of using DSS and contends that the ideas behind often-cited advantages are flawed.

Our focus is on the effect and effectiveness of decision support. As we adopt the terminology of Silver (1988) for this matter, effect refers to an assessment of decision support with regard to what has happened to the decision making process being supported. That yields several questions: When do decision makers find decision support useful and when do they find it bothersome? How do they use decision support? Does the support affect the agent's decision making and, if so, how does it affect? How does the agent react to the decision support yields some recommendations (Silver, 1991)?

The effectiveness of decision support indicates examining decision support with regard to its objectives. In this case, the questions would be: how effective is decision support at accomplishing its objective? How effective is the delivery of decision support? Does the cost of learning the provided support exceed the benefits if using it? These questions can be extended further and clustered at a certain level of analysis (such as individual and social)[lxxii].

Decision Support Focus

This is the most relevant element in terms of the focus of decision support concerning the structure and content of a decision-making process. We examine this element by considering *support layers* and *support levels* for decision support.

Decision Support Layers

Depending on the matter addressed in a decision making process, the decision support focus may be determined. For this we consider certain layers to determine decision support focus. The support layers for MAP support, as we present later, are inspired by the foundation of MAP and the idea of structuring for decision-making mentioned in the literature. The decision-making and support literature establishes that human beings perform decision making while structuring and executing its process in some ways.

Silver (1988) states,

> …structuring the process involves selecting a problem representation and then defining the macro process, the ordered set of information-processing and problem-solving activities to be performed. Executing the process entails actually performing the various information-processing and problem solving activities (p. 52)

Notice that structuring functions as meta-decision making or conceptual modelling which leads to a certain way of handling a decision problem. Boersma (1989) and Stegwee (1992) propose a generic cycle for DSS which appears to be what we call decision support layers. Consequently, we consider certain layers to discuss MAP support later on.

Decision Support Levels

In addition to decision support layers, a decision-making process involves certain levels or phases at which certain cognitive activities are performed irrespective of the matter at hand. The idea of 'structuring' the decision process is articulated along with the phase theorem of problem solving in the decision-making literature. Lipshitz and Bar-Ilan (1996) review several models and argue that since most of them regard this structuring in terms of phases; their accounts contribute to the phase theorem of decision-making. They discuss often-cited models (Simon 1965) in the virtue of their theoretical ground and test the descriptive and prescriptive validity of the models. They propose a model containing six phases (identification, definition, diagnosis, generation of alternatives, evaluation of alternatives, and choice/action), which uncover all the phases of the prevailing models. Retrospectively described, their testing of the model is based on analysis of seventy-five successful and unsuccessful cases in an organisational setting. To test the descriptive phase of the phase theorem, they examine the location of theoretical phases and their sequence in actual problems. For its prescriptive facet, the occurrence and sequence of phases are examined against successful and unsuccessful cases. One of their findings confirms the descriptive validity of their model and *disconfirms* its prescriptive validity. For the reflections of this finding with regard to the theory of learning and knowing, we refer to their study; of particular relevance to our study is the prescriptive facet of the model. The authors state,

> …effective problem-solving is contingent on proper execution of early phases, variously labelled problem solving, problem framing, problem structuring or problem formulation (p. 57).

This means that at early phases of decision-making support for a decision-making process (MAP in this work) would contribute to a successful case. We turn our attention to this point later; directly related to or motivated by their work as we have adopted it for MAP support, is that for an effective decision support it is essential to have a better understanding of

decision-making in its own setting, especially in early phases. It is with this motivation that Naturalistic Decision Making was taken up in the late 1980s as an alternative to normative or prescriptive models of decision processes, which, as already discussed in Section 4.3.2, are dominant in theoretical accounts of decision processes.

Seeing that decision support for early phases of decision-making is critical, perhaps it would be useful to know what basic activities are performed at these phases. A five level problem representation model of (Humpreys, 1992) provides further details. The model depicted in Figure 5.2 contains five qualitatively different levels of constraint setting, each associated with a different kind of discourse concerning how to structure the constraint at each level.

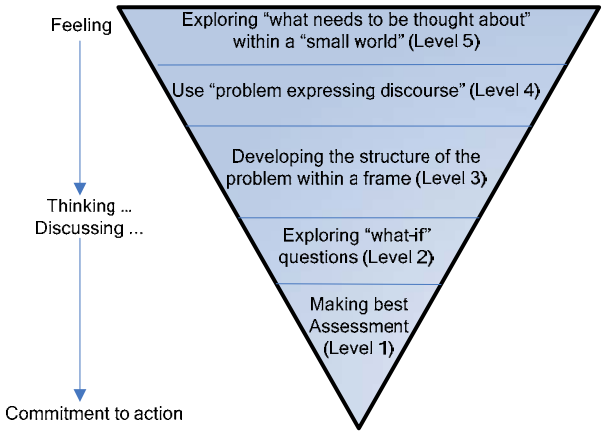


Figure 6.2 Five Levels for Problem Representations

These levels are:

(1) making best assessment,
(2) exploring "what-if" questions,
(3) developing the structure of the problem within a frame,
(4) use of "problem expressing discourse" and,
(5) exploring "what needs to be thought about" within a "small world"

Humphreys (1992) argues that in practice decision support focus is often level 1 and 3, which is concerned with the normative or prescriptive paradigm. He further discusses that historical background of the normative or prescriptive perspectives on decision support is related to a certain school of thought. He distinguishes three schools of thought, scientific management, the human relations school, and the structural approach, which are backed by three legacies: the need for the power to control, disciplinary power and the disciplined decision implementer, and experts

and consultants employed to fix decision problems. He argues that these three schools of thought and corresponding legacies reveal the discourses underpinning decision support. His critiques are concerned with the fact that many models of DSS adopt normative or simply prescriptive views of decision situations and simply fail to accommodate the 'reality' of certain decision processes which involve high-stakes, countervailing arguments, conflicting interests, time pressure, and uncertainty. That is, due to incurrence between the 'realities' of the support provider and the one to be supported, these models are doomed in achieving their premises. Implications of this incongruence are evident in many failure stories about tools and computerized decision support systems that are not used effectively in practice. We turn to our discussion on existing means of decision support.

Techniques, Tools Available for Decision Support

Types of DSS for MAP Support

There are probably numerous ways and means to provide decision support including human beings and artefacts (techniques, tools, computerized decision support systems, etc.). DSS literature has a long history about decision-making support, but recently has been criticized about the fact that the dominant view in this particular literature is on the tools rather than their effectiveness or use in practical setting.

The history of DSS in IS research goes back to the late 1950s when theoretical studies of decision making were conducted at the Carnegie Institute of Technology. Power (2004) notes the continuing body of knowledge for DSS at different stages: from model-oriented DSS to theory development, and further to focus on specific functions (expert systems, executive IS, group DSS, business intelligence) together with AI (Artificial Intelligence) involvement. Among others, a number of researchers, including Scott-Morton (1971), Alter (1980), and Sprague and Carlson (1982) have contributed to the BoK of DSS with their groundbreaking ideas. One interesting observation in the history of DSS is that prevailing models of DSS tend to focus on DSS rather than decision support needed in a business situation. Alter (2004) states,

> Decision support is not tool per se, but rather, about making better decisions within work systems in organisations. The common emphasis on features and benefits of DSS as artifacts rather than on how to improve decisional aspects of work systems in organisations may contribute to the frequently cited (e.g., Frolick and Lindsey (2003))

> and occasionally questioned (e.g., Inmon, (2001)) failure rates of data warehousing, CRM and other technology-based innovations (p. 320).

Several arguments are present in DSS literature, but often the nature of decision problems is considered an important criterion in choosing a certain type of DSS. This is useful but not sufficient as DSS type does not give any indication of other dimensions of decision support. It is useful to characterize the decision problem one deals with at a high level. For instance, concerning the nature of decision problems, Gorry and Scott Morton's (1971) classification of structured, semistructured and unstructured decision problems motivates the support provider to orient the decision support for MAP. (Stegwee, 1992) distinguishes three types of DSS based on the degree of generalization: a DSS generator, a generic DSS, and a specific DSS. The generator, as the term suggests, contains various models and techniques to be used for particular decision-making processes or decision problems. The generic DSS can be based on a particular decision model and is an instance of the DSS generator. Specific DSS contains the empirical content for the use of a model embedded in the application. A generic DSS is proposed where execution of the particular MAP pattern held by the agent. This is also a preferred type of DSS by which the provider adopts a prescriptive decision support.

From the perspective of naturalistic decision support, a specific DSS is preferred for the purpose of providing informative decision guidance. We propose that a DSS generator is an ideal type for cases where decision support is directed for the structuring aspect of a decision-making process. This kind of DSS support will help the agent structure her way of structuring the decision making process, which is about being aware of how the decision is made. Note that this is a type of support through which the agent's way of thinking is augmented, possibly by the attitude regarding critically reflecting her own way of thinking. The role of decision-making support than becomes like a change agent; with this role one can expect certain changes on the agent side by critiquing a preferred decision-making process.

Architecture of the Critiquing DSS

There are a few examples of DSS proposed to realize this kind of critiquing. This kind of DSS is denoted by different terms such as argumentative systems (Metcalfe 2002), issue-based DSS (Sherif and Sawy, 1988), and dialectic decision support (Jarupathirun and Zahedi, 2004). We call them 'naturalistic DSS' (NDSS) which explicitly adopts the naturalistic support orientation as it differs from expert systems or similar that

implicitly adopt normative and/or prescriptive orientations and consider its knowledge indisputable. Experts systems also lack a 'critical thinking' component of naturalistic decision support. We now discuss some of them as examples of naturalistic decision support proposed in literature.

(Vahidov and Elrod, 1999) propose a framework for a DSS based on critique and argumentation. Inspired by the generic roles involved in a problem solving process as suggested by (Kornfeld and Hewitt, 1981), they propose four roles as essential to critiquing: decision maker, proposer, opponent, and proponent. Their proposed architecture includes the last two roles as critiquing agents (see Figure 6.3-a).

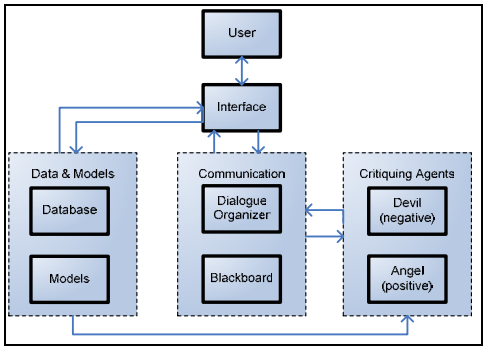


Figure 6. 3-a
Architecture of the critiquing DSS

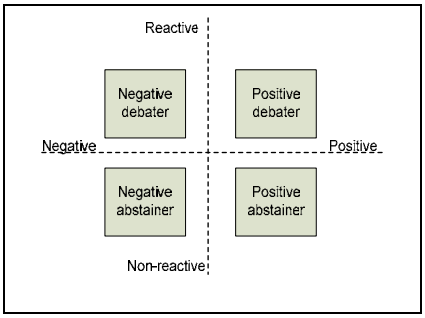


Figure 6.3-b
A map of critiquing DSS profile

Important components of this architecture are the models, one which is aimed to frame critique. Knowledge representation of framing contains such elements as *criterion* indicating the name of criterion to which the critique relates, *condition* indicating the conditional part of the logical expression, *variables* indicating the name variables used in the condition, *data* storing actual values of the variables, *support* indicating an extent to which the condition is supported by the data, *threshold* used for activation of the support activate the support, *activation* indicating whether critique is active, *critique* representing the claim, and *warrant* storing what warrants used in argumentation. The behaviour of the proposed DSS is plotted in four positions determined by dimensions: negative vs. positive critique, and reactive or non-reactive critique (see Figure 6.3-b). A DSS in the upper quadrants employs directed change behaviour with a particular stance; a DSS in the lower quadrants goes with undirected change and probably uses informative guidance. Although the proposed idea of incorporating critique and argumentation is useful in supporting our proposal for NDSS to be used for MAP support, it lacks an empirical testing of whether it works in practice. One of the challenges that naturalistic DSS faces is adequate

representation and mechanisms for a better model of knowing (argumentation or reasoning) in particular. There are surely advances in the AI domain on this matter; the use of soft computing techniques (such as fuzzy reasoning and neural networks, and their combination) has seen results as well as several other techniques - one of which we provide in the following. As argued by many researchers including ourselves, the foundation of human knowing is still a subject for philosophers with countervailing ideas. What is perhaps useful is to acquire insights into how people react to naturalistic decision support in a field setting; exactly what we provide in the case study section later on.

Critical thinking for Naturalistic DSS

Critical thinking can be regarded as a technique to change the way of thinking. It has been used in the area of training cognitive processes and cognitive mechanisms. Critical thinking is one way people question the ground of their knowledge on certain matters and their way of knowing. The latter is more related to reasoning mechanisms enacted to perform critical thinking.

Cohen et al. (1996) proposes a model, called recognition and metacognition (R/M) to study how people come to a level of questioning the grounds of their knowledge (warrant, belief, backing, etc.) and their knowing process.

The upper level of the model depicted in Figure 6.4 is related to the recognition part of the model. That is, the cogniser attempts to make sense of the real world based on the model and plan her actions as partial plans. This recognition goes through 'a quick test' to ensure its viability in regard to internal critiquing. This is required especially when the schema internalized is incongruent with a possible situation model to be enacted. Metacognition begins after the quick test. To a certain extent the rest of the model reflects the information-processing theories of (Marr, 1982; Anderson, 1990).

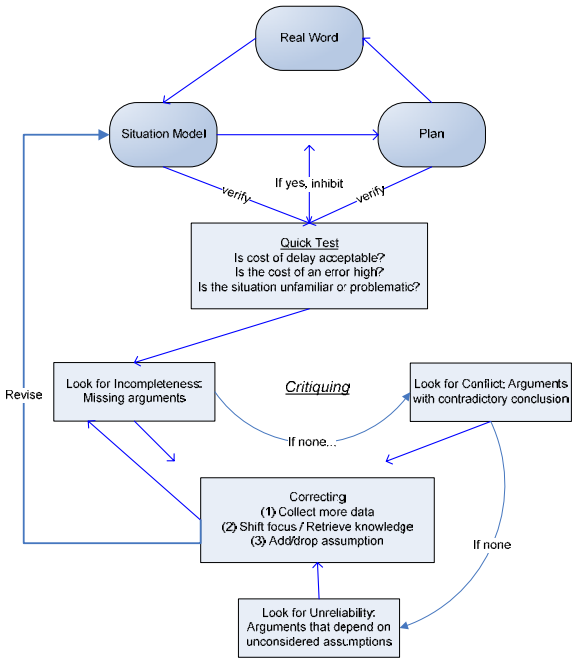


Figure 6.4 Components of the Recognition/Metacognition Model

Cohen and his associates have used this model for training military commanders in critical thinking skills. Our purpose is to show the feasibility of support at a certain support layer for MAP.

6.2 Examining MAP Support with Basic Elements of Decision-Making Support

Our attention will now turn to the basis of MAP support by using the basic elements of decision support discussed in the previous section. In doing so, we argue that Naturalistic Decision Support (NDS) as an appropriate approach to MAP support.

Orientation of MAP Support

Value Orientation of MAP Support

Our discussion of value orientation draws the reader's attention to the essentiality of value orientation for MAP support. Not to claim what value orientation should be, but we argue that MAP support would be appreciated if the orientation incorporated a balanced view on normative-affective and empirical-logical factors. In this respect, value orientation should be

determined by incorporating the decision maker and support provider's preferences on these factors. This would provide a good start for establishing the basis of MAP support and that requires applying some principles[lxxiii] (Meredith, 2004). We have adopted the following principles:

- A decision concerning MAP support should agree with the agent's value- orientation[lxxiv].
- A decision concerning MAP support should agree with the agent's pro-attitudes and perhaps also her intentions, but only where those intentions stem from a value.
- A decision concerning MAP support should agree with the life world of the community to which the agent belongs.
- In case of conflict between the first and the third principles, the first should prevail if compatibility with the autonomy principle is to be ensured; otherwise the third one will prevail.

Implications of these principles for MAP support are manifold. First, the support provider should be aware of whose value orientation, the target or project organisation or her own, is adopted for MAP support. Second, the support provider should incorporate and appreciate the agent's value orientation when appropriate. Third, in case of a conflict between the supporter and the agent's value orientation, priority should be given to the agent's value orientation; otherwise, as already surged in DSS literature, the support will most likely fail.

Decision Support Paradigm of MAP Support

We now employ the three paradigms of decision support for examining possible MAP support. The normative paradigm requires that a starting point should be a particular pattern of MAP, hopefully congruent with the agent's decision-making. This kind of support appears to be the dominant view in the core cluster literature in general, and in method engineering in particular. Advantages of this kind of support are the effectiveness of legitimating and executing certain decision-making in projects, and the implementation and maintenance of decision support means regarding the structure of reasoning mechanisms that can easily be set up using rule-based techniques.

The prescriptive paradigm employed for MAP support is useful in case biases in the agent's decision-making are acknowledged by both the supporter and the agent, as claimed in the prescriptive paradigm. This is possible if the agent's body of knowledge is distilled to a number of heuristics, grounded in the field setting where the agents perform.

The third paradigm – the naturalistic decision support paradigm, is preferable in many cases, but especially where the agent's decision-making cannot be subsumed to one particular MAP pattern. This is 'naturally' not possible because for instance, the system to be developed or the individual character requires amethodical thinking. This does not mean giving up hope to support the agent without a particular MAP pattern. That is, understanding variations in human decision-making processes (patterns of MAP) provides the support provider with important clues about the agent's MAP patterns. It is this understanding by which the provider can facilitate the agent in critically examining the agent's own MAP pattern and other possible patterns.

Effect and Effectiveness of MAP Support

MAP support can be evaluated in terms of its effect concerned with, for instance: what changes are perceived in the agent's decision-making task along with MAP support? How does the agent use such support in relation to her task? What problems have occurred while using this support? Is it easy to accommodate for the execution of MAP? What functions of the MAP support system are found to be useful or relevant?

MAP support can be evaluated further in terms of its effectiveness related to: how does MAP support affect the agent's decision-making process? How and by which ways does MAP support ease her task? How do certain features of the MAP support system function in performing decision-making?

As will be evident in our case study, we make use of these questions while discussing effect and effectiveness of MAP support in an ISD organisation.

Focus of MAP Support

MAP Decision Support Layers

We distinguish three layers of MAP support that target different subjects of MAP: the generic and specific patterns, and realization layers. For each we examine various MAP supports by taking into account the decision-making paradigms reviewed. In line with the research rationale of this work, special attention is paid while discussing each layer to the naturalistic paradigm (Figure 6.5).

In the generic layer of MAP where the generic model of MAP stays, MAP support aims to contribute to the achievement of *structuring method adaptation processes* that eventually lead to a specific MAP pattern. In the

specific pattern layer, support is directed toward execution of a specific MAP pattern that results in a situated method. Finally, support for the realization layer of MAP is concerned with proper enactment of a situated method. Notice that MAP support can be achieved at each layer individually, but since the outcome of each support layer is subject to others, these layers feed each other.

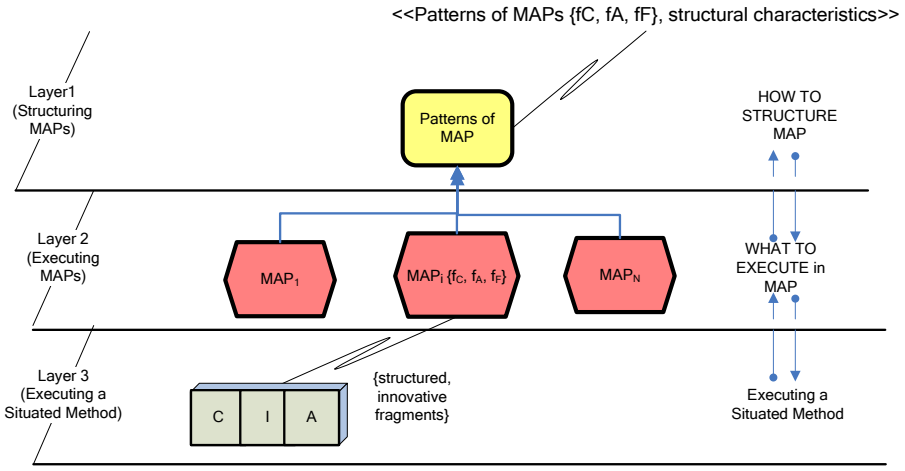


Figure 6.5 Visualization of the support layers for MAP

At the outset, three paradigms of MAP support can be applied for each MAP support layer.

