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Karlheinz Kautz
Copenhagen Business School

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Karlheinz Kautz
Copenhagen Business School
Copenhagen, Denmark
Karl.Kautz@cbs.dk

Abstract

The aim of this paper is to contribute to the discussion about the utilization and enactment of information systems development (ISD) methodologies in development projects. To contribute to the scientific documentation of methodology enactment, we provide an empirically grounded study of the practical use of development methodologies in a project, in which, on the basis of a defined systems development methodology, a process unfolded that resulted in the development of a multimedia information system (MMIS). On the basis of understanding the enactment of methodology as organizational innovation, we present an integrative framework, which allows us to investigate the relation between individual actors, structural elements, and the interactive process of systems development in practice. This results in a richer understanding, shows how the methodology emerged in practice, and provides a basis for reflecting on that emergence in order to draw lessons about systems development practice and theory.

Keywords: Information systems development, systems development methodologies, amethodical development

Introduction

The aim of this paper is to contribute to the discussion about the utilization and enactment of information systems development (ISD) methodologies and methods in development projects. Methodology enactment is the process of the social moderation of methodology use; it covers both the change of methodology as formally described through use and the change of its users' actions that results from their interaction with the methodology. Research on ISD methodologies suggests there is a disparity between the way methods are formally described and the way in which systems are developed in practice. Empirical studies have found that, in practice, methodologies are used in a pragmatic way resulting in a unique instantiation of methodology for each development project (Bansler and Bødker 1993; Fitzgerald 1997, 1998; Hansen et al. 2003; Madsen and Kautz 2002; Stolterman 1992, 1994). Truex et al. (2000) argue that the assumptions underlying the concept of ISD methodologies must be addressed. They question that ISD is a manageable, linear, repeatable, and rational process and propose an alternative set of amethodical assumptions.

Writing in the field of organizational change, Pettigrew (1987) argues that there are remarkably few studies that actually allow the change process to reveal itself in any kind of substantially temporal or contextual manner. He further notes how research in the field is largely ahistorical, acontextual, and aprocessual in nature. This is also true for the field of ISD methodologies, where only limited detailed empirical documentation and research have addressed the issue of how an actual methodology emerges in practice, and what shapes a methodology in an organization (Nandhakumar and Avison 1999). On this background, Wynekoop and Russo (1997) request more field research about systems development in practice and Robey (1995) and Mathiassen (1998) propose the use of structuration theory as a comprehensive framework with its key components of structure and interaction process to get a deeper understanding of systems development and to subsequently develop sustainable theories hereof.

A notable exception to the lack of historical and contextual studies is Vidgen et al. (2004). They provide a historical account of the dynamics of methodology