In the *execution layer*, MAP support may adopt the normative paradigm to ease the execution especially of those types of situated fragments requiring more computational skills (e.g., technical fragments concerning reliability tests for an application). In this layer, a prescriptive paradigm can be adopted if some alternative options for executing a situated fragment are proposed. Finally, the naturalistic paradigm is adopted if MAP support is provided to facilitate the agent in informing about or suggesting possible alternatives the agent may consider.

Regarding the *specific pattern layer*, if MAP support accommodates the normative paradigm, then a certain pattern is considered *the* reference model. For instance, in case a contingency-based model is used as a particular MAP pattern, then the support provider would require certain information about the project context from the decision maker based on a list of predefined characteristics. The support provider eventually provides what fragments ought to be applied. In case the prescriptive paradigm is adopted, the support provider will consider not only the contingency-based model a

reference point for the support, but alternative models as well. The support provider may provide situated fragments as suggestions rather than as granted. Finally, the naturalistic paradigm is applied if the support provider collects information about, for instance, what situated fragments are developed, and what and how characteristics perceived by the decision maker are relevant to which situated fragments. Support can then be provided by showing just this kind of empirical evidence, experience which is captured in certain situations in past projects. MAP support that embodies the naturalistic paradigm might go further in that the provider can propose some alternative MAP patterns and show what rationales and reasoning mechanisms are backing these models along with the experience explicating these patterns. So, any mechanisms or heuristics[lxxv] that would help in surfacing the content of rationale are of interest to supporting MAP in that layer.

Regarding the generic layer, MAP support holding the normative paradigm presupposes the existence of a certain way of structuring MAP and provides a sort of instruction to follow such a structuring of MAP. If the prescriptive paradigm is held in the *generic layer*, the support provider employs a certain pattern that already provides a kind of structuring, but there is may still be room for the agent to change it. Finally, MAP support backed by the naturalistic paradigm helps the agent to reflect on her own structuring of MAP. This reflection will be explained in relation with support levels in the following sub-section.

Decision Support Level

Now we discuss what the focus of MAP support can be in terms of levels for each layer, especially when the naturalistic paradigm is held. We provide some indications of such a focus in that particularly levels three, four, and five have greater potentials to realize effective decision support.

In line with Lipshitz and Bar-Ilan'sb (1996) findings, we contend that supporting early phases of MAP would bring great benefits. Referring to the Five Levels Model of Humpreys (1992), we propose that the focus should be on those MAP support levels concerning feeling, thinking about, and discussing MAP along with the generic and pattern MAP support layers. This is possible if MAP support adopts the naturalistic paradigm.

In *the execution layer*, all MAP support levels except Level 1 can be applicable if the agent (the user of the situated fragment) is allowed to consider it again for executing MAP. Otherwise, the situated fragment is supposed to be executed without any question. This means that once the agent accepts the situated method, all five levels are already passed and subsumed. There is no room for applying MAP support in terms of these

levels if there is no critiquing by the agent. If there is, MAP support levels are inscrutable for that MAP support layer. Turning back to our proposal and the focus of our work, these levels are especially useful to apply in the specific and generic layers.

Regarding the *specific pattern layer*, MAP support can be helpful (in the sense of effect and effectiveness) by adopting the naturalistic paradigm to enrich the agent's MAP characterization processes in terms of what needs to be thought about the context, the method, and the agent herself (Level 5). In that case, MAP support augments the agent's thinking about characterization along with a preferred MAP pattern (Level 4). Augmentation of context characterization can be achieved by showing the agent what other characteristics are out there. Similarly, along with method characterization MAP support shows that the agent might use certain fragments in a situation. In this way, MAP support as targeting Level 3, helps the agent to develop the structure of MAP by adopting a particular MAP pattern as a reference point. MAP support can also be helpful by providing the agent with an opportunity to see how changes (for instance, on the context) will affect the situated method (Level 2 – Exploring "What-if" questions).

To illustrate MAP support in specific pattern layers, consider a MAP pattern corresponding to the Configuration Procedure of Van Slooten (1996). Let us call this pattern MAP_1. With this pattern, MAP support will be provided by showing a number of relevant factors and preconditions for those fragments subject to MAP. Namely, for the agent 'small' world and the 'problem expressing discourse' are already determined with a frame in terms of a number of contextual factors. There is no any attempt to stimulate the agent to reflect on the context and the chosen fragment. The main interest behind this model, if it is used in normative or purely prescriptive sense, is to make a best assessment on behalf of the agent. This observation also holds for almost all of the prevailing models or in our language patterns of MAP in the literature. They implicitly or explicitly provide decision support by using a prescriptive model, and the structuring of decision-making is already embedded in the support means by such patterns. Put simply, at Level 3 the agent would be asked to answer several questions: What is the size of project? What is the status of the requirements? What is the level of management commitment? Are there any conflicting project goals? What is the level of confidence that the targeted problem is the real problem? Once this level is accomplished, then MAP support would probably jump to Level 1 and provide either suggestive or informative guidance on such fragments as communication, development, testing, and change management. In adopting the naturalistic paradigm, the agent, on top of the factors

suggested by the provider, can provide her own possible dominant factors and then make a selection of dominant factors and express what ideas or thoughts come into her mind with these factors. Afterwards, the MAP support provider would use this content and compare it with the provider's own understanding along with MAP_1. The provider might make some suggestions based on MAP_1 and encourage the agent to make up her mind and determine about the situated fragment herself.

Again by adopting the naturalistic paradigm, MAP support can be helpful regarding the generic layer to make the agent aware of her own MAP pattern and show alternative MAP patterns that would be important to consider. In this case, MAP support should have some mechanisms to reveal not only the agent's own pattern, but also how the agent reaches this pattern. This is about examining structuring MAP (the interplays among the context, the agent, and the fragment). This way of structuring MAP may also have something to do with, for instance, individual characteristics (e.g., a risk or success driven attitude) industry characteristics (e.g., in government organisations the fragment might be dominant in MAP structuring), or stages of ISD (e.g., at later stages of ISD, the context might be dominant in structuring MAP). For example, it can be observed in certain situations that projects often start with the contingency-driven pattern but continue and end with the success-driven pattern. As situations may differ in terms of certain attributes such as organisation type, industry type, or the agent's individual characters, the provider may use these attributes to MAP support more flexible.

Regarding flexibility, we now consider types of decisional guidance that MAP support can provide. In accordance with the naturalistic paradigm, we suggest that starting with informative guidance and then striving for suggestive guidance will be a good strategy for participative mechanism, considered an effective mode for making MAP support work.

Figure 6.6 indicates examples of decisional guidance concerning targets and forms of support. Suggestive guidance is tied to judgemental recommendations, whereas informative guidance disseminates basic information that aims to provide what needs to be known without prescribing thereof. In accordance with the NDM paradigm, suggestive guidance should be distilled from the informative view which entails records of the assessment of decision support and descriptions of decision activities. Both forms can be used for each decision support view, though their content surely differs in two layers of decision support.

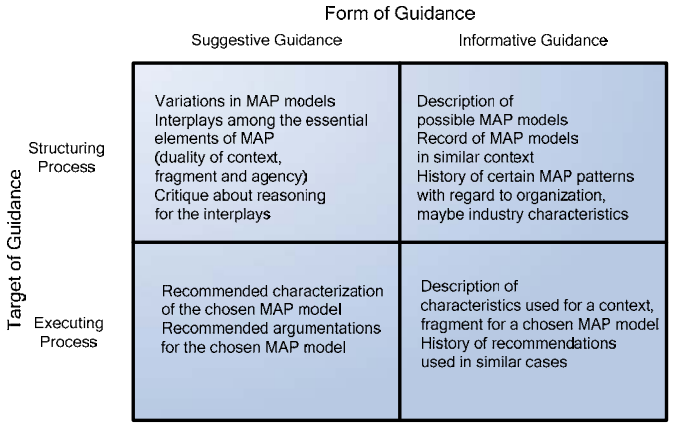


Figure 6.6 Examples of Decisional Guidance to MAP support

Delivery of MAP Support

This element is concerned with how to realize MAP support by taking into account possible variations in terms of orientation and focus. If one considers all these variations, overwhelming numbers of means (techniques, tools, etc.) for MAP support can be found in the literature and practice. In the review section of this chapter, we provide only some of the existing means that are especially useful for realizing MAP support from the naturalistic paradigm. Our intention is to show only few examples of such means rather than considering all kinds of means available for MAP support.

Notice that MAP support includes a system containing human beings, computerized DSS, and all kinds of techniques. Examination of MAP support so far has been limited to the support provider and the agent who might play one or all of the roles in MAP, but MAP support can be very well adapted to a group of people who are involved in MAP as long as MAP is under the responsibility of "one man". Nevertheless, similar arguments can be applied for other roles per se and their interactions during MAP. This necessitates an idealization for MAP support to be in the form of group decision-making support. Among those interactions taking place in MAP, the interactions among designer, mediator, proposer, and user are critical to determination of MAP support. Implications of these interactions can be taken into account by referring suitable MAP support orientation and focus.

Surely, existing support tools in the core cluster and in method engineering in particular (the studies published in the proceeding edited by Brinkkemper, Lyytinen and Welke (1996)) provide a certain amount of support and contribute to the achievement of MAP support. By referring to

types of DSS (Boersma, 1989; Stegwee, 1992), we propose that a DSS generator and a generic DSS are suitable for MAP support in the generic and specific pattern layers respectively. By having the generic and specific pattern layers through a DSS generator, MAP support aims to help the agent to identify, reflect on, and maybe change the way of thinking about how the interplays occur between the context, the method fragments at hand, and her own fragments. Such support is possible if the naturalistic decision making paradigm is held by the provider. An ideal DSS oriented for naturalistic decision support at the specific layer should accommodate a mechanism to question a specific model of MAP and prompt several questions for critiquing the very arguments underpinning the model. As we call these support systems Naturalistic Decision Support Systems (NDSS), they can embody critical thinking technique as a mechanism to realize MAP support in the generic and specific pattern layers. In the generic layer, this technique would be effective if the agent is able to see how the pattern is achieved through MAP and thereafter the critiquing cycle of the technique can make the agent aware of her own thinking and preferred pattern. After achieving this awareness, the agent may probably choose other patterns provided by MAP support as having the specific pattern layer feature and change her own thinking about constructing MAP. This suggests that a naturalistic approach suggests that MAP support should consider a descriptive form on MA as a starting point and then the support can be directed towards a prescriptive form, rather than the other way around. This is the vision that we propose for naturalistic MAP support. The question remains to what extent this vision can be realized in practice.

6.3 Viability of MAP Support

The central research question in this work is how to support MAP. The previous section discussed MAP support in an analytical manner; in this section we turn our attention to such an examination in an empirical manner, as realized in a case study. Our examination of MAP support in this case organisation was limited to what has been practiced. With this case study we are only able to examine certain elements of MAP support. Specifically, this case allows us to examine MAP support in the specific pattern and execution layers. Notice that the given research design rationale (i.e.,, using the case study for the purposes of the development and illumination of MAP support), we treat this 'limitation' as part of the naturalistic MAP support as experienced by the organisation in a ten year period. In this way, we address how various organisational settings observed in the last ten years of the organisation affect MAP support.

Evolving MAP Support in an ISD Organisation

This section includes an empirical investigation of MAP support as part of our case study, which we also used to evaluate MAP in Section 5.2. We should remark that this case was conducted while the examination of MAP support has continued. This case study will explicate MAP support with certain elements. In this sense, the description of MAP support can be seen as an experience report. The structure of this section is follows.

We first explain what has been experienced about MAP support in an ISD organisation without using the relevant elements of MAP support. We turn our attention to three episodes found to be essential for examining MAP support. We provide information about the organisational setting, the fragments used, the involved parties, and the existing means delivered for MAP support for each episode.

Having presented the description of MAP support in the three episodes, we discuss and reflect on the kinds of MAP support in these episodes, using elements of MAP wherever applicable.

In our earlier study (Aydin, 2004; Aydin et al. 2005a; 2005b), we considered the observed practice of MAP support in the case organisation in terms of three episodes. The term episode was used as a metaphor to indicate organisational memory of the case organisation; consequently, here we use the term 'stage' and 'episode' interchangeably. The term stage, as discussed later on, indicates that these episodes can been treated as the constituents of "evolving decision support" by which the "appropriate delivery of advice and guidance" on MAP has been achieved after a certain time period. The idea of evolving and appropriateness emphasizes that understanding of and support for MAP has evolved over a ten-year period for which we depict three stages. The idea of appropriateness indicates a stage-wise delivery of support. We convey these key messages with the case study presented below.

Table 6.1 summarizes the three stages and corresponding deliveries of MAP support that have occurred in the last ten years in the ISD department, the same department discussed in chapter five. The research methods used in each stage are provided in chapter two. Here we draw attention to our participation in MAP support.

It is important to note that the researchers were actively involved and stayed on the department site at Stage II. One can see details of the research method use for that stage in Sections 2.5 and 5.2. Stage I, which took place ten years ago, we did retrospective analysis by conducting interviews with many actors involved in MAP support with various roles (the support

provider, the agent, etc.). Finally, Stage III began two years ago and continues, but the conduct of the study was completed two years ago.

Table 6.1 Summary of Identified Stages Concerning MAP Support

	Stage I	Stage II	Stage III
The fragments	Merger of two (in-housed and brand-named) conventional methods; overwhelming numbers of fragments out there	An agile method introduced and experienced along with innovative fragments	An agile method incorporates with evolving ISD practices
Involved parties and their understandings of method adaptation	Support officers focusing on risk management; Project managers with a passive role	Coaches as facilitators; Project managers with an active role; Researchers studying the feasibility of transferring the coaches' experience via an instrument	Project managers with a an active role; Expertise team providing second hand coaching, incorporating feedback from the practice for MAP, as ;
MAP support	Ad hoc (no formal procedure or tools specific to method adaptation); only the knowledge repository of structured fragments were available; risk management tools were promoted	Human-based support service as 'active first line' coaching; training and self-learning materials; several prototypes of an instrument	Human-based support service active as 'second-line' coaching; an instrument concerning MAP support in use

They commented that there were too many templates, procedures, and most of the sections in the templates were not relevant to their projects. Many attempts were made to help practitioners to use the fragments appropriately.

A special role and an organisational unit were created; a knowledge repository containing all fragments and tools was also developed. One of the tools was supposed to be used for risk management in every project. The support officers were committed to gather feedback from practitioners in the departments and worked closely with project managers. The practitioners commented that the questions and the output of the tool were not relevant to their projects and the tool was not flexible enough to incorporate the feedback of project managers. Other attempts in providing support with

some tools did not work out. There was no formal or semi-formal procedure or support tool available regarding method adaptation, so decision-making concerning method adaptation was done ad hoc. Neither the executives nor the practitioners were happy about the situation at hand.

Stage II

Almost four years ago, the department decided to change the method and adopted an agile method (the Dynamic Systems Development Method - DSDM). The new method has become the method of choice for all ISD projects in the department. The main motivation was to ensure 'time-to-market' systems development, in order to achieve substantial product and process improvements, and to use one terminology for all projects. The method implementation in the department focused on coaching project managers in adopting the method at the department and project levels with the help of experts. The department established a temporary organisational unit consisting of a number of experts. The experts known as coaches, had extensive project experience and were subject matter experts in the chosen method use. They coached project managers on how to make better decisions on the suitability of DSDM and the degree of adaptation the method would require for each project.

There were two essential and important roles in DSDM adaptation: the project-coaching role and the project management role. We refer the reader to Section 5.2 for details about MAP support in this stage. In two years, the coaches created their own coaching procedures and other decision support related artefacts (the ESRL tool) and used them during the provision of the so-called first-line coaching support.

Consequently, the executives, the coaches, and project managers in the department commented on their satisfaction with the new practices concerning method adaptation. This first-hand coaching practice was aimed to establish a basis for MAP support; it was known from the beginning that due to limitation on the resources available in the department, the accumulated knowledge gained during this first line coaching should be institutionalized and certain practices (e.g., analysis of suitability of the method) handed over to project managers.

The department approached the research team for the feasibility of transferring accumulated knowledge and decision support related artefacts developed by coaches to the project managers. During the actual research stage, described in Section 5.2, the research team studied the existing decision support instruments, procedures, and other artefacts that coaches

used and how the coaches used them together with project managers in projects. After this study, the research team worked on the idea of self-coaching, i.e., the way through which project managers would coach themselves. The feasibility of this study was done in terms of business (effect and effectiveness), operations (what roles, responsibilities would change), and technical aspects (what features of MAP support can be realized under the technical environment, skills at hand). The team especially focused on the document-based version of the SRL and the way to use it in active coaching. The instrument did not tell the coach what should be written in the advice; the coach used the questions as a reference for this advice.

We organized a workshop and invited a number of experts to capture, define, and model the coaches' knowledge. We actually tried to imitate coaches' ways of thinking to formulate heuristics implicitly used in the process of method adaptation. This resulted in a knowledge model and a number of heuristics that were agreed on by the experts. We were trying to understand how the questions were used and linked to each other to reach a determination regarding situated method development. The challenge was to understand what relationships among the context characteristics were used. The mechanism to capture and represent these relationships is similar to the contextual graph representation of the reasoning as described in (Pomerol and Brézillon, 2001). During this modelling, it turned out, given the complexity and time availability, that we could not reveal all these relationships for all possible fragments. We decided to focus on a particular fragment considered frequently used and critical for ISD projects. We focused on a certain decision point, but to have an opportunity to extend this analysis into the future we provided a so-called Decision Point Card which characterizes the decision to be made at high level (see this characteristics in Appendix 3). Consequently, we turn our attention to modelling a fragment concerned with determining an appropriate development strategy for a project.

In Chapter 4, we gave an example for the variants of the iterative-incremental strategy fragment (the DSDM life cycles) proposed by the (method) fragment out there. Now, let us explain how coaches dealt with this fragment. Experts' ways of thinking indicate expert behaviour for a project situation. Several features of the expert behaviour can be found in the field of decision sciences (Larichev, 2002). One important feature, also relevant to our analysis, forward that reasoning and unconsciousness are of primary importance to the elicitation of expert knowledge. According to Larichev (2002), the former means that experts have superior memory skills in recognizing the patterns in the domains of expertise and tend to work

'forward' from the description of a problem to a decision. In this case, 'description of a problem' appears to correspond to Level 5 of Humpreys (1992). As we focus on a particular fragment, we try to elicit how this forward thinking works for our subjects.

The key issue here is the elicitation of dominant factors and formulation of heuristics. We now present a number of heuristics aiming at helping practitioners for the selection of an appropriate DSDM lifecycle variant. First, we asked experts for their understandings of key terms and whether there was consensus. Among the key terms, DSDM life cycle, increment, and iteration drew more attention by experts. We then asked them to select the most dominant factors; adding corresponding follow-up questions in the layers (Figure 6.7).

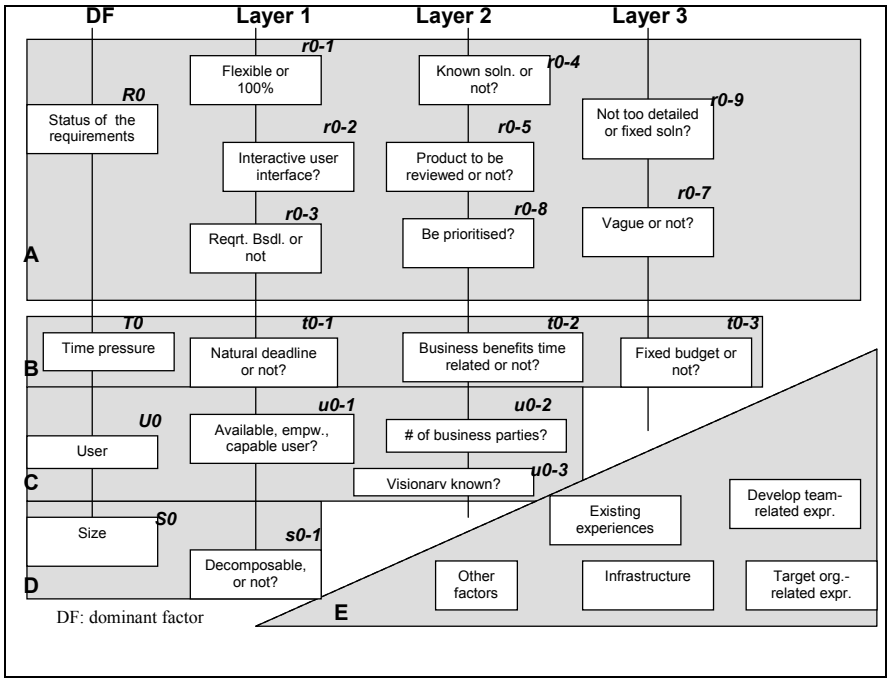


Figure 6.7 Overall dominant factors and visualisation of the situation factors using layers.

We have discussed the high relevance of the factors in the ESRL to characterise the situation, and to decide on the appropriateness of method fragment variants. The problem here was simply the difficulty of revealing all possible combinations of factors, which can be considered a combinatorial problem. For instance, if we had three factors (questions) and each had three answers, then for five variants we would have 3x3x3x5 = 135 different

heuristics. It would be difficult to analyse these heuristics separately. This problem is mentioned in Schultz et al. (2000).

Nevertheless, we used clustering and layering technique to reveal more sound relationships between factors. As figure 9 depicts, four dominant factors were identified for this decision point (DSDM life cycle variant decision point): "the status of requirements-related factors", "existing time pressure", "size of the solution", and "user-related factors". The follow-up questions were then clustered and layered. For example, for the "status of requirements" four follow-up factors are layered as Layer 1 and clustered in Box A: "flexibility of the solution", "existing of user interface interactivity", "requirements are baselined or not". One can see that the cluster E is not considered a dominant factor and is called "other factors". Experts suggested that it would be better to isolate them from the dominant factors since 'other factors' are not directly involved in their decision-making process.

The idea in this modelling of coaches' knowledge was to identify dominant factors and find out the relationships between them and the five DSDM lifecycle variants. To that end, we asked experts to rate these relationships using the scale of 0-1-2-3 as 'least appropriate', 'less appropriate', 'could be appropriate', and 'most appropriate', respectively. For instance, we asked them how to perceive appropriateness of variants if the situation is described as if there is no time pressure for the project. Then, they commented they would give us follow-up questions to understand the implications of time factor on DSDM lifecycles. The question would most likely be "Is there a natural deadline for the project?" They agreed that if there is a natural deadline for the project, then they might have some ideas about the appropriateness of DSDM lifecycles. If the answer to that question is 'no' then they cannot differentiate appropriateness of DSDM life cycle. In that case, if there is no natural deadline for the project, 'time pressure' is no longer a dominant factor. Even though the answer to that question is "yes" they need to look into other factors before selecting DSDM lifecycle. When we tried to figure out how other factors can be used to reveal implications on DSDM lifecycle variants per se, we observed that they had similar difficulties as we explained for 'time pressure'.

The next step is to identify how they used a number of follow-up questions and proceed to reach cut off points. First, we present our observations about how they used a number of questions and reached cut off points.

- Cut off points were reached after the first layer of questions, otherwise the follow up questions were needed.

- Starting points of analysis usually were those factors related to Layer 2 and 3. The reason appeared to be that Layer 1-related factors did not give enough confidence to reach a cut off point.
- Some dominant factors became non-dominant factors once they received certain answers.

We used labels for each factor to better trace experts' ways of thinking,. For instance, for 'status of requirements' we used the label 'R0'; for 'Is the product to be reviewed or not?' we used the label 'r0-5'. There are three possible answers to each question: 'yes', 'no', and 'unsure or not known yet' with the following abbreviations: 'y', 'n', and 'u'. For instance, t0-1n means the answer to the question labelled as t0-1 is 'no'. Furthermore, if we reach a cut off point after a sequence of follow-up questions we use '→h#' labelling where the arrow indicates reaching a cut off point, 'h' is an abbreviation for 'heuristic' and '#' sign shows the number is given to that heuristic. For instance, the label 't0-1n-2y-3n → h2' means that we started with the dominant factor 'TO', asked the question labelled 't0-1', got the answer as 'no', asked the question labelled 't2', asked the question labelled 't3' and we got the answer as 'no' and that resulted in a cut off point or a heuristic as '→ h2' (heuristic number 2). It means that h2 provided us enough confidence to assess the appropriatness of each DSDM life cycle variant. One can see all labels for other factors in figure 6.7. After using these labelling mechanism we derived a number of heuristics: t0-1 → h1, t0-1n-2y-3n → h2, r0-1n → h3, r0-1u-r0-10n-8y → h4, r0-3y-11y-8y → h5, r0-3y-11y-8n → h6, r0-2n-5y-U0y →h7, r0-2n-5y-U0n →h8, s0-1y-2y → h9, and s0-1y-2y → h10. These were used to assess the appropriateness of each DSDM lifecyle variant (figure 9). Notice that user-related factors were not used as starting points in the decision-making process; they were used after the use of heuritics derived from 'status of requirements', 'time', and 'size'. Indeed, the factors related to the user were more trivial to determine appropriateness of DSDM lifecycle variants. For instance, if hueristic1 is applicable, then we might opt for a full DSDM lifecycle variant, but then we must take into account a degree of executing this variant from the user point of view. We should ask whether the user is available, the existing user is capable, and enough empowerment exists.

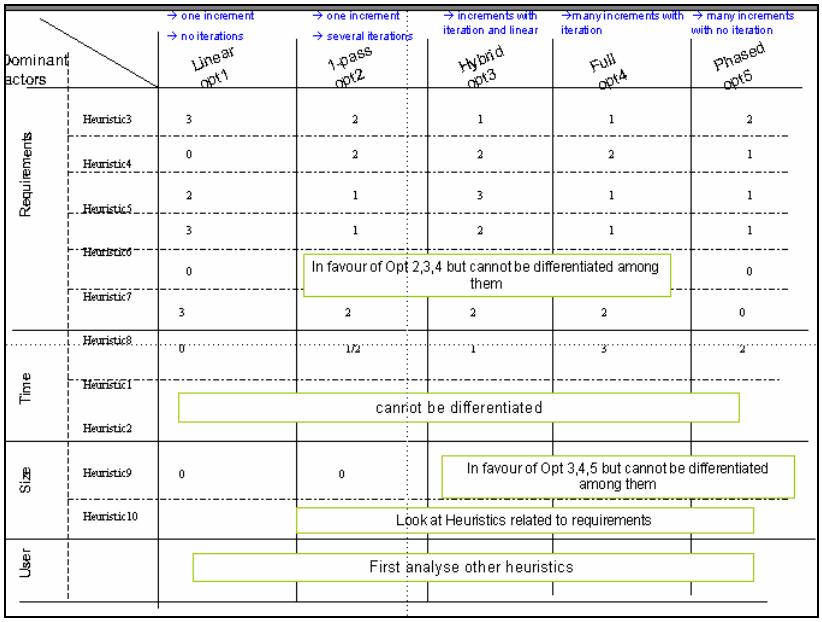
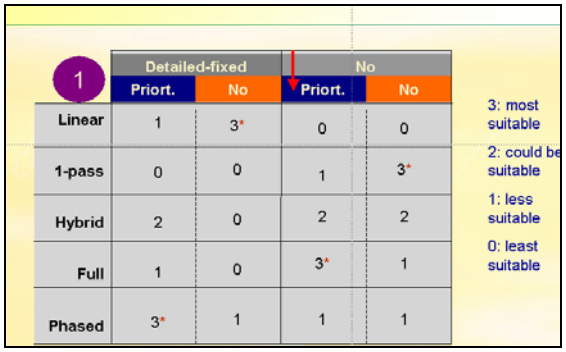


Figure 6.8 The use of heuristics to determine appropriateness of DSDM lifecycles.

For the representation of these heuristics and identification of new heuristics we found that a matrix representation was more feasible and easier to visualize heuristics. In that sense, the matrix in Figure 6.8 includes a number of heuristics. For instance, heuristics 3 and 4 can be seen with matrix representation. We used a simple scale as follows: 0-1-2-3 for 'least appropriate', 'less appropriate', 'could be appropriate', and 'most appropriate', respectively. Such a matrix representation has already been proven useful in the software engineering domain (Schultz et al., 2000) and led us to form five matrices.

It appeared that the proposed representation was more effective because,

- Derivation of heuristics was much easier for experts,
- It was much simpler for the user to describe project characteristics and,
- It was much easier to calculate the overall impact of heuristics.

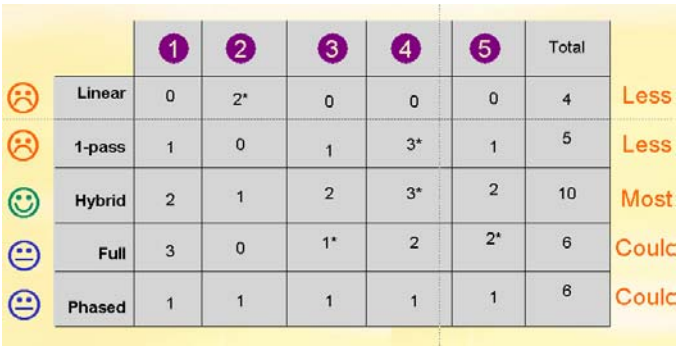


1	Detailed-fixed		No	
	Priort.	No	Priort.	No
Linear	1	3*	0	0
1-pass	0	0	1	3*
Hybrid	2	0	2	2
Full	1	0	3*	1
Phased	3*	1	1	1

3: most suitable
2: could be suitable
1: less suitable
0: least suitable

Figure 6.9 New representation of heuristics related to degree of detailed-fixed requirements.

In this representation, we can see dominant factors and related factors in one form. A close examination of figure 6.9 explains the meaning of 'representation in one form'. It says a combination of the *level of detail for requirements* and *their prioritisation status* can provide us some confidence to assess the appropriateness of variant. For instance, if the requirements are not fixed or detailed then we ask whether they can be prioritised. If they are prioritised then we can say that 'Full DSDM' is most suitable, 'Linear DSDM' is least suitable, 'Hybrid DSDM' could be suitable, and '1-pass' and 'Phased DSDM' are less suitable. Similar arguments hold for the other matrices (see Appendix 3). All the matrices formed were used for representing heuristics and assessing the appropriateness of DSDM lifecycle variant. These matrices were consolidated into the final matrix indicating overall project characteristics (Figure 6.10). The sum of all values across columns gave a final score for the suitability of DSDM life cycle.



	1	2	3	4	5	Total	
Linear	0	2*	0	0	0	4	Less
1-pass	1	0	1	3*	1	5	Less
Hybrid	2	1	2	3*	2	10	Most
Full	3	0	1*	2	2*	6	Coulc
Phased	1	1	1	1	1	6	Coulc

Figure 6.10 An illustration of consolidated matrix indicating overall project characteristics by using heuristics described in five-matrices.

For the final evaluation we used a kind of logical reasoning to draw a conclusion on the lifecycle variants. We also used symbols for the total. If the total is X, then we give meaning to X as follows:

- If X≥10, then it was considered a *high value* and the corresponding life cycle was considered 'the most suitable lifecycle' for which we used a smiling face symbol.
- If X ≤ 5, then it was considered *low value* and the corresponding life cycle is considered 'a less suitable lifecycle' for which we used an unhappy face symbol.
- For the rest, i.e., if 5< X<10, it was considered *medium* and the corresponding life cycle was considered 'could be suitable lifecycle' for which we use a neutral face symbol[lxxvi].

To implement these ideas concerning MAP support, the research team also decided to use DSDM as a method to develop a prototype of a MAP support system. We argued that throwaway prototyping in combination with iterative development strategy would be an effective means to quickly incorporate feedback from the experts and the project managers. To control the feedback mechanism and get in-depth opinions on our work, the first version of the prototype was presented to the limited number of coaches. The second version was presented to all coaches and other interested parties, excluding project managers. There were two goals behind this presentation: first, to see coaches' reactions and attitudes to such an automated coaching support, and second, to use their feedback for the last version of the prototype. Keeping similar goals on mind, the third version of the prototype was presented to a broader audience, including all coaches, some project managers, project sponsors, and other interested parties (change managers, quality assurance managers, architects). At the end of the actual study stage, the research team discussed the details of research findings with the executives and provided a report. The report included implications of replacing the first-line coaching support with the idea of self-coaching, three versions of prototype, feedback from the relevant parties, and suggestions for the use of prototype in future.

Stage III

After the actual research stage, the researchers had a passive role in the evolution of the instrument, but there was continuing communication between the research team and the department. As we have already indicated, the first-line human-based decision support for project managers was only planned for a limited time period. During this stage we waited for the reactions of the coaches and executive managers on our thoughts about

the idea of self-coaching. The coaches organized several meetings and discussed the research findings of the actual study stage. They concluded that the prototype needed to be worked out and the instrument should be developed. The coach is considered an ambassador user in the development of a MAP support system and became a volunteer for constructing an instrument.

The instrument was developed in the same way the prototype was constructed, i.e., using iterative development strategy. One project manager was involved in the development of the instrument as an ambassador user representing the community of project managers.

The instrument was developed using MS Excel (See Appendix 3) and consists of several worksheets. The first worksheet was about user guidelines and how to use the instrument. The second worksheet was used to capture general information about the project in which the instrument was being used. The third worksheet, the so-called characterization module, included a number of statements and related subquestions for characterizing the project context at hand. Depending on the phase in which the instrument being used, only relevant statements and questions were listed. In addition, if the statement was agreed with, no follow-up questions would be asked. If disagreed with, then the follow-up questions would be asked. The user of the tool could answer as many questions as he liked. The fourth worksheet, the so-called measure module, was generating management measures. The fifth worksheet, the so-called suitability advice module, included a number of charts that indicate to what extent and which aspects of the method were appropriate or problematic in a given project situation.

A pilot use of the instrument took place in a number of real projects. The organisation wanted the researchers to conduct a study concerning the reactions of project managers to the instrument. Six interviews were conducted with semi-structured questions. The interview questions were formulated carefully to measure correct constructs we wanted to know (see Appendix 3). Key constructs in the interview protocol included, but were not limited to: the degree of relevance of the tool to project managers' needs; the extent to which the semantics of the content of the instrument were perceived as clear, meaningful, and relevant; the extent to which the outcome of each module was perceived as useful, project managers' opinions on the usability of the tool, and their opinions of the tool comparing with previous situations.

It was found that general opinions of those project managers who used the instrument were very positive. In general, they commented that the

instrument was interesting, easy to use, practical, and relevant to the stages at which they used it. The statements and follow-up questions were perceived as, to some extent, clear, easy to understand, meaningful, comprehensive, and relevant at particular time in the projects. They all commented that the questions required interpretations and for some statements, project managers needed to understand the meaning behind the statement and questions if they were not very relevant for their projects. In this way the characterization module helped them think more about their project situation. The measure module was found to be the most interesting and useful module. Most of the measures were clear, meaningful, and feasible for their projects. The interesting point was that they all considered the generated measures suggestions rather than taken for granted. In fact, they used the measures as the means to justify or enhance their way of thinking for the use of countermeasures. The new or adapted measures were usually discussed and agreed with by their business partners to determine appropriateness.

The tool was perceived as relevant to their task concerning some other project leading activities such as project proposal preparation, and work plan preparation. One project manager who received first line coaching, commented, "The tool encourages and reminds the project manager to take the responsibility of assessing suitability of the method for their projects, in the past coaches were doing this". Another commented, "The measures can act like referees in a discussion between project managers and other stakeholder". So, the tool was perceived as useful for the achievement of their task, their project leading skills, including to some extent, better communication with business partners and attaining higher confidence in managing risks. An important issue was also identified: how to incorporate feedback from the users of the tool?

Since the executives were happy with the result of the pilot use of the tool, they decided two things. First, use of the tool in all projects in the department became mandatory. Second, coaches would continue to provide offline support for tool usage and utilize the feedback from the project managers and maintain the tool.

Reflection on the Three Stages

Now we discuss these three stages and refer three approaches as distinguishing ways of realizing MAP support.

Stage I is an example for what we call a top-down approach for MAP support. Namely, the executives wanted a standard method to be used as 'a

cook book', that reflects the 'one-size-fits-all' approach and considered project managers' roles as a passive agent in decision making for method adaptation. The proposed decision support practices were aimed at Level 1, and simply indicates making best assessments from the fragments out there. The project managers in the departments were supposed to implement the decisions provided by human or technology agents. Legacy of the proposed solutions in this stage appeared to be in line with the need for the power to control projects. In this situation the practitioners clearly opposed the embedded rationale employed in several decision support practices provided. This is an example of MAP support adopting the normative paradigm. The understandings of method adaptation held by involved parties were not shared. In this stage, the degree of the appropriateness of the provided decision support for method adaptation was perceived as low.

Stage II is an example of what we call *a bottom-up approach* for MAP support. Namely, the voice of practitioners in the organisation was effective while considering an agile method (i.e., the method chosen allows and even encourages adapting its fragments to the project context). Project managers were an active component of decision process. The chosen method was a reaction to 'one-size-fits-all' issue faced in the previous method. The method strongly emphasized the concepts of suitability and adaptability – the method would be, to a certain extent, suitable for a project or an organisation and was adaptable if not completely suitable. The chosen method was highly adaptable; it was possible to use the method full-fledged, but individual techniques or just the terminology were still valuable on their own. Human decision support was perceived as an effective way to facilitate project managers to make better decisions about how best to use the fragments out there. The experience gained during the first-line coaching support was collected, shared, and institutionalized. All levels of representation concerning method adaptation were of interest to the coaches, but they especially focused on Level 5 (exploring "what needs to be thought about"), Level 4 (use of "problem expressing discourse", and Level 3 (developing the structure of the problem within a frame). Note that the questions or contextual factors in the ESLR were used as a reference to frame the project context. To a certain extent, the naturalistic paradigm was employed for MAP support in this stage. There was even a preferred MAP model (MAP_1) embedded in practicing MAP support. They were encouraged to consider other patterns (MAP_2 and MAP_3) by the research team. The discourse underpinning the human decision support seems to the legacy of the human relations approach. In this case, the appropriateness of the provided decision support for method adaptation was high.

Stage III is the realization of the plan, the idea of self-coaching as discussed in the Stage II. It was therefore a smooth transition from human-based decision support to instrument-based decision support in combination with the second-hand coaching support. In this stage, it was interesting to note that the practitioners used the instrument to support different levels of representation of method adaptation. In fact, various roles can be attached the instrument in this stage. For many practitioners the instrument acted like a proposer or a facilitator. For others, it was like an expert because it was based on human coaching support and its outcome was applicable to their project situation. Since the instrument in use was based on the continuation of stage II, the discourse underpinning this instrument appears to be again a combination of structured and the legacy of the human relations approach. Consequently, the degree of appropriateness of the provided decision support to the situation at hand was high and verified by the reactions of the practitioners in the department.

Concerning the transition from stage II to stage III, we argue that what we call a typical middle-out approach was deployed. Namely, while developing the idea of self-coaching, the needs, wishes, and expectations of both executives and practitioners were taken into account. The researchers did not act like consultants and were careful about not being seduced by either the executives or the practitioners. Incremental development with the prototyping technique was very useful to accommodate feedback of the parties interested in and/or affected by the self-coaching. Of course, it was challenging to imitate the coaches' way of thinking, which was proven to work in practice. It is important to note that the researchers were not bound to a single perspective concerning method adaptation while studying the coaching practice. Rather, the researcher wanted to investigate decision-making phenomenon that took place in the department and used a multi-theoretic lens combining engineering and socio-organisational perspectives. The discourse underpinning the prototype instrument and the suggested additional practice appears to be the legacy of combination of structured approach and the human relations approach.

As the three stages indicate, this study shows that agility of the method used, the degree of consensus of the meaning of method adaptation held by involved parties, the appropriateness of the approach (top-down, bottom-up, or middle-out reflecting dominations of involved parties) to method adaptation, and the combination of human- and technology-based means, are essential to a suitable delivery of decision support on method adaptation. For understanding the degree of appropriateness of advice and guidance on method adaptation from the standpoint of their effect and

effectiveness, we use general and typical traits for some scale of appropriateness (e.g., low, moderate, high). It is clear that in the first stage the degree of appropriateness was low and resulted in an undesired situation. The lessons learned from one stage have been used in the consecutive stages. These three stages are evolving decision support practices. This study also explicates the often-cited suggestion in the decision support literature that before providing tool-based decision support to practitioners we should first understand how the decision is made. Depending on the explicitness and complexity of discourses embedded in a decision-making process, such an understanding would take quite a few years.

CHAPTER 7: REFLECTIONS, IMPLICATIONS and CONCLUSION

"Knowledge should mean a full grasp of knowledge: knowledge means to know yourself, heart and soul. If you have failed to understand yourself, then all of your reading has missed its call."

- Yunus Emre

This chapter presents what we have achieved with this work and a discussion about future research directions. First we reflect on the extent to which we have achieved the premise of the research. We then discuss the implications of this work in relation to possible research avenues. Finally, we provide concluding remarks. This chapter is composed with the viewpoints of both academics and practitioners taken into account wherever applicable. As such, we hope to contribute to the advances in both IS research and practice.

7. 1 Reflections on the Research

We critically examine to what extent we have reached the premise of the research as stated in Chapter 1. We explicate the premise in terms of the subject matter by taking into account academic and practitioners' perspectives and discuss vis-à-vis the research objective, questions and what we have achieved so far. We explicate the research design by considering its rigour and relevance, including the approach and method adopted.

Reflections on the Subject Matter

An Academic Perspective

To begin, we reflect on situated method development from an academic perspective. The underlying assumption for situated method development is that a situated-method takes into account the uniqueness of a system development project and in turn provides an appropriate manner (a situated method) of developing an information system. This appropriateness eventually and hopefully yields contributions to information system development in certain ways (e.g., by reducing risk of failures). We note that we need certain taxonomic dimensions to characterize the situated method

development as part of method development, which embodies all method related activities performed throughout the project. As such, situated method development deals with certain features of method development, especially modifications of fragments of a method.

The premise of this research is to support situated method development. Three key research questions were formulated to address two research issues: *understanding of* and *support for* situated method development. Notice that at the beginning of the exposition of the research questions, we refer to decision-making orientation as sensitizing direction to formulate the key research question. The key research questions then refer to what situated method development means in relevant literature and practice, what support situated method development means, and how to support situated method development.

The basic tenet in the logic of inquiry connecting these three questions is that to provide viable support for situated method development one needs to understand its underpinnings. That is, to be able to provide adequate support for situated method development we need to know the underlying notions and approaches of the subject and how it is realized in practice. In this respect, the thesis manifests two essential features: foundation of, and support for method adaptation.

Foundation of Method Adaptation

Now we reflect on the extent to which the foundation aspect has been built up. Observed practice and our critical examination of the existing body of knowledge concerning situated method development suggests that understanding it as a phenomenon is best conceived as a decision-making process. Such a process or capability is introduced as method adaptation. The idea of adaptation is rooted in the fact that involved parties in a 'perfect' sense cannot arrive at matching, adjusting and/or transferring elements of a situated method to the project situation where the context is unique and relative for each agent. To understand what this adaptation means and how it occurs we need a solid ground to establish its basis. We argue that such ground requires a richer treatment of the very notion of situation and related key notions. The meaning of method adaptation was provided at the outset of this introduction as a process or capability in which agents determine an appropriate (method) fragment for a specific project situation through responsive changes in, and dynamic interplays between, the context, the agency, and the method fragment.

With the introduction of method adaptation we looked into the theory of purposive actions and the decision-making literature in particular to search for a ground for method adaptation. Such a ground has been found to

be intimately linked to certain accounts in the reference cluster including cognitive psychology, sociology, and philosophy of the mind. With certain accounts in the reference cluster, we establish a foundation of method adaptation by articulating four essential notions: situation, context, agency, and fragment. We employ the notion of situation as a binding and composite construct for the other three notions. With the certain accounts in the referenced disciplines, we conceptualise *situation* as a limited portion of the world –partial reality – as emerging over location, time, and agent. Three other essential notions (context, agency, and fragment) are examined carefully and extensively to pave the way for further development and illumination of method adaptation. In particular, we argue that a naturalistic decision-making approach among others (prescriptive and normative) provides promising ideas to reveal the decision-making processes underlying method adaptation. We remark that the prevailing models proposed for situated method development, as they adopt normative or prescriptive views of method adaptation, consider context as static and reduce its meaning to a number of characteristics. By adopting the naturalistic decision making model, we adopt the idea of characterizing to explain how the context takes place in method adaptation. In a similar vein, we provide extended meanings of fragment and agency. Together with a modest extension of the meanings of context, agency, and fragment, we produce a generic model called Method Adaptation Process (MAP). With this model we are able to demonstrate intriguing interplays between the agency, context, and fragment defined as essential constructs. We state that what underpins these interplays is the adaptability of the essential constructs; each is subject to influence or be influenced along with the cognition of an agent. That is, we reveal this character by considering them things-in-themselves. We have also emphasized that these interplays constitute building blocks of a situated fragment as continuing changes in the conception of framing with characteristics, intention, and the partial plan. Frame is related to inclusion and exclusion of circumstances contextualized at the moment MAP occurs and in which the intention (either future- or present-directed) is formed and/or enacted along with a partial plan and required actions. The form of situated method produces a kind of reasoning, argumentation, or heuristics that is beneath its representation. We consider certain fictitious cases for MAP to underscore the adaptation character and dynamic interplays of the essential constructs. We also model the adaptation processes to better explain dynamic interplays. We propose that these processes can be incorporated in a generic model for method adaptation. Such a model is generic in that it generates specific patterns and models.

The evaluation of method adaptation has shown us that the generic model 'accommodates' basic models in the literature as specific MAP patterns. By using the case study conducted in this work we explicate and evaluate MAP on an empirical basis. Explication of MAP is done by showing the existence of two forms as identified in the organisation investigated: static and dynamic method adaptation. The former considers MAP in a static manner (i.e., the characterization processes of MAP are based on "prescribed situation"), whereas the latter employs these processes for "the situation on the move" throughout the project execution.

MAP Support

Drawing upon state-of-art knowledge in the decision support and decision support systems (DSS) literature we establish a basis for MAP support by taking into account a number of basic elements of decision-making support grouped into three dimensions: *decision support orientation* (referring to value orientation, decision support paradigm, and effect and effectiveness), *focus* of *decision support* (referring to MAP layers and levels), and *existing means* (types of DSS, techniques, and tools). By these dimensions, we articulate MAP support in terms why, what, and how to achieve it. Our articulation complements the idea of method adaptation by proposing a novel approach for MAP support called Naturalistic Decision Support (NDS) as an appropriate way to truly achieve MAP support. Finally, we examine the viability of NDS for MAP in an empirical setting and discuss it using relevant elements for MAP support. Our case study identified three distinguishing stages. These three stages have provided an illustration of how MAP support was experienced over ten years in an ISD organisation. In particular, we show "evolving MAP support" by which "appropriate delivery of advice and guidance" on MAP has been achieved after a certain time period. As the three stages indicate, this study shows that agility of the method used, the degree of consensus of the meaning of method adaptation held by involved parties, the appropriateness of the approach to method adaptation (top-down, bottom-up, or middle-out reflecting dominations of involved parties), and the combination of human- and technology-based means are essential to a suitable delivery of decision support on method adaptation. We believe that this empirical investigation of MAP support explicates the often-cited suggestion in the decision support literature that before providing tool-based decision support to practitioners we should first understand how the decision is made. We conclude that such an understanding would take several years, as was the case for the organisation investigated, depending on the explicitness and complexity of discourses embedded in a decision-making process.

A Practitioner Standpoint

We describe the task of situated method development by using a simple language. We note that situated method development is definitely not a one time activity and takes place in an evolutionary way as new insights are gained when time progresses in a project. We consider certain roles (designer, mediator, proposer, and user) to be effective in method adaptation. Depending on the size of the IS development and project organisations, these roles can be separated or merged. Designer and mediator roles are especially dominant in method adaptation at early project stages. The designer role is usually performed by a project manager and therefore, in practice the task is often implicitly referred to as part of project management. Our observations indicate that static and dynamic adaptation are naturally required and serve different purposes. We argue that static and dynamic forms of method adaptation could be applicable and useful in a large-scale ISD organisation.

Static adaptation yields relevant fragments to be enacted in the project and provides a kind of a reference point for overall structuring of thinking and actions. Dynamic adaptation takes place in the virtue of fragments enactment and unfolds structured thinking and actions. This unfolding may necessitate the innovation of totally new fragments, modest extension of structured fragments, or other degrees of modification. We observed the influence of a mediator especially in static method adaptation.

In observed practice, we identified several ways and means used for static method adaptation, however, using project management toolkits and workflow type instruments was criticized by the practitioners in many respects (such as simplistic view of characterizing situation, purely risk, and irrelevance of suggestions).

We show that coaching is a novel way to realize a supporting role for MAP. But this human-based caching service has been subject to the economics of decision support. The case study organisation believed that human-based coaching was simply not feasible because there was an overwhelming number of projects which required substantial investment to provide coaching service for individual projects. As noted, the organisation decided for a smooth transition from human-based coaching to self-coaching via an instrument.

We argue that the use of an instrument in this sense is useful for characterizing the project context and provides a reference point by which the designer and mediator can share understanding of how to carry out method adaptation. Such an instrument has been developed by imitating coaches' ways of thinking and incorporating feedback on method adaptation practice. This is especially important for delivering a naturalistic decision

support for MAP. We show the feasibility, applicability, and usefulness of such an instrument in the context of agile systems' development in one of the leading financial institutes in Europe. We now discuss limitations of this work.

Limitations on the Subject Matter

Despite the best endeavours to utilize both literature and the case study for the empirical and analytical basis of our proposed idea, more research is needed especially for the empirical justification of how the generic model would manifest in a field setting and how MAP support has been realized. The case conducted is limited to an agile method (DSDM) and a number of in-house method fragments in a single organisation operating in a certain industry. This certainly limited us to explicate certain MAP patterns identified in the case organisation.

Another limitation was 'operationalisation' and/or formality of constructs or concepts underpinning method adaptation. Operationalisation is of interest to ISD researchers who are interested in clear-cut and measurable constructs or concepts, and researchers in method engineering are interested in formality of constructs or concepts underpinning method adaptation as the elements in a model should be confined to a certain degree of formality. Regarding operationalization of concepts, this work attempts to provide several ways to operationalise key notions and constructs, but warns that this operationalisation should not be reduced to a limited meaning. We show this is really the case for operationalisation of some notions including the notion of context. Regarding formality, using mathematical notations is an effective way to avoid ambiguity related to the elements used in the model. The side effect could be that formality of the model can be so sophisticated that the reader may have some difficulties in following up the reasoning or even the meaning of symbols used to explain the models. Our strategy is to use certain notations, not to overwhelm the reader with formulae, but to explain intriguing interplays among essential MAP elements using basic notations.

Reflections on the Research Method

We treat the adopted research method as a means rather than an ends. In this respect, practical relevance and rigour are guiding principles for the construction of our research method.

The adopted research method is unique in that it has been constructed to structure our way of thinking and actions. As far as practical relevance, we use meta-theoretical dimensions to make our thinking explicit

during the research. The epistemological dimension is especially useful to explicate researchers' knowledge. That is, we show the relevance of three worlds, material, social, and the primary researcher's world, and their influences on our knowledge.

The conventionalist paradigm has been salient as there is an established research community (Information Systems Development and Method Engineering) dedicated to the subject matter. The discourse underpinning ME is especially influential on structuring thinking. Nevertheless, a critical thinking attitude was taken while establishing the thesis.

Regarding structuring actions in this research, we employ a number of research design elements such as the logic of inquiry, research processes and key activities, techniques concerning data collection, and research methods for case studies. Logic of inquiry refers to the research rationale applied for establishing the thesis. In this respect, development and illumination aspects of the employed knowledge are identified and effectively used.

Given the nature of situation development as practiced in the ISD organisation investigated, we employed several techniques (action research, focus group, etc.). This was necessary because of the different sources of knowledge and several artefacts in use. We conducted several rounds of interviews for the triangulation purpose and gaining richer content.

The Use of Empirical and Analytical Sources for Method Adaptation

This work incorporates many ideas from three clusters literature, which we call the core, supportive, and reference clusters. It also attempts to incorporate insights gained from the case study; we use both literature and the case study to *develop* the idea of method adaptation. We also use both literature (especially the core cluster) and the case study to *illuminate* the viability of method adaptation empirically and analytically. It seems that this is not a very common research technique and there are some difficulties in determining demarcations about how our knowing developed. In the case study we employed two theoretical lenses (the engineering and socio-organisational perspectives) to further explore the phenomenon that we didn't name at that moment. Gradually and along with the three worlds (the material world, the social world, and the primary researcher's world), the idea of method adaptation emerged. We certainly had a preliminary case protocol for conducting the case, but the research context, the nature of the subject matter, and of course the research team's intentions necessitated modifying the case protocol substantially (for instance, taking into account

different sources of information, development of prototypes, and using various research techniques).

While we theorize method adaptation and support we use ideas from the literature and the case study for development and illumination purposes. It is often the case that, either theory drives the empirical study or the other way around, but this research employs the interplays between theory and practice as part of our knowing about method adaptation.

Action Research as a Technique for Studying Viability of MAP Support

One effective way to check the viability of a theoretical model is to apply it in practice. This is one of the problems of IS research and method engineering in particular in that most models lack empirical justification whether they are feasible or not. Among others, the work of Van Slooten (1995) takes a step towards analysing feasibility of situated method, but feasibility of supporting its construction via DSS remains an open question. This work attempts to contribute to advances in method engineering and ISD research not only from the subject matter, but also by a particular research technique (action research) used to check the viability of method adaptation. The use of action research is rare in ISD and method engineering, as well as in DSS literature. Investigating the viability of a decision support tool for MAP through action research provided both challenges and advantages already mentioned in chapter two. We hope that the experience with action research gained in this work is found to be useful by prospective researchers for conducting method adaptation and MAP support in an empirical setting.

7.2 Implications of the Research

There are two extreme views on the use of ISD method in practice. One suggests amethodical system development (that a formal method should be dismissed in systems development); the other view is inclined to apply a method rigourously. Of course, many researchers and practitioners stay somewhere between. This thesis treats a method differently, as it is related to structuring agents' thinking and actions for system development and argues that whether or not any formal method is used, the existence of method is inevitable. The agent always has to deal with method use in some way, irrespective of the use of formal or other kinds of method. We show that the (method) fragment proposed, the agent herself, and the context in which the fragment is to be enacted, are tightly coupled yet separated as things-in-themselves and cause intriguing interplays among the fragments in the head of agent. The fragments are derived from the proposed fragment, the fragment owned, and the fragment induced by the context.

One implication of method adaptation is then that method, context and the agent are not passive elements in these interplays but purposively intervene in the agent's knowledge about how to handle construction of situated method. This implies that we should advance in our thinking about the effect of method in these interplays rather than reducing its meaning to certain aspects and attributes. To show how to advance in thinking, we suggest looking beyond its 'frozen' rationale captured and often implicit in the presence of the method, and possibly capture its creator's way of structuring the intended user's (the designer role) thinking and actions. This advanced understanding of method is related to its intellectual function; the practical function is more geared to structuring actions. Most methods are proposed to make use of the practical function of the method, but this is limited in its use and has possibly severe consequences if the agent is unaware of the intellectual function. The consequence can be so dramatic that the agent can become a 'slave of the method' if she is not confident about her own fragment. Non-technically speaking, if the agent is not familiar with and forced to use the method, then either the agent's thinking or actions are fully captured in the method or severe clashes and breakdowns occur between the agent and method. These often occur at later stages and may cause project failures. The agent holding the designer role should be more proactive in revealing and preventing these breakdowns. Guidance in this research explicates how the designer can be supported in this respect. The role of mediator is essential to support the designer in awareness of limitations of not only the method, but also her own fragment.

In this regard we suggest that method should be enacted with its intellectual function so that it will not tell you what and how things should be done but act like an advisor and facilitate the designer in constructing a situated method truly. Implication of this change in method functioning is substantial for its creator. Instead of providing full-fledged content of a method, the experience of those who use the method should be a starting point for establishing the basis of a method. This idea resembles the method life cycle consisting of several loops (Ad-Hoc Approach → Best Practice → De Facto Method → De Jure Method → Ad-Hoc Approach) as mentioned in Harmsen (1997).

Experience-Based Method Adaptation

Experience-based method adaptation is, as promising future research, related to capturing, organizing, disseminating, and maintaining experience about method adaptation. This is especially important if naturalistic MAP support is targeted. Two mechanisms are prominent in using method adaptation experience: decision points-based method adaptation and issue-based method adaptation. The first mechanism puts special emphasis on certain decision points more concerned about those fragments with strategic orientations and in turn provides basic blocks of a project scenario. The second mechanism uses a skeleton and language of the method for anchoring the issues faced and solved while adapting method with the relevant fragments. These two mechanisms feed each other in that issues and corresponding fragments are intimately linked to certain decision points. Take, for instance, issues concerning the end-user involvement in projects. It is possible that in every project different instances of this issue are present such as the end-user is not empowered and/or not capable. In every project there are different or similar ways of handling this issue and this is intimately linked to a decision point regarding an extent to which the end-user involvement is required and possible. Consequently, experience-based method adaptation suggests a bottom-up approach concerning using practitioners' experience with method use. Quite recently several attempts, such as experience-based product or process software development and case-based support tools (Henninger, 2003), have been made. Method adaptation might serve as a reference model to assess and enrich the underlying models behind their accounts which often lack either descriptive or prescriptive validity.

MAP Patterns

MAP patterns are similar to the models proposed in method construction in general and the prevailing models proposed for situate method construction in particular. We articulate different MAP patterns and mention that some patterns can be 'typical' in certain industries, specific to organisational characteristics, or may be related to system characteristics. Regarding industry characteristics it might be the case that MAP patterns are more in the type of Method→ Agent→ Context in government organisations (the department of tax office, or other units) or in financial institutes. That is, the method is a key driver and enforces the agent to construct a situated method in the context. In other industries such as High-Tech, Consumer Good and Services where innovation and business dynamics are more prominent, MAP patterns are more likely to be Agent → Context → Method. That is, the agent is a key driver to construct a situated method where the context is influential in this construction. Finally, certain MAP patterns prevail in system characteristics at a high level such as business process applications, enterprise-wide systems, infrastructure-related applications, and management information-related applications. Notice that this research puts some effort into analyzing BPA characteristics to gain insights into how these characteristics are influential for characterizing the context rather than comparing with those characteristics meant for other types of applications. Consequently, investigating the effect of industry, organisation, and system related characteristics on MAP patterns would be a fruitful research direction.

Method Adaptation in Globally Distributed System Development

Traditionally, systems development activities are co-located and almost no methods are designed for this purpose. All parties are close so many activities are carried out face-to-face. But the trend in practice is changing towards systems that have been developed in a more globally distributed manner. Methods fall short in addressing the challenges of how to conduct globally distributed systems development (GDSD). It is interesting to see how method adaptation deals with differences among parties involved in such settings in terms of ways of thinking (along with cultural, legal, language, etc.) or action (distribution of work, communication and coordination mechanisms, etc.). Not only is distributed global systems development needed in practice, but distributed global method adaptation would also be required. In case the method fails to accommodate globally distributed systems development, we can expect a MAP pattern that depicts context → agent → method type interplay. This suggests that since the

method does not address the aforementioned challenges driven by GDSD, people would be forced by the context to come up with a new practice which leads innovative method fragments. Studying method adaptation in GDSD would provide new insights in understanding the effect of contextual differences on MAP.

Naturalistic MAP Support

This is a research direction in which practical support tools for MAP should be experienced. Of particular interest among the types of support mentioned in chapter six would be naturalistic MAP support. It should be noted the naturalistic decision making (NDM) paradigm still demands both theoretical and empirical justifications about how to make naturalistic support happen in reality. Most examples in the literature are in different domains such as defense organisations, air traffic control, or critical thinking on the battlefield. Thus, it is a new research direction for IS researchers to apply naturalistic MAP in ISD practice. Related to the NDM spirit, naturalistic MAP support pays special attention to the evolution of decision support based on understanding descriptive and prescriptive MAP support. It is important to illuminate what has happened in organisations in general and in the world of the practitioner concerning method adaptation. The background of practitioners who usually have experienced different kinds of method, different types of project context is equally important for naturalistic MAP support. An investigation of how method adaptation and MAP support evolves across time or projects and organisations is another research avenue.

Method Adaptation for Agile Methods

Agile methods have been promoted as a panacea for the long-standing problems of conventional methods in practice. It is still questionable whether agile methods will achieve premises put forward by the agile community where the belief in 'agility' appears to be mythical or religious. Thanks to the case study conducted in the financial institute, we had a chance to see how method adaptation has been realized together with an agile method. Agile methods indeed provide flexibility or even encourage the agents to construct a situated method. It is so flexible that the agents, especially novice agents, can find it difficult or uncomfortable to proceed in constructing situated method. To ensure that agents do not feel insecure during method adaptation we can refer to the idea of control flexibility mentioned in Harmsen (1997). This idea needs be further articulated to cope with

challenges that novice agents face when an agile method is considered for method adaptation.

Regarding our investigation of adaptation for an agile method in the case organisation, we should note that the focus in this work has been on method adaptation at the project level, but the idea of method adaptation can also provide a basis to investigate the adoption of agile or conventional methods at the organisation level. We also note that practitioners first worked on method adaptation at the organisational level in the case organisation (for instance, compatibility of the chosen method to the fragments already existed in the organisation, and construction of road maps and/or route maps as a result of situated method) , then on method adaptation at the project level. It might be the case that an organisation may first begin with method adaptation at the project level and learn and extend its method practice to the organisation level. These are two approaches (starting from the organisation and moving to the project level, or vice versa) that we can think about practicing method adaptation in an organisation. The interesting question is then which particular approach should be adopted to implement method adaptation support in an organisation.

7. 3 Concluding Remarks

We would like to end where we began, which was *where to start?* This work shows that the starting point for investigating situated method development went through changes during the research journey. The researcher developed a mixed feeling of scepticism, objectivity, as well as a critical thinking attitude towards his knowledge. The research community in which our work is positioned has a dedicated research group on the subject matter and has a solid Body of Knowledge (BoK). In that sense, our contribution might be regarded as a modest extension of the BoK in IS research, consisting of further articulation, explication, and establishment of the idea of method adaptation which refers to the phenomenon about dynamic interplays between a context, an agency, and a method fragment in an ISD situation. Naturally and essentially, the foundation of method adaptation is established and illuminated by using existing BoK and the case study conducted. It is *natural* that such a modest extension was needed because the very notion of agency deserves more attention as the heart of method adaptation. It is *essentially* needed because without this notion, method adaptation lacks its essential feature referring to how the agent in some way adapts her knowledge (either through her own or method fragments out there!) to the context or the other way around. One can argue about where her adaptive capability comes from. We all have this capability, which goes

beyond the basic discussion of survivability. Whether it is granted or learned it is this capability that makes the agent aware about what is going on around her and helps the agent involved in method adaptation in particular to manage intriguing interplays among herself, the context, and the fragment.

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APPENDICES

Appendix I:

- An Analysis of the Selected Papers for Situated Method Development

Appendix II:

- About the research method applied
- Example of data analysis for the interviews conducted
- Overall relations among the characteristics for a context
- The list of factors used to characterize a project context
- Questionnaire for coaches' opinions on certain fragments of DSDM

Appendix III:

- A prototype of the tool developed for MAP support
- The tool used for MAP support in the organisation
- The reactions of project leaders to a MAP support tool

APPENDIX I

Table A1. An Analysis of the Selected Papers for Situated Method Development

Author	Research stream	Proposed approach and emphasize	Key Notions and/or constructs	Stages / Procedures for method development	Criteria or the mechanism used for selecting elements of method(s)
(Slooten 87; 95)	ME/situation -specific approach	Situated method engineering	Situated method, context, contingencies, scenario, fragments, route maps, method engineering information systems	1) Project characterization 2) Determining the aspects, levels, constraints, and development strategy, which is related to a set of route maps and fragments 3) Configuring project scenario by selecting route maps and method fragments 4) Refinement adaptation in the course of project performance	A framework which has two dimensions: the five aspects (process, information, behaviour, organisation, and problem) and the two levels (object system analysis and design, information system analysis and design)
(Harmsen, 94; 97)	ME/ situation-specific approach	situational method engineering	Situation, situational method, method fragment, fragment properties, method engineering languages	1) characterization of situation 2) selection of fragments which are stores in method base 3) assembly of fragments 4) project performance and experience accumulation	S3 model: the relationships between situation, success, and scenario; formulated as heuristics
(Tolvanen, 98)	ME/ situation-specific approach	incremental method engineering	local method development, method refinements	1) method selection 2) method construction 3) tool adaptation 4) collection of experiences 5) analysis of method use 6) method refinement	- ME criteria (contingencies, development problems, stakeholders' values) and characteristics of ISD environment. - Product- and process-oriented ontology is developed to anchor product and process fragments of the available methods
(Punter, Lemmen, 1996)	ME/ situation-specific approach	MEMA-model	Customizing ISD approach modelling strategy, project environment,	1) problem characterization, 2) matching process, 3) matching process 4) modelling strategy determination, 5) assembly process 6) project performance	The following dimensions are used for determining modelling strategy: the level of uncertainty about the analysis of the problem situation and the selected solution, the complexity of the modelling process and the validation and iteration process.
Euromethod (1994; 1999)	ME/ situation-	Euromethod	Risk exposure, situation, measures,	1) situation analysis 2) risk analysis	Situational factors and critical risks together with heuristics

	specific approach		delivery strategy	3) design of a deliver strategy 4) the impact analysis of the chosen strategy	
(Lycett et al., 2003)	SE/ situation-specific approach for agile methods	Situated process framework	Situated processes, tailoring, pattern	1) contextual characteristics 2) decision making 3) pattern selection 4) reflection on the use of pattern	A decision framework for selecting patterns from four characteristic sets: project elements, product elements, team elements, organisational elements
(Boehm and Turner, 2003)	SE/ situation-specific approach for agile methods	Risk-based approach	Tailoring, agile and plan-driven risks	1) risk analysis 2) Compare the agile and plan -driven risks 3) architecture analysis in case neither (agile and plan-driven) dominates in the risk analysis 4) developing overall project or risk mitigation strategy and tailoring lifecycle 5) execute and monitor	For selecting milestones and associated elements of method, anchor point technique is used (Lifecycle objectives, Lifecycle architectures, Initial Operational Capability
(Kettiger, et al., 1997)	I/BPR	A Stage-Activity (S-A) Framework	Mapping of BPR techniques, tools to the S-A framework , risk taking behavior	1) construct the S-A framework 2) conduct mapping of BPR techniques, tools to the S-A framework 3) customize the S-A framework 4) categorize and select techniques and tools	-For customizaton, first determine the degree of project radicalness and relate it to propensity for risk, and then use four major project characteristics to identify activities. - For selection of techniques, tools, use four major project characteristics
(Parr and Shanks, 2000)	I/ES	A taxonomy of ERP impl. approaches	Implementation characteristics and category	No any mentioning about the method development. Characteristics are grouped as physical scope, the BPR scope, technical scope, module implementation strategy, resource allocation	No any mechanism for the selection of an implementation category
(Mabert and Venkatramanan, 2003)	I/ES	The impact of design variables on the execution and outcome of an ERP implementation	implementation variables: planning variables, management variables., key strategic decision variables	No any mentioning about how the decisions concerning implementation variables are made.	No any mechanism provided for the determination of strategic decision variables
(Markus et al., 2000)	I/ES	A process theory of enterprise system	The four-phase model along with key decisions, activities and outcomes	The proposed model can be considered as a situation-independent method for ES implementation	No any mechanism provided for further refinement or modification of the process, framework.

		success			
(Hickey and Davis, 2004)	ME/RE	A unified model of requirements elicitation	Requirements elicitation activities; a selector function as part of the procedure for tailoring methodology	1) characterize requirement 2) characterize situation in which requirements are to be selected and techniques to be used for elicitation activities 3) describe and select the technique to be used	Procedure for tailoring a method: examine the state of requirements; examine the characteristics of the problem and, the solution, and the project -select a technique of the given method, if not adopt or create a new technique by using personal preferences.
(Offenbeek, 1996)	ISD	A dynamic fit between context and SD approach, contingency model	Approach, context, scenario, risk profile, levels of SD approach	1) contingency or contextual factors, leading to five types of risks 2) approach characteristics 3) outcome factors, indicating effectiveness of the SD process	A number of propositions are formulated as to relate the contextual factors to the approach characteristics which are operationalzed as decision points and related modeling dimensions at three levels (strategic, tactical, and operational)
(Baskerville and Stage, 2001)	ISD	A social process for method fragment adaptation	Method fragment, work practice, practical ethnography, method fragment adaptation, the ethnographic encounter consisting of schema (goals, frames, plans), strip, breakdown	A framework to accommodate method fragment adaptation consists of three components: a set of generalized method fragments originating from published methods a set of determinants of fragment selection a sociological process for the on-going accommodation	- selection of method fragments - if necessary, invention of method fragments in work practice - combination of method fragments that are appropriate in a given work setting
(Hirschheim and Klein, 1994)	ISD	Method reformulation	Emancipatory principles, ideals concerning design and realization of emancipatory ideals	1) extract ideals, principles behind the method 2) analyse design and realization of the captured principles, ideas 3) reformulate method along	Reformulation method proceeds in two steps: assumption analysis, which identifies the basic building blocks of a method the proposal of improvements for overcoming the limitations inherent in assumptions

APPENDIX 2

Table A2.1 About the Research Method Applied

Research stages	**The preliminary study stage**	**The actual study stage**		**The posterior study stage**
The sources of knowledge and the techniques used to interact with subjects	*Informants:* Five experienced method engineers First round of interviews in the form of semi-open formal interviews	*Documentary analysis:* The organisation-wide development method; the existing route maps and related fragments; an instrument (the ESRL) used for method adaptation; templates and actual project documents, including advice documents, project proposals, systems development plans. *Direct observations*: Attending daily meetings of method engineers		*Informants*: The head of coaching group and some method engineers
		First round of interviews in the form of open-ended and semi-open (formal and informal) interviews	Second round of interviews in the form of open-ended and semi-open (formal and informal) interviews	
		Informants: Twelve method engineers	*Informants:* Twelve method engineers, six project managers, two portfolio managers, one change manager, two quality assurance leaders, one chief domain architect	
Main research focus	Determining relevant context(s) for the ways in which an agile method is adapted Gathering perceptions and opinions of method engineers on method adaptation in general	Identifying and studying the prescribed forms (route maps) of the method Identifying tailoring drivers behind the prescribed forms Studying the formulation of structured and unstructured fragments Exploring, describing, and analyzing working practices and a means that the department uses to deal with the static and dynamic adaptations Studying the practice for dynamic adaptation in detail		Being up-to-date on the subject matter
Sample questions	What do you think about adaptability of the method (DSDM) to a project situation? What about previous and current practices on method tailoring? How do you go about tailoring it for a specific project? How do you support project managers on this matter? What kind of information you exchange with project managers?	What do you think about the coaching support (provided or received) for a project? What do you look for and take into account when tailoring the method for a specific project situation? Could you explain the activities, the knowledge used while coaching a project manager? How do you determine the suitability of the method to a project? What do you use for it? What do you do if the prescribed parts of the method do not fit the project context? Do you use any means to characterize a project? What do you think about the instrument (the ESRL)? What about the contextual factors and measures in the instrument? How do you use them? How do you write down your advice on how best to use the method for the project? How do you use the advice in your project? What about relevance of the instrument and its parts (contextual factors, measures) to the task concerning method adaptation? Are the factors and measures meaningful, comprehensible, and useful for method adaptation?		What have been changed in method adaptation practice so far? Any change regarding coaching support, other working practices, the means, etc?

Table A2.2 Example of Data Analysis for the Interviews Conducted at the First Round of Preliminary Study Stage

	(Q-2.a) How do you go about tailoring DSDM for a specific project?
Interviewee A	[…] We are no coaching that way that prescribes things. The way of doing is that we say you have to do manage your own project; you have to deliver your project on time, within budget, and so on. It is your project. We are giving you ways to improve and taking care that everything is on time and according to requirements […] What we do is that we have a suitability filter coming from manual somewhere, we have worked on and expanded it. We have clarified certain questions for our case. With this filter we can convince project leaders in a first conversation that we can do something for them. Because we tell them 'OK, you have found out something about your project proposal and you want to take it up like this written in a document'. Then we start to ask a number of questions. And, then we have very good experience with these questions. That is, asking simple questions we can clearly indicate where risks are on the project. […] What we do is that we sit together with project leaders and we look together how DSDM techniques should or could be used.
Interviewee B	In the suitability filter there are very important questions. Questions where you answer no are potential risks. Those risks also identify aspects how you can tailor to specific project. So this is a basic list to tailor DSDM. (answering questions in the suitability filter…) […] You can do it together with project manager. If I am a project leader. I will fill it in with my business partner and also technical specialist or coordinator in DSDM. For the bank when I coach a project, I fill it in with business partner and project leader. Together we are thinking how we can tailor DSDM to a project. Sometimes there are small changes, sometimes there are big changes.
Interviewee C	[…] What we do is we first talk people involved in. You may know the word, SIPM – Solution Integrator Portfolio Manager that is more or less a person high in the hierarchy of development area who is responsible for implementation of DSDM. He has project managers in his group, we talk to project managers they call pla- project leaders from automation contrary to project leaders from business they call plb- project leaders form business who represent users directly or indirectly. They represent users or at least they represent interests of end-user in project. What we do is the SIMP gives 'go ahead' for a certain project to start with DSDM. What we do is that we talk first to both pla and plb to find out what kind of persons they are to see whether they would be suitable for DSDM ideas or not. Because some people are not able to this. So this is more or less is formal. What we do is also that there is a DSDM product, called security risk list, which is a list of 27 questions with which you can map more or less suitability of projects as DSDM projects. So, you have 27 answers and from these answers you can deduce the risks, from the risks you deduce actions. […] My point of view we should not do things that are not improving or not improving the quality. So, apparently according to answers you can know the level of risks involved. You can get the certain pictures what is happening. It is not a mater of answering questions and picking up answers and saying 'Okay, this is it'. You have to change into integral approach, which makes sense to people, "We do not do this, we are going to do that for that reason, we are surely watch out this and that, etc."
Interviewee D	[…] Now, the process… It is hard to say. I am thinking an example. But each time it is different. You need to have business commitment to implement DDM properly. So, the first hurdles 'Okay. We are going to do project but how to introduce DSDM to business side, do they accept? For instance, they have to follow courses. […] Tailoring is also depending on attitude of the business. How do you receive the message that we are going to start DSDM? Then we use usability filter, you try to aware of risks and depends how big a project is, the size of project is important, it can be small that is one of the aspects of DSDM project. Are there any existing environment?, is it like maintaining projects?, that is another aspect knowledge of developers, tooling and environment of targets. For bigger projects, you pick the parts of the method, which are suitable for DSDM.
Interviewee E	[…] We use a tool, DSDM suitability filter we extend it with a number of measures, instruction for project coaches. Before I do that I try to get sense of the project. Then, I start to get clear that what the business goal is. I keep asking them 'Why?' […] once project manager has clear understanding of the goal and project members as well, then you make choice. And then you can also get a team sense we're all striving for the same goal. This is the first thing that I always go for. Once this is clear then I am looking for aspects, that I said earlier, time constraint, interfacing, for some sort of review is possible.

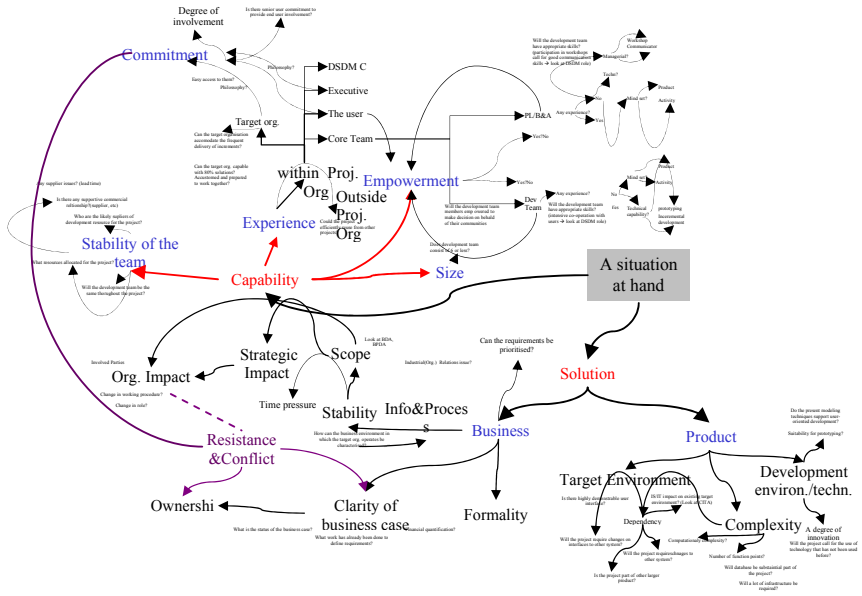


Figure A2-1 Visualization of overall relations among the characteristics for a context

Table A2.3 The list of factors used to characterize a project context

Applicability factor	Related Views or Factors	Explanation
The identity of the problem holder or customer for the project is clear	Business /Ownership	Is a champion (proponent/leader) present and able to handle political problems and to ensure that resources are released?
The customer and senior management understand and accept the philosophy behind the DSDM approach.	Degree of involvement and Commitment	A thorough understanding and complete acceptance of the iterative approach is essential. Commitment on the part of the customer/management for the iterative approach must be explicit.
The customer and senior management on the user side are committed to making enough properly qualified end-users and material experts available for user participation in the project.	Capability/ Commitment	Determine whether the user group is clearly defined and whether it has decision-making authority. Also determine whether the members of this group are committed to complete participation in the development process
What priorities (time/money/functionality) does the customer have? How does the customer rank time, money and functionality (control parameters for the project):	Solution/ Business case	Is the solution required quickly? Is time the most important consideration (delivery time is most important) or is the budget more important? Is the required solution business critical? If speed is important, a fixed end date and fixed timeline must be given. If these items are unavailable, time may not actually be the most important consideration.

Applicability factor	Related Views or Factors	Explanation
Is the scope and definition of the (end) user group clear?	Solution/ Scope	The scope of the (end) user group must be specified to ensure that the system is developed for the appropriate people, with input from the appropriate people, i.e. the people who will actually be using the system.
All users have the same manager.	Capability/ Ownership	In cases involving users from different organisational units with different managers, the functionality probably cannot be ascribed to a single customer.
All parties involved have the same objective	Solution/ Business case	If the parties involved do not share a common objective, the project definition may be unclear.
There is a basis for working together.	Capability/ Commitment	A great deal of energy, time and resources can be wasted in projects that do not have an inherent basis for working together. The lack of this basis results in serious setbacks when the iterative approach is applied.
The end-users are available to participate in the project.	Capability/ Empowerment	A department may be positioned between the developers and users. Direct communication with users is not always possible. People who will not actually be working with the system develop specifications.
The users in the development team are given the authority to make decisions in areas delegated to them by management.	Capability/ Empowerment	Essential characteristics of the iterative approach must be present so that the process can proceed with the necessary speed.
The end-users with delegated authority to make decisions are capable of making decisions.	Capability/ Empowerment	End-users may have the required authority, but may fail to use it.
The end-users are able to define requirements and desires interactively.	Capability	The speed and quality of the workshops depend on a number of factors, including whether or not the users are able to interactively describe requirements and desires, record their descriptions and adjust these descriptions where necessary.
The development team (Business and IT) will consist of the same people for the duration of the project.	Capability/ Stability of the team	Team stability in terms of participant availability is an important consideration.
The individual development teams are small, i.e. consist of up to 6 people.	Capability/ Size	Small teams consisting of a maximum of 6 people, including users, to decrease overhead and increase speed.
The developers and users possess the appropriate skills (technical, communicative, material knowledge).	Capability/ Experience	Includes technical knowledge and skills, knowledge of business domains and interpersonal skills.
Does the IT and user organisation have prior experience with workshops?	Experience	Workshops are an essential part of the iterative approach. If insufficient knowledge and expertise is available, the linear approach should be used.
Does the IT and user organisation have prior experience with iterative development?	Experience	Use of priorities and timeboxing as management tools requires a different work approach.
The user interface is highly interactive and demonstrative.	Solution/ Product	Screens, reports and other documentation. Large number of on-line/user interfaces.
The system to be developed relies heavily on batch processing.	Solution/ Product	Batch is not very interactive and is more difficult to prototype. Mainframe applications are usually batch-oriented systems.
The system to be developed is complex in terms of calculations and algorithms.	Solution/ Product	The more complex the system, the greater the risk that algorithms will not be completed within the timebox.

Applicability factor	Related Views or Factors	Explanation
Mathematically complex components can be isolated or decomposed.	Solution/ Product	Decomposition reduces complexity. Isolation of the complex component allows use of a different development approach for this component.
Priorities can be assigned to functionality (requirements and desires).	Solution/ Business	Can the MoSCoW guidelines be applied? If a number of 'must haves' cannot be delivered at once, an 80:20 solution can be used to achieve immediate benefits. If functionality is the main consideration, use of priorities will usually not be possible. .
The solution can be developed in increments (subsystems/releases).	Solution/ Business and Product	Incremental development and delivery (see next question) create immediate benefits for the user organisation.
The organisation is able to deliver and implement increments (subsystems/releases) regularly.	Capability/ Experience and Org. Impact	Project organisation must deliver the solution in increments and customer and management department must be able to implement the increments in production.
The desires for the user interface are clear and completely specified.	Solution/ Product	If everything is already clear and has already been specified, the iterative approach and workshops will not generate much added value and the linear approach should be used. In this context, specifications include requirements, desires, system requirements and functionality.
The specifications have already been finalised.	Solution/ Product	If there is any uncertainty regarding the specifications or total solution, use of the iterative approach can generate benefits.
The technology, development environments and other tools are associated with a repository and are suitable for: • prototyping • iterative development.	Solution/ Product/Dev. Environment	Platform/environment development must be iterative and, where applicable, must be reversible. Good development and prototyping tools must be available to developers. These tools should require a minimum on documentation, they should increase productivity and they should support system development at the required speed.
Stable technical infrastructure is available.	Solution/ Product/ Target Environment	Stable infrastructure is required to allow delivery of new systems. Instability can cause delivery and acceptance problems.

A2.1 Questionnaire for Opinions on Decision Points (Fragments) by DSDM Coaches

This short questionnaire aims to determine most critical decisions that project leaders have made *during FS and BS phases in DSDM*. Furthermore, we would like to find out new decision points based on your suggestions. To do so, we kindly ask you to fill out the following table by taking into account three measures to be used for assessing a degree of 'criticalness' of each decision point. These measures are:

- *Impact*: a degree of their impacts on overall project performance
- *Dominance*: a degree of their influences over other decision points.
- *Relevance*: frequency of the occurrence of the decisions mentioned below in ICT project at the bank.

Decision Points (Fragments)		Impact			Dominance			Relevance		
		H[1]	*M*	*L*	*H*	*M*	*L*	*H*	*M*	*L*
Dividing strategy	Are we going to split the project into subprojects? and How to do it? e.*g. subprojects can be based on timeboxes (process oriented) or subsystems (system oriented)*									
Realisation strategy	If there are subprojects, how are we going to realise them? E.g. concurrent (parallel), sequential, overlapping									
DSDM Development process strategy	Which DSDM development process variant is more appropriate for a project? e.g. (*one iteration with one increment) or (one iteration with many increments) or (many iterations with many increment) or (many iterations with one increment)*									
Delivery (Implementation) strategy	Installation or implementation strategy: The way of delivering and introducing the system or its components on the organisation e.*g. one shot or incremental (installation in parts) or evolutionary (periodically updated by new versions).*									
A degree of user participation	E.g. *No user participation or Consultation (advisor user) or Representation and consensus (ambassador user) or*									
Project organisation (staffing)	*Decisions have to be taken about who is involved and who is responsible for what takes place. E.g. standard project roles in DSDM or adapted or additional roles*									

Your level of coaching experience at the bank:

Expert ☐

Senior ☐

Professional ☐

Junior ☐

Names of the domains you are coaching in:
……

[1] *High*, M: *Middle*, L: *Low*

APPENDIX 3

A3.1 A Prototype of and Tool for realizing a MAP Support Concerning the Execution Aspect of MAP

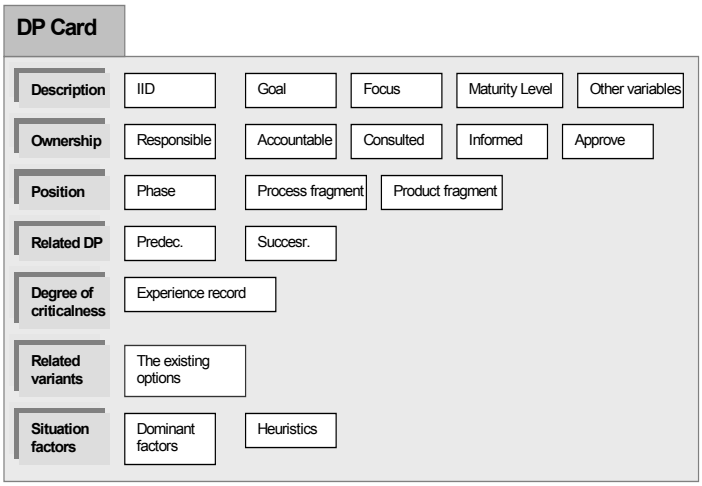


Figure A3.1 Summary of the elements of Decision Point Card

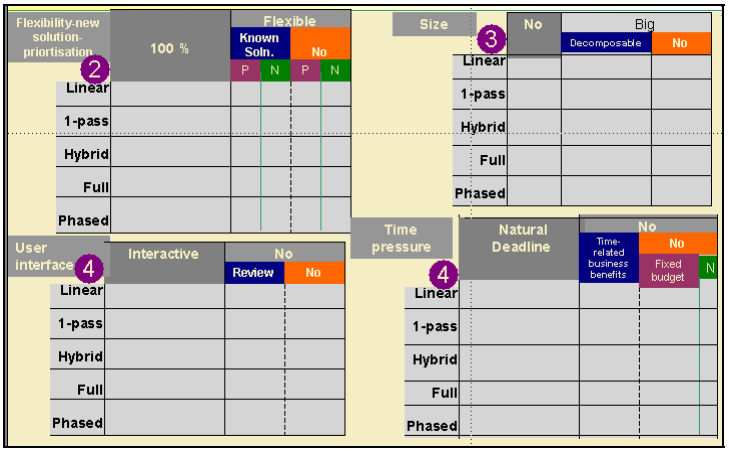


Figure A3.2 The matrixes representing heuristics as dominant and related factors together

Release I – Extractions from the Certain Components (MS Power Point)

Step 1. Identifying Interest of the Practitioners on Certain Fragments

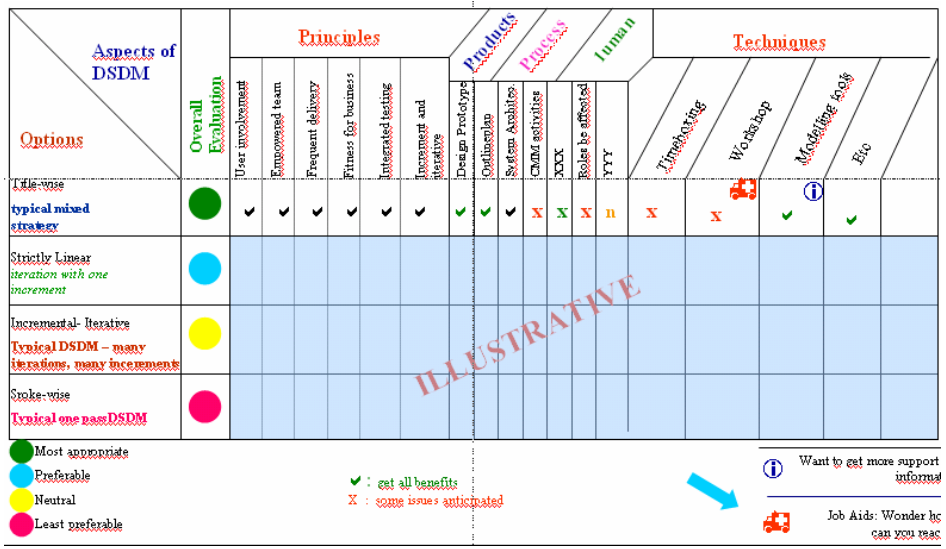
For simplicity purpose a number of decision points for fragments determination are proposed. Again, for simplicity purpose, the focus was on development strategy.

Step 2. Identifying Relevance of Characteristics to Determine Development Strategy

Factor Name	**Explanation and related question to be answered...**	**A degree of dominance**			
		D	M	I	N
Clarity	To what extent the goals (business benefits), needs, and desires of the users are clear and coherent enabling a sound specification of requirements				✔
Complexity	To what extent the functional components of the system are complex in terms of # of function points, dependency to other system)	✔			
Size	In terms of # of people, project duration	✔			
Importance and attitudes of	. To what extent the system or project is important for the business A degree of keeping the business involved in the project		✔		
Organisational	To what extent there are lasting rules, procedures, and standards for the business process and supporting information			✔	
Capability	In terms of availability of skills, experience, available resources	✔			
Level of innovation	In terms of applied technology (environment), tools and techniques	✔			
Additional					

D: Dominant **M: Moderate** **L: Less dominant** **N: No influence**

Step 3 Presentation for the relationships between the choice options and corresponding fragments



Step 4 Further Articulation of the "Job Aids" and "Experience & Tips" parts of the tool

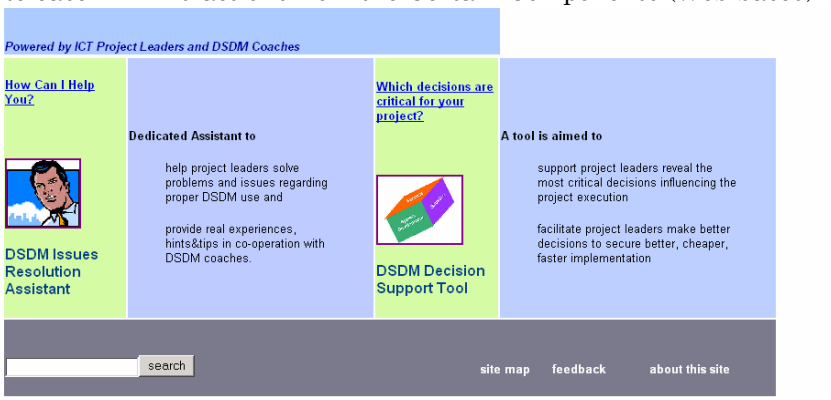
Job Aids:

Decision point name:	Development Process Variant Strategy
Name of the option:	Tile-wise
Its status	Most appropriate
Name - aspect name of DSDM	Technique: Timeboxing
A reason related to issues anticipated	Given the situation that: If timelien for the project is not known and there is uncertainity of available human resources, then you may face with a difficulty of applying timebox directly.
Ways to react:	• (pro-act strategy)Change the situation : Namely, try to fix the project time line • (React directly) Modify the technique: Use timeboxing technique in a different way → Want to learn how your colleques have done this in the past. • (Challange) Change or replace this technique with another one → deadlock. It means it is not appropriate, we can not the situation, we cannot replace it.

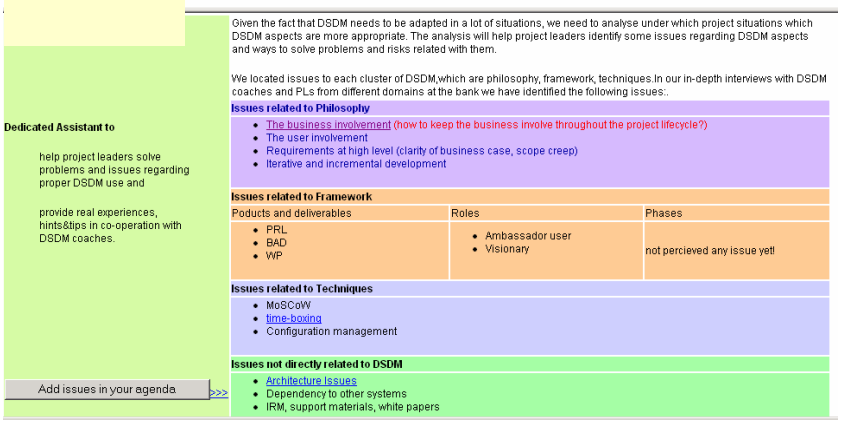
Experience & Tips :

Name – experience gained :	Using timeboxing technique in a different way
Contact info and related links :	Geert Mooi, Geert.Mooi@nl. , DSDM Coach
Briefly, explanation for the tip:	You can use timeboxing not only in terms of time but also in terms of budgetboxing. Namely, you can calculate total available human resources in terms of manhours and then convert them into fixed budget and then you can apply timeboxing as *budgetboxing*.

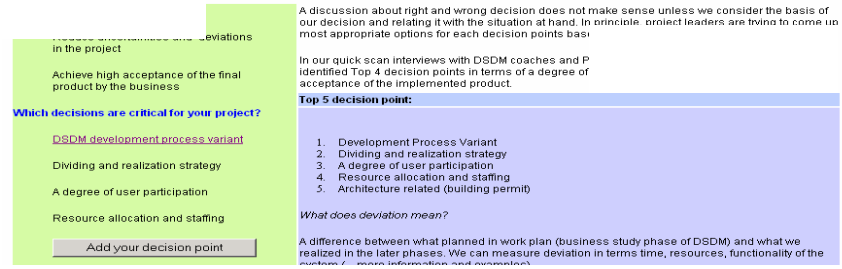
Release II – Extractions from the Certain Components (Web-based)



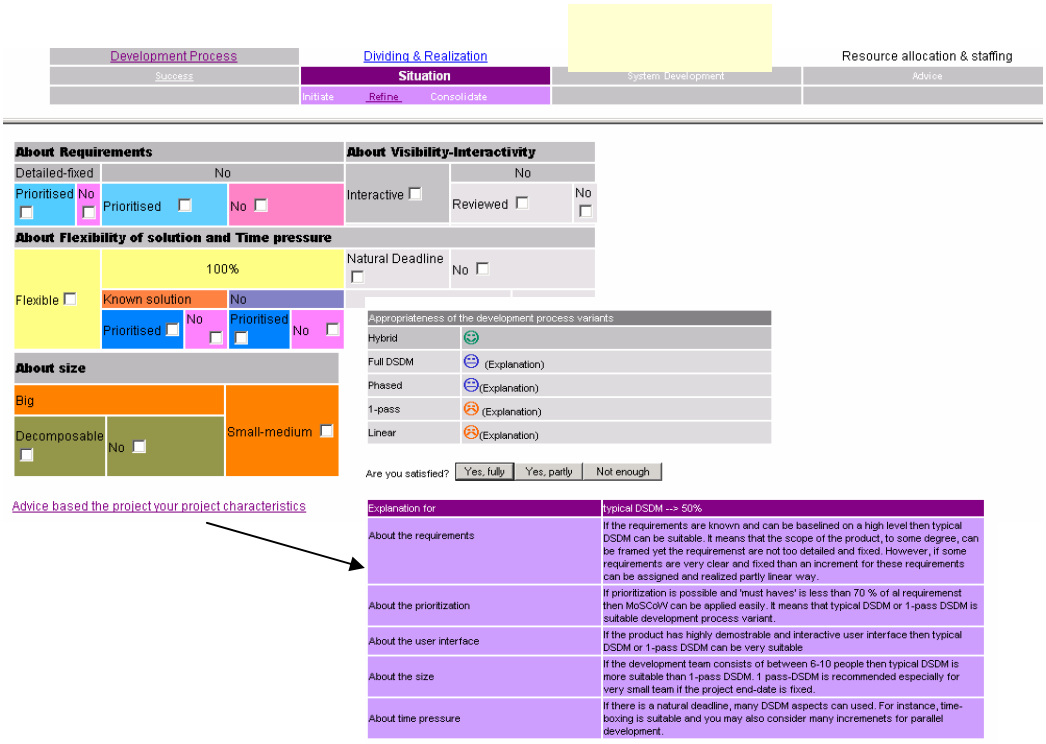
Component 1: Resolution Assistant



Component 2: Decision Support Tool



Decision Support Tool – A Concise Representation for Relationships Among Project Characteristics



Release III- The Tool as Used in the Organisation (in Dutch)

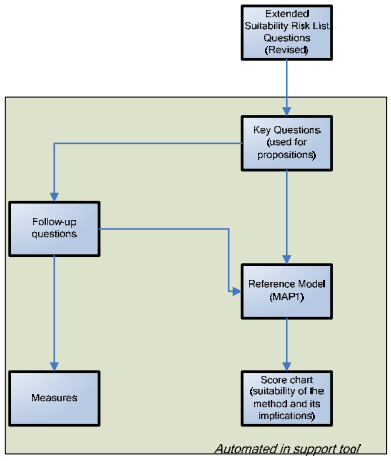


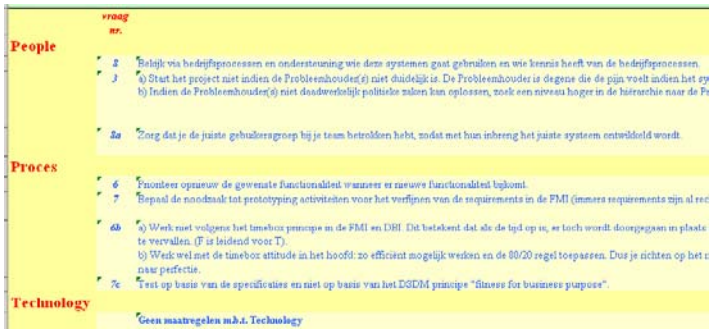
Figure A3.3 High-level architecture of the support tool

Sheet 1 and 2 are about how to use this tool and incorporate feedback
Sheet 3. Characterization of Project

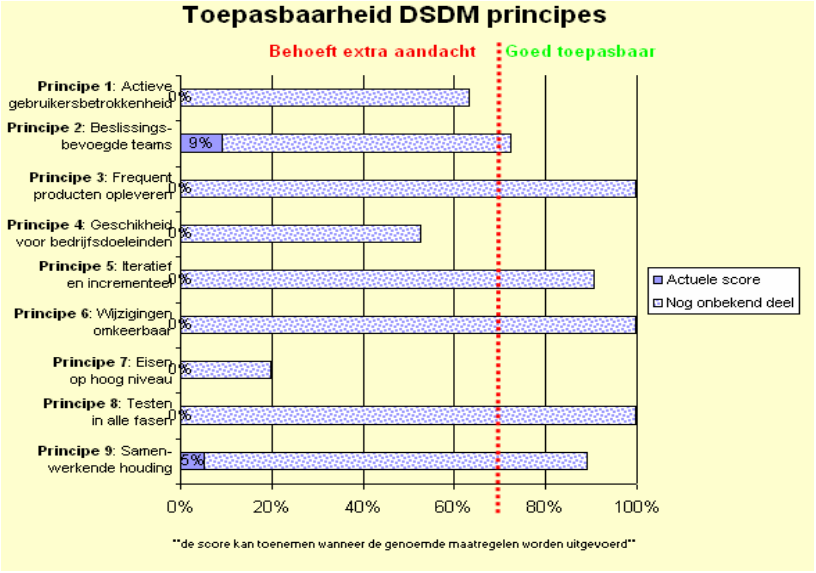
Feasibility Study | Feasibilitv en Business Studv | Print SRL vragen

Nr.	Fase	Stellingen / Vragen	Antwoord	Toelichting op antwoord
1	FS	**Het bedrijfsdoel van het project is voor alle belanghebbenden helder.**	oneens	
1a	FS	*Is de bijdrage van het project aan het bedrijfsdoel gekwantificeerd in een Business Case?*	ja	
1b	FS	*Is de Business Case met alle belanghebbenden afgestemd / gecommuniceerd?*	nog onbekend	
2	FS	**De Sponsor / Opdrachtgever van het project is bekend.**	nog onbekend	
3	FS	**Er is maar één Probleemhouder van het project, deze is bekend en kan ook daadwerkelijk politieke zaken oplossen.**	oneens	
3a	FS	*Indien er meer dan één Probleemhouder is, hebben zij allen dezelfde projectbelangen (doel, prioriteit, commitment, inhoudelijk projectresultaat, ...)?*	nog onbekend	
4,1	BS	**De Opdrachtgever en het Senior User Management stellen voldoende en juist gekwalificeerde eindgebruikers en materiedeskundigen beschikbaar voor het gehele project.**	oneens	
4.1a	BS	*Zijn er afspraken gemaakt over (lager) beschikbaarheidspercentage en is men beschikbaar op vaste dagen?*	nog onbekend	
4.1b	BS	Hebben de beschikbaar gestelde maar minder gekwalificeerde materiedeskundige en eindgebruikers mogelijkheid om tussentijds af	nog onbekend	

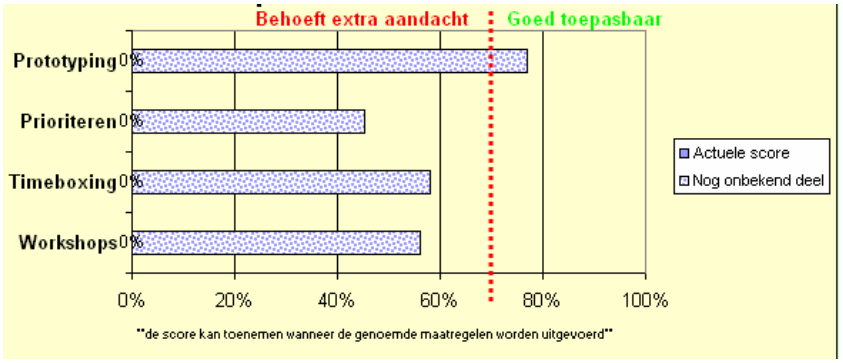
Sheet 4. Advise Provisioning

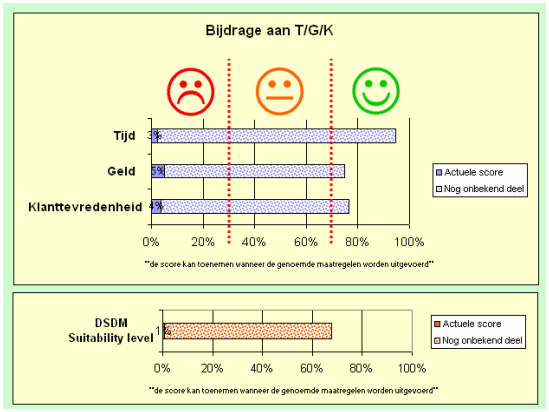


Sheet 5. Implications on Principles



Sheet 6. Implications on and Techniques of DSDM and Time, Budget and Target Org. Satisfaction





A3.3 The Reactions of Project Leaders to a MAP Support Tool

The Interview Protocol

The short interview to be conducted is aimed at learning your opinions on the tool – the SRL Support Tool (for further information on the tool see the appendix). This document includes a list of questions to be used in the interview. It will take less than 45 minutes.

It consists of three parts:

- In Part I, we intend to know basic information about you. (3-5 minutes)
- In Part II, we aim to learn your opinions on the tool. (25 minutes)
- Part III is about comparing the tool with your old way of doing suitability analysis (for further information on the meaning of suitability analysis see the appendix) for a method. (15 minutes)

1- T1

Current position and tasks:	
Domain Name (s)	

Background Information:			
Project experience in general		as a project leader	as a project participant
	In years		
	Number and type of projects		
DSDM related project experience			
	In years or months		
	Number of projects		
	Application types		
	Route maps: (CBD Java, cool:gen, etc)		

1.1 Were you using any thing (document, tool, guidance) for suitability analysis of a method in the past? If yes, please provide more information on that. (Were you using just your own experience or any tool or something else like communicating with your colleagues, DSDM coaches, etc?)

Part II: Opinions on the Tool

2.0

- At which stage(s) of the project did you use the tool?
- Given this stage, how relevant was the tool?
- What do you think about the tool? How did you like it in general? (the benefits
- and things to improve)
- Why did you want to use it? Who suggested it to you?

2.1 Let's talk about SRL Vragen

- Was the distinction between stellingen and vragen clear?
- What do you think about SRL Stellingen/Vragen? How do you like them?

2.1.1

- Were the statements (stellingen/vragen) clear to you?
- If not, please indicate unclear, ambiguous statements and what kind of clarity you would expect.
- Was there a need for some explanations about any statement?

- If yes, please indicate those statements and what kind of explanations you would expect.

2.1.2

- Was the filling out of the tool clear enough?
- Were the statements relevant to the project situation at the time of filling out?
- Please tell me which of these were relevant?
- Was the order of the questions logical to you? If not please state which questions should be rearranged.
- Do you think these statements were rich or comprehensive enough to understand your project situation at a high level?
- (If necessary, ask the PL to choose one of these: Very comprehensive, good enough, very limited, no idea)
- If limited, could you tell us additional statements that are different from the suggested statements?
- Would you be willing to send your feedback to the one who maintains the tool and letting him/her share your feedback with your colleagues?
- Did these statements really help you to understand your project situation? To what extent did it help?
- (Very helpful, moderate, not very helpful)
- You could notice that depending on the answer to a statement the follow-up questions changed. Did these questions make sense to you? How would you comment on the linkages between the statement and follow-up questions? (logical, meaningful, strange, I did not pay attention, etc)

2.2 Let's talk about Beheersmaatregelen

2.2.0 What do you think about this Beheersmaatregelen module of the tool? How do you like it?

2.2.1

- Were the measures (beheersmaatregelen) clear to you?
- If not, please indicate unclear, ambiguous measures and what kind of clarity you would expect.
- Was there a need for some explanations about any measures?
- If yes, please indicate that statements and what kind of explanations you would expect.
- Was it clear to you that only / mainly DSDM aspect were covered and not the normal project risks?

2.2.2

- You can see only your measures. Do you want to see all possible measures?
- Were these measures meaningful to you? (very meaningful, surprising and interesting, strange, etc)
- Were they applicable or feasible to implement in reality?
- How do you comment on the usefulness of these measures?
- (Very useful, useful, not very useful) Which were very useful?
- Were you satisfied with the suggested measures?
- Did you really use them or are you planning to use them? Which were they?

2.3 Let us talk about DSDM Chart (Principles and Techniques)

2.3.0 What do you think about DSDM Chart Module? How do you like it?

2.3.1

- Were the charts (principles and techniques) clear/understandable?
- Were they really clear what they mean? If not, please tell us what kind of explanations you would expect.

2.3.2

- Were these charts and indicators of applicability of principles/techniques (behoeft extra aandacht/goed toepasbaar) meaningful to you?
- Were the results similar to what you expected? Were the suggested results surprising, interesting, novel, strange? Were you satisfied with the result?
- How do you comment on the usefulness of these indicators?
- (Very useful, useful, not very useful) Which were of these very useful?
- Did you really use them or are you planning to use them? Which were of these used?
- What would you want to see more there?

2.4 Let's talk about the usability of the tool

- Did you fill it in yourself or with someone else (if so please mention his/her IQS role)
- Did you read the instructions Tab?
- Was it easy to use?
- Was it easy to learn? How long did it take to learn it?
- How long did it take to complete your analysis?
- Did you see any strange or wrong functionalities of the tool?
- Was it interesting to use?

Part III: Opinions on Task Relevance & Comparisons

3.1 Which module/part of the tool was the most interesting, useful, relevant to your needs?
3.2 Did you use the results of the tool for any specific task and deliverable in your project?
If no, go to 3.2.0
If yes, go to 3.2.1
3.2.0 How would you relate the use of this tool to your project leading activities?
Then go to 3.2.3
3.2.1 How helpful (effective) was it to carry out your task? (very helpful, moderate, not very helpful)
3.2.2 Did you use the model for 'what–if' analysis? (For instance, did you change your real answers and see how they affect the measures and DSDM charts?)
3.2.3 Did you consider the results in the measures and the charts as taken for granted or as suggestions?
3.3 f you compare this tool with the way in which you were used to analyse suitability of the method (DSDM), how would you comment on them?
(To structure the comparison discussion and for the guidance, use the follow-up questions below)
3.3.1 With respect to the way and the degree of which you understand the project situation (meaningfulness, clarity, relevance, comprehensiveness of the statements)
3.3.2 With respect to usefulness of the measures (i.e. the degree of which they (the old way and the tool) provide novel, useful measures)
3.3.3 With respect to usability aspect (time to learn, easy to use, portability, etc).)
3.3.4 With respect to their contributions to improved communication and justification.
3.3.5 With respect to their contributions to your decision-making skills concerning the effective use of method in the project
3.4 Over all, will you be willing to use this tool in the future?
3.5 Do you have any other comment on the tool? Otherwise, I would like to

Thank you very much for your contributions to our review sessions. THE END OF INTERVIEW

A3.4 Interview Results

Part I: Basic Information about Interviewees

	Int1	Int2	Int3	Int4	Int5	Int6	Int7
Current role & project	PLA (representing development org.), middle size project, the delivery of new functionalities for AIMS.	PLA, middle size project, delivery of new infrastructure for the ICT department	PLB (representing user organisation), small size organisational project, supporting portfolio managers for 9210 project	PLA, small size project, a provision of batch processing system	PLB, small size project, Output management for invalid transactions in the payment domain	New DSDM coach and voice of a PLA	PLA
Project experience	> 20 years	> 20 years	≈ 20 years	< 10 years	≈ 10 years	For PLA, 10 years	> 20 years
A priori DSDM Experience	≈ 1 year	Only DSDM training	≈ 1.5 years	9 months,	Only DSDM training	Not available information	Only DSDM training
Success criteria	1st: user & sponsor 2nd: time 3rd: budget 4th: method	1st: user & sponsor 2nd: time 3rd: budget	1st: time 2nd: user & sponsor 3rd: budget 4th: method	1st: user & sponsor 2nd: budget 3rd: time	1st: user & sponsor 2nd: budget 3rd: time		1st: user & sponsor 2nd: time 3rd: budget 4th: method
A priori usability analysis	No formal analysis done	There was a tool developed by externals and I was that one for SAP projects	Before this project, I was a portfolio manager and steering a degree of adherence to DSDM in his domains.	In my previous project there was the first-line coaching support.	Recently I have moved from the insurance domain to the payment domain.	No formal analysis done	"Project Health Check" was used
Additional information	I was asked to review the previous versions of the tool. (act like an ambassador user)	The tool he used is more specific to SAP and ASAP methods.		DSDM champion in the payment domain. I used the tool for two projects.		This PLA cancelled the interview, but we got some information about his opinions on the tool from his colleagues	

Part II – Opinions on the SRL support tool

Overall opinions and the context in which the tool used:

	Int1	Int2	Int3	Int4	Int5	Int7
Stage(s) of the project the tool was used	BS	Two times with two versions in BS stage	At the Beginning of BS	The tool was used for two projects in BS stage	BS	Two times with two versions in BS stage
The relevance of tool for that stage(s)	Very relevant for project planning	Most of the questions were relevant, a few of them were not	At a first glance some questions were not relevant because of nature of the project	Very relevant	Relevant	Relevant
Opinion about the tool in general	Very helpful, especially DSDM charts	Questions required interpretations, so I discussed them with other people	It is potentially good because it is based on the knowledge, experience of DSDM coaches	Easy to use, practical and only relevant measures were provided	Compare to the other tools, including TRIMIT, is big improvement, but still progress can be made	No specific comment was made at this stage of the interview
Why did you want to use? Who suggested it to you?	Leo Diepstraten asked me to use it	The method is new to him and I needed this tool. I just learned that the tool is available.	DSDM is going to be mandatory for the project and this tool is related to tailoring guideline which is used to achieve CMM Level 3 in the payment domain	I used the tool in a project-wise and domain-wise manner for proper DSDM use. I learned it in a DSDM champions meeting	The domain and the method were new to me, so the tool was needed to guide me He found it by himself, no one suggested to me	Everything (domain, CMM, DSDM, professional attitude) was new to him. He found it in IQS by himself

Opinions on the usability of the tool:

	Int1	Int2	Int3	Int4	Int5	Int6 (PLA)	Int7
Who filled it in?	myself	myself	myself	myself	myself	First myself, then with a DSDM coach	myself
Read instructions?	Yes	No	Yes	Yes	Yes	No	Yes
Easy to use and learn? Duration? Any malfunctioning?	Yes 30 min. no malfunctioning	Yes 30 min. only printing was problematic	Yes ≈1 hour no malfunctioning	Yes ≈1 hour no malfunctioning	Yes < 30 min. no malfunctioning	Yes Duration unknown no malfunctioning	Yes 30 min. no malfunctioning

Interesting to use?	Yes, but I doubt its usage after 5-6 projects	Yes	Yes	Yes	Yes	N/A	Yes

Specific opinions on each module:

	Int1	Int2	Int3	Int4	Int5	Int7
SRL Vragen Module (Specific opinion, clarity, comprehensibility)	- s&w* were relevant, meaningful - s&v were much clearer in version 6 than in version 4. - question #6 needs more clarification	- clear, but I tried understand the meaning behind s&v - some questions need more care - much relevant than the questions in other tools, for instance TRIMIT - questions were helpful	- clear, some of them were not relevant - additional questions might be needed, but they are to be discovered - s&v themselves did not help me much, but the measures did.	- I like them, s&v easy to understand maybe because I am already familiar with them - In general, s&v were clear, but I need to think meanings behind the terms - the logic of 'follow-up' questions is good - For DSDM context, s&v were comprehensive	- clear, but need interpretations, so I discuss s&v with my colleagues - with respect to DSDM aspects, s&v were relevant - comprehensive enough, say 75% of the things were covered in s&v	-clear - In general relevant, but some (for example 12, 5) were not - comprehen sive enough
Beheersmaatregel en Module (Specific opinion, clarity, relevance & applicability)	- neutral opinion on the measures - clear, meaningful measures - many measures were used	- I really like it, only problem with layout; better to use risk log format as an optional layout - clear, useful, satisfactory and relevant measures - use them in the risk log	-good in potential, I used them as a second opinion - they are objective, and should not be used politically - use measures as the basis of a contact between you and sponsor - only relevant measures needed - measures were justifying my thoughts	-clear, useful, relevant measures - 80 % of them were applicable - satisfactory measures	- I used both versions (document-based and electronic version); this module surprised me! - meaningful - most of them were applicable, I already used them	-they were good hints -some of them were easy to use (he gave us the outputs of his analysis using two

			- measures were used			versions of the tool)
DSDM Chart (Specific opinion, relevance and applicability, align with expectations)	- interesting, applicable - principle names should be there - these charts remind me that which principles and techniques are out there and show which of them need more attention - the charts were in line with my thought	- nice, colourful - did not understand charts - principle names should be there - I want to know why some principles and techniques need more care	- with these charts I was charmed by DSDM aspects to be complied with - visualization should be interpreted carefully - no specific comment on the usability of the charts	- funny to have this visual representation - principle names should be there - clarity was OK! - most of them were in line with my thoughts	- easy to use - for timeboxing aspect it is clear to me -no specific comment on the usability of the charts	- they were not clear to me - I do not know what the principle numbers are

Part III – Opinions on Task Relevance & Comparison

	Int1	Int2	Int3	Int4	Int5	Int7
Most interesting module, Used in 'what-if' analysis manner?	DSDM Chart Yes, in two versions, I did a kind of what-if analysis, i.e. I went back and forth between s&v and other modules	Measure Module Yes, I changed some questions and checks the measures out	Measure Module No, I did not use it that way	Measure Module I only used this way for two questions	Measures and DSDM charts No I did not use it that way, maybe I will use that way in FMI stage	Measure Module Yes, I used it that way
Relating the tool to a specific project leading activity	Project proposal preparation	Part of risk analysis, risk log preparation	Project proposal preparation	Planning, approach determination, risk management, assembling	Risk log preparation	Risk log preparation
Directives or suggestions?	suggestions	suggestions	suggestions	suggestions	suggestions	suggestions

Contributions of the tool / comparison	In the past I used common sense, now I see it is in line with my thought It helps me to be more convinced about what I think, but it does not tell you what the decision itself should be	Previous tool was very specific to SAP applications. This is more easy to use. I used it when I discuss things with my boss. Now I know that for workshop I should be more careful.	- I discussed the measures with my sponsor. - the measures help PL to say sometimes "No!" PL should learn to say 'no' in case the conditions are suitable or feasible to carry out things in the project. - the measures can act like referees in a discussion between you and your bosses.	- I think the tool incorporates DSDM coaches' knowledge, it is good. - Now, the use of tool is PL's own responsibility. In the past, coaches were encouraging PLs to use. So, there was a kind of pressure from coach side. Now, they take this responsibility and have to think about all required aspects of the method . - You know there are people who dislike methods or procedures. The tool is like a facilitative tool and helps you think more rather than limiting you.	-After five or six times usage, people will know what the result will be and it will take 15 minutes to complete the analysis for DSDM. - Compare the other tools, including TRIMIT it is big improvement, but still progress can be done in the field of risk management and it can be linked or used with the risk log	- If you don't use the tool, it is difficult to communicate with portfolio managers or project managers from the business side.

Willing to use in the future Other suggestions	Definitely yes.	No! (just kidding..) I think all PL(project leaders) should use it. I t is important to have a method than having nothing. The tool provides a good starting point. It is just a single starting point, not an end point	-Yes, I will -PL can be happy, I do not see why they will be not happy. -The tool provides some a piece of advice, it does say what you must do. The tool can be part of IQS and the use of tool should be mandatory but the use of measures should not be mandatory	-Yes, I will use it in two ways: as a PL in my project and as PQAL in my domain. Especially, as PQAL it will help us to identify common problems concerning DSDM aspects and I will try to let people come together to discuss and share their experiences for the issues identified through this tool.	- It should be possible to use the output as input for risk logs and also there should be feedback from the changes in risk logs and reactions to them. So, the tool will include more up to date real experience. It is also important to do changes in the tool carefully. It should not be changed frequently	- I may use the tool for every increment (we will have seven increments) and write results in the workplan.

END NOTES

[i] The discussion of what information system means is important to our work and examined in the remainder of the book, but in this chapter the reader is encouraged to consider it in its widest sense: computerised and human based information processing and business support activities and means (Jayaratna, 1994)

[ii] Several terms are candidates for indicating these kinds of applications. Among them enterprise wide systems such as ERP and workflow management systems (WfMS) appear to be closer to the meaning of the term that we want to use. In addition to difficulties finding agreed definitions of these terms, they are limited to certain support type. For instance, ERP applications are limited to support of business processes within an organisation, WfMs are concerned only with supporting activities at a control level which excludes their execution. We basically introduce this term to emphasize supporting business processes within and/or across an organisation, not only at the control but also the execution level. So, *business process application* is introduced as an umbrella term for different kinds of applications which have a business process support characteristic.

[iii] The term methodology or MTTs is often used in practice as an umbrella term for any methodical support for information system development. As the definition of ISD method provided in the third chapter, the term method has a reserved meaning in literature and reflects a proper meaning we wish to use in this work.

[iv] The IFIP IS technical group consists of a number of work groups, some of which emphasize their investigations not only at an organisation level but also at the individual and social levels.

[v] The terms methodology and method in IS research are understood differently and in fact a further clarification on these terms are provided in the remaining chapters. For the sake of simplicity the reader might consider them as similar terms indicating all types of methodical means used for ISD.

[vi] phe·nom·e·non: in Latin phaenomenon and in Greek phainomenon, meaning, a fact, or event of scientific interest susceptible to scientific description and explanation.

[vii] An agent preference can be analysed in terms of many factors such as an actor's free will, intention, motivation, beliefs, and attitudes. For the purpose of research focus, we limit ourselves to a certain level of analysis that has a lot do with actor's free will and intention. Another remark on this sentence is that from now on we prefer to use ISD method to ISD MTTs as the term 'method' has an established meaning in the ISD research. We will get back to this point in the terminology discussion section in chapter three.

[viii] Different terms are used to describe this activity. For instance, Harmsen (1997) uses 'situational method engineering', whereas Van Slooten (1995) adopts 'situated method engineering'. Notice that we prefer to use development instead of engineering to underscore our differing treatment of this activity as to be seen in the remaining chapters.

[ix] For the discussion of theory of science, interested readers are referred to Lakatos and Musgrave (1970), which includes the critiques from Popper and Khun, Lakatos, and other representative people in the area of philosophy of science. We also suggest (Johnson and Duberly, 2000) as a more recent book which is oriented on management research.

[x] Schultze and Leidner, 2002 provides a long list of the classification of IS research in terms of the four paradigms in Deetz, S. (1996). "Describing differences in approach to organisation science: Rethinking Burrel and Morgan and their legacy." Organisation

Science **7**(2): 191-207. The interested reader might examine those studies using qualitative research with a particular paradigm.

[xi] Other dimensions are also mentioned in the literature. Philosophical, ethical, and praxis related dimensions. This concerns about why and what matters about interjecting personal desires, experience in inquiry. Then we need to answer 'what is worth knowing? How do we personally engage in inquiry?'

[xii] One can find alternative ways of framing the relevant worlds for the research (see for instance the 'fields' of Jonker, J. and B. J. W. Pennink (2000). De Kern van mehodologie. Assen, Van Gorcum which have some communalities with to the three worlds of Mingers, J. (2001). "Combining IS Research Methods: Towards a Pluralist Methodology." Information Systems Research **12**(3): 240-259. But, we found that Minger's work based on Habermas' theory of communicative action suits the metatheoretical dimensions of our research methodology.

[xiii] Epistemology broadly speaking refers to the assumptions about knowledge and how it can be obtained. The word is derived from two Greek words: 'episteme' which means 'knowledge' or 'science'; and 'logos' which means 'knowledge', 'information', 'theory' or account. So, literally it refers to 'knowledge about knowledge' Johnson and Duberly (2000) suggest that "it is the study of the criteria by which we can know what does and does not constitute warranted, or scientific, knowledge".

[xiv] Some researchers, including Myers(1997), suggest not split the activities concerning empirical data into distinct activities like collection, codification, analysis, and presentation. It is argued that a clear distinction between these activities is not held by some qualitative approach and techniques. Myers gives an example form a hermeneutic perspective and puts "[it] is assumed that the researcher's presuppositions affect the gathering of data – the questions posed to informants largely determine what you are going to find out. The analysis affects data and the data affects the analysis in significant ways". We agree with such critics, but for convenience of the reader, four types of techniques are worth to mention in this work.

[xvxv] Davidson (1997) provides an elaboration of the use of narratives as a technique for qualitative research. We adopt the procedure described in her work. As such, we codify and analyse the interview documents by using structural analysis of the interviewees' narratives that include metaphor, myths, etc. IS literature includes some studies where the narratives, metaphors were used as an effective technique to reveal the intention, genuine thought of the narrator on the subject.

[xvi] The levels depicted in Figure 3.1 are adopted from Webster and Watson (2002), which is based on (Parsons and Shils, 1962). We have slightly modified it for the purpose of this work. Namely, we use it to refine relevant research (the relevant material of academic world) and present it in a more systemic way.

[xvii] The term 'analytical' has a reserved meaning as discussed in the previous chapter. There we use the materials of the academic world to answer the research questions and to explicate the generic model which is a subject for the next chapter.

[xviii] This section consequently employs theory evaluation criteria in Weick (1989), Eisenhard (1989) for the selection of a few papers that are subject to close examination in the consecutive sub-section.

[xix] Etymology: Method comes from Middle French word *methode*, Latin word *methodus,* from Greek word *methodos,* from *meta- + hodo* (situated behind or look into beyond + way). Methodology comes from Latin *methodus+ -logia* (account, theory, knowledge).

[xx] Incommensurability and related matters in the philosophy are concerned about meaning change, reference to theoretical terms, scientific realism and anti-realism, rationality of theory choice, and cognitive aspects of conceptual change. While some researchers including Burrel and Morgan (1979) agree with Kuhn, (1970) that

meaningful communication between paradigms is impossible, they also consider that several paradigms characterized by permanent incommensurability can exist simultaneously.

[xxi] As we adopt the definition of this term (Baskerville and Truex, 1996, p.14), it refers to the way in which a concrete development process is *actually* conducted in practice.

[xxii] It should be noted that an artefact may obey its own deterministic law, but it does not imply that the implications of its usage in the organisational setting would do so. For instance, one can say how a computer *should* function in a particular organisation setting, but from this she cannot conclude that people use it in such a prescribed way.

[xxiii] There are countervailing arguments in the IS field, about which account(s) should be the foundation of IS (see Hirschheim et al., (1996)) IS scholars employ several accounts from the fields of ontology, sociology, and systems sciences. Some researchers, including Walsham (1996) and Staplaton (2003), advocate ANT as a more suitable account because compared to the structuration theory and ANT it specifically examines interactions between human and non-human actors (e.g., technology).

[xxiv] One may wonder why we use this term among all possible terms also used for supporting business processes. Alternative terms seem to be ES (ERP, PDM), business-enabled applications, e-commerce applications, web services-based e-business systems, CRM, SCM, etc. It is true that it is claimed that they support business process, but in fact they (ES) do more than that. Their support includes many aspects, which are too broad to consider and analyse in an empirical setting. CRM, SCM appear to be more suitable but are more specific to certain business processes and too narrow for our research. Other terms (service-based) e-business, e-commerce appear to be promoted for the current trends in IS and in practice, but one can be never sure how long they will last. BPA is especially used to stress that whatever the applications are named, if they are specifically meant for supporting business processes then they will be considered kinds of BPA. In that sense, it is an umbrella term and strongly emphasizes the very notion of business process.

[xxv] We are aware that development has a reserved meaning in organisational change management literature. (Limburg, 2004, p. 61) concisely shows the reserved meaning of development and design in that literature. But, it should be noted that in the IS field, especially in ISD literature, an IS development covers the whole life cycle of the artefacts including stages such as analysis, conceptual design, construction, implementation, maintenance or use. A number of researchers consider this a socio-technical process where ISD development is situated in its emergent context (Gasson, 1999; Orlikowski, 1996; Gouleilmos, 2004; Hirscheim et al, 1996). We are also aware that the term, *development* has some connotation with only constructions of information systems. Harmsen (1997), for example, makes similar remarks and uses '*engineering*' to stress that the emphasis is on the whole "(…) process as being controlled by means of methods and tools". Another remark on the term ISD should be noted that it has some other connotations with specific types or applications of ISD such as tailor-made or custom-made application development where the former emphasizes on or is supposed to require the implementation and use stage of ISD and whereas the latter covers the entire lifecycle irrespective of the sequence of all the stages and related development activities. A final comment is about the abbreviation for Information Systems (IS). This abbreviation is considered a singular term when we use "an IS".

[xxvi] Many researchers, including Lyytinen (1987), Iivari (1986), Hirscheim et al. (1999) refer this definition in their works which focuses attention on the change aspect of the development in that it is argued that ISD eventually results in some changes in the object systems and it is this process which should be central to the development of IS. In method engineering, researchers (Harmsen (1997), Olle et al. (1991)), focus on the supporting aspect of the development in the sense that ISD needs to be supported by methodical means such methods, techniques, and tools, irrespective of whether or not a change process contains the set of all development and project management activities related to the consistent and effective design, installation and modification of an information system.

[xxvii] (Alter, 2002, p.92) The term is concisely explained along with its relation to other basic terms such as business process and organisation. 'Work system' refers to "a view of work as occurring through a purposeful system"

[xxviii] This sentence neither implies nor suggests that method has or should have absolute power in influencing the way of thinking of practitioners. The interaction between method and its users along with the degree of their domination is a very important subject for our study and we elaborate this subject extensively in the remainder of the book (see especially chapter four).

[xxix] Implications of the employment of MTTs in ISD on the development of human intellects are mentioned in Truex and Baskerville (2001), and Hirschheim (1999). One can argue that the outcome of ISD is an IS which can be considered as a design artefact as part of the organisation and eventually part of society. At the societal level, it is argued that MTTs are out there as the essentials of system approaches which emerged in the 1940s. At this level, there is some discussion about the need for questioning the role of system approaches to managing the problems of today's society. Details can be found in (Erikkson, 1998).

[xxx] This definition is adopted from Brinkkemper (1996). It is adopted in the sense that we include the term amethodical referring to anything not methodical, but then what is methodical? Truex and Baskerville (2001) introduce the term 'amethodical' to defer the meaning of methodical for which the ideas of 'orderly', 'systematic', 'regularity', 'regimen' are often attached to ISD.

[xxxi] The term method engineering also used to refer to "the process of designing, constructing, and merging methods and techniques to support ISD" (Truex and Avison, 2003). This term has been used in similar way by other researcher including Olle, (1996). Consistent with the principle of using original and appropriate meanings of terms, we use 'method engineering' as a discipline where many studies are conducted for method development rather than a process for or approach to situated method construction.

[xxxii] For some researchers (e.g., Truex and Avison (2003)) method engineering is the process of engineering methods rather than the name of the research school dedicated to studying methodical means to support ISD. We disagree with the former use and stick to the definition of Brinkkemper (1995) as other researchers do in the 'method engineering' school.

[xxxiii] Many frameworks proposed for ISD and ISDM are based on the level of abstraction and aspects or views that reside at each level. Iivari has elaborated the notion of "levels of abstraction" and "levels of details" to illuminate a basis of the framework existing in the ISD literature. Abstraction is a mental process through which one suppresses irrelevant details in to emphasize the essential in a given context (Bergheim et al., 1989). At one abstraction level, there exist its own concepts, principles, and notations and might be confined to the view(s) or perspective(s) held. These are considered aspects of the system. The level of details is also termed as granularity layer (e.g., Harmsen (1996)). The levels of abstraction and detail are different notions and use the same mechanism, 'the generic-

specific relationship': for the former, the number of level is fixed and determined by an underlying "theory" and for the latter, the number of levels is not fixed and uses a decomposition modelling technique to further refine or specify the aspect(s) of a system at a certain level. Beside the distinctions between the level of abstraction, aspects, and level of details, it is worth mentioning the use of notion of 'meta-level' in the context of the construction of ISD frameworks. Meta-level uses the intension- extension relationships whereas the abstraction level uses the generic-specific relationship explained above. Bergheim et al., (1989) explain the former relationships in light of meaning triangle of Ogden, (1967). As such, intention and extension refer to the reference and referent respectively. Having stated the conceptual differences between the level of abstraction, the level of details, and the meta-level, we can give an example of their use to characterize frameworks. The frameworks in Lyttinen, (1987), Iivari, (1989) and Hirschheim, et al., (1986) are very similar in that they have three abstraction levels (organisational, conceptual/infological, and datalogical/technical); the frameworks in Van Slooten, (1996) and Sowa and Zachman, (1992) have five levels of abstraction with the distinction that a number of aspects appear in their frameworks. Some researchers explicitly use decomposition technique to shows the level of details achieved (e.g., Van Slooten, 1996), while others present the level of details in an ad-hoc manner (Hirschheim, 1996).

[xxxiv] The aforementioned modelling techniques, especially formal ones, are used to create models that can be executable or implemented in a symbol-manipulation machine. There are other techniques, which are more or less informal and used at the early stages to create models that are non-executable.

[xxxv] From there on, for the sake of simplicity, we use 'method' as a substitute for 'ISD method'. Some researchers, as a matter of convention or conviction, use 'ISD' to refer to 'ISD method'. Truex and Baskerville explain this conviction in the following: "The methodical view is privileged because the modern concept of method has been so strongly impressed on our thinking about system development, that the two concepts, information system development and information system development method, are completely merged in systems development literature" (p.56).

[xxxvi] This definition seems to accommodate the meaning of method as defined in many studies, including Iivairi, Lyytinen, Hirsscheim, Baskerville, etc.

[xxxvii] This definition seems to accommodate the meaning of method as defined in many studies including Brinkkemper (1991), and Roland (1996).

[xxxviii] It should be noted that method fragment is also described by (Van Slooten, 1996) that means "a coherent part of method (ology) for systems development or project management. In fact, Van Slooten uses two other terms concerning situated method: 'route map' and 'route map fragment'. The former refers to "… a plan associated with the development strategies, including the activities to be performed and the products to be delivered", and the latter means "…a coherent part of the complete route map of a systems development project". The conceptual differences and use of the terms, method fragment, route map, and route map fragment, in Van Slooten's model for method adaptation are elaborated in later sections of this chapter.

[xxxix] Principles are fundamental doctrines or assumptions understood as abstract accounts of approaches to the development of an IS.

[xl] Several terms or metaphors are used to describe this tunning (e.g., 'a social process' (Baskerville and Stage)), 'a route map or scenario configuration process' (Slooten, 1996,

Harmsen (1997)), 'strategy determination process' (Davis, 1982), 'approach determination process' (Slooten, 1996; Offenbeek and Koopman, 1996).

[xli] The research methods in Tolvanen et al. (1996) are explained and not very clear as to what they mean by, for instance, case study. If we adopt 'conventional' case study (e.g., Yin, 1989), then we agree with their positioning of the studies in their framework. For instance, Wijers' work is then surely not a case research, but is experiment research.

[xlii] In the IS field, there are some examples of reviewing more than one research stream and mentioning a clear distinction between, for instance, the use of IS and development of IS as a software development process.

[xliii] Sabherval and Robey (1995) show the feasibility of reconciling variance and process strategies and suggests that for ISD such reconciliation is beneficial as both strategies have complementary views on the subject under investigation.

[xliv] The term design refers to any activity which leads to the creation of artefacts in ISD.

[xlv] As mentioned in Harmsen (1997, p.40), these levels are akin to several models in Brinkkemper (1990), Jarke (1992), and Heym (1993). See for instance, three levels of the model in Brinkkemper (1990), which consist of meta-modelling technique, meta modelling, and system to be modelled, which are akin to the three levels of method engineering hierarchy.

[xlvi] Kees van Slooten (1996) uses the notion of project context in a broad sense in that it includes "the existing systems development organisation, the customer organisation, the supplier organisation, the systems developers, the users, the area of application, information and computerization policies" (p.19).

[xlvii] Van Slooten (1996) uses 'scenario' and 'project approach' interchangeably.

[xlviii] Van Slooten and Schooven (1994) use the term development approach instead of development strategy. By this they mean variants of development strategy. For instance, phase-wise development is one of the five development strategies, and for this particular development strategy, they distinguish the following variants: strictly linear, subsystems tile-wise, subsystems in parallel, and the development of throw away systems.

[xlix] Some researchers argue (e.g., Henderson-Sellers (2003)) that situational method engineering has not been fully utilized to date in practice because it is perhaps "…often viewed (unfairly) as also having a costly overhead (in terms of time, money, and people)" as stated (Henderson-Sellers, 2003, p.74). We have a reservation for the critiques of other researchers ((Fitzgerald et al., 2000) (Henderson-Sellers, 2003), (Baskerville and Stage, 2001)) on (situational) method engineering in the later chapters.

[l] They define 'a successful outcome of ISD' as 'development of a system that is implemented and used a regular basis'.

[li] The common conception of the notion of fragment in Van Slooten (1995) and Harmsen (1995) is that it is considered a coherent element. Van Slooten clearly distinguishes some coherent elements of ISD method, for which he calls method fragments from other coherent fragments route map fragments that are supposedly essential to the design of ISD approach. Harmsen also acknowledges the significance of these route map fragments for the selection of method fragments, but considers them as scenario aspects which is the stable intrinsic type properties. Even though neither author defines the notion of scenario, they seem to mean the same. In fact some of the scenario aspects are exactly the same route map fragments (e.g., development strategy and development types, delivery strategy and installation type).

[lii] The reader might see that the presentation of the ideas in this way may have some similarities with the conventions used in mathematics. We remark that the work is not bound to any specific conventions, in particular mathematics unless otherwise specified. However, we acknowledge that the appearance of these conventions presented in this

chapter is due to a better structuring of the ideas that is inspired by the use of conventions in mathematics.

[liii] Many studies guarantee this assumption though relevant statements are paraphrased differently. See, for instance, Truex and Baskerville (1999), that the very existence of method is coined with the term ISD and its history.

[liv] How do we know that these are essential features? What about non-essential features? The second question is already answered in Section 4.1. Whereas the first question strongly is tied to the research approach adopted (that is, the communications between the three worlds involved in this research have surfaced these features (see Figure 2.1)). In particular, a number of studies in the decision-making literature are granting the basis of these essentials.

[lv] At the present stage, there are still fundamental disagreements within modern science in general and psychology specifically about how human mind works. See for instance, the dispute on "the layers to human consciousness" proposed by Sigmund Freud, who is known as the founder of the psychoanalytical school of psychology.

[lvi] According to the Marian Webster dictionary it is the act or process of deciding; a determination arrived at after consideration.

[lvii] Berkeley and Humphreays (1982) identify seven types of uncertainty, which appear to be concerned with means, ends, goal conflicting decisions, and put that

"How well fantasy of the future projected in a decision analysis will serve as a model of decision-making depends upon how well seven different types of uncertainty are handled in structuring the decomposition of immediate acts." (p.206)

[lviii] Some approaches to decision-making do not rest in one particular model; instead they incorporate more than one model. For instance, consider the argumentation approach, which is concerned with how people arrive at a certain decision after what is called an argumentation process. This approach is rooted in conversational field, in particular the research domain of a dialectical and conversational restructuring. After the review of existing approaches in that particular field, it is stated that there is a continuum extending between dogmatic and emergent arguing. The former refers that arguing nothing at all becomes intersubjective and a position is justified or refuted on the basis of communicative backgrounds essentially identical for all the arguers. Whereas the latter suggests that arguers make a co-operative and collaborative problem-solving effort to match their communicative backgrounds. In this kind of arguing discourse operations like precision, specification, exemplification, and conclusion are more frequent than in dogmatic arguing. Currently this particular approach does not arrive at an agreed structure of how the argument process can be represented. If there was such a structure available, then decision matters involved in situated method development would be articulated in the light of such a structure, which may even be used for a basis of heuristics as a suitable form.

[lix] Notice that one can treat the associated models for the four accounts in descriptive, prescriptive and normative forms (see Table 4.3). For instance, Rational Choice as a representative model for Classical Decision-making can be treated in descriptive form by adopting the idea of utility maximization and also be regarded in prescriptive form as the applying axioms and principles of rational decision-making (see Meredith, 2005). Several attempts, including (Meredith, 2005) are made to relax rational decision-making by proposing the idea of well-balanced decision, which is drawn upon the principles of autonomy, value-orientation, and critical reflection.

[lx] See, for instance, situational or situated method in (Harmsen 1997; Slooten and Brinkemper, 1993), situation mappings in (Lanzara and Mathiassen, 1995), situational approach in (Weger and Franken, 1997), situated learning in (Lave and Wenger, 1990).

[lxi] Generally speaking, most of studies in the cognitive disciplines are aimed to understand what is going to inside the head in terms of cognitive mechanisms as so stimulus-response and information processing ideas are adopted. Whereas studies in social science, the subject matter is about the interactions between the agencies in the setting where relative collectives are structured.

[lxii] The difference between goal and expectation appears that the latter draws on similar experience, trend, maybe believe upon the matter, whereas the former seems to be more concrete and materialized as in the form of commitment.

[lxiii] A mental model is a psychological representation of the environment and its expected behaviour. The purpose of a mental model is to provide conceptual framework for describing, explaining and predicting future system states (Klimoski and Mohammed, p.405)

[lxiv] The is different from distributed cognition as used by (Hutchins, 2000)

[lxv] Some scholars use different terms for these forms. For instance, Searle (1983) prefer to use 'prior intentions' and 'intentions in actions' for 'future-directed' and 'present-directed' respectively.

[lxvi] I provide an example how the structuring is done without the agent's substantial involvement the appendix.

[lxvii] The work of Truex, Baskerville, and Travis (2000) titled "Amethodical IS Development" emphasizes this point as well.

[lxviii] A map means a representation of ISD method or part of it and a route refers to an established or selected course of action to achieve an intended goal.

[lxix] By 'well-defined' we mean existing formal definitions of fragment types. For instance, Harmsen(1997) defined a method fragment as a description of an ISD method, or any coherent part thereof. In this definition, the notion of coherence refers to considering a method as a connected graph of conceptual fragments. The same holds for other terms except the strategy fragment, which needs to be introduced and defined. A strategy fragment is a special type of the conceptual fragment as being critical to success of a project. The term, criticalness, emphasizes on the significant contribution of a strategy fragment to success of a project. A development strategy, a realisation strategy, the user involvement strategy are examples of the strategy fragments.

[lxx] Readers may need to know the specifications of each route map to understand their contents. However, the contents are specific to the organisation and are no necessary to grasp differences between them if we give some basic information about them. Indeed, some route map names are self-explanatory if we consider them from the nature of product or the type of development environment perspectives. For instance, PS route map indicates that it is meant for packaged enterprise systems implementations. Likewise, the mainframe route map is meant for legacy type applications as their development environment is usually on mainframe operating systems. The tool independent route map is designed for those system development projects that cannot be covered by other route maps.

[lxxi] Actually, Meredith (2004) adopts these terms – logical-empirical and normative-affective from (Etzioni, 1988). Accordingly, the factors related to the former term are concerned with the agent's decision making resulting from, for instance, reason, logic, deduction and regarding the latter, those factors addressing the agent' social and personal norms, emotions, and values are considered.

[lxxii] Wijnhoven (1992) considers three levels of analysis, at each of which you can examine the assessment of decision support along with topics such as individual processing

capacity, formation of commitments, alternatives under consideration. Although, for analytical purpose, it is useful to consider certain levels, genuine assessment of DSS should be derived from the value-orientation, which goes beyond the criteria tied to the economics view of assessing DSS (see (Meredith, 2004)).

[lxxiii] Meredith (2004) considers these elements as the requirements for his account of rationality, which is necessary for what he calls 'balanced decision making'. This is a kind of decision making that is somewhere on the scale which has two extreme points: the empirical-logical and the normative-affective.

[lxxiv] This is somewhat difficult to operationalise in the context of MAP support. In DSS, it is reduced to the idea of effect and effectiveness of DSS. Although this does not fully accommodate the very notion of value, and perhaps is limited to the viewpoint of economics, it fairly does capture certain elements.

[lxxv] Granted by the naturalistic paradigm that since handling uncertainty is embedded in the nature of establishing rationale, a naturalistic decision making analysis provides insights on how to arrive at this rationale. For instance, Lipshitz and Bar-Ilan (1996) propose the RAWFS heuristic (Reduction, Assumption-based reasoning, Weighing pros and cons, Forestalling and Suppression) to cope with uncertainty concerning how rationale is induced.

[lxxvi] These symbols were suggested by the coaches to make the instrument more surprising, interesting. Surprisingly, we later found that these symbols indeed contributed to make the instrument interesting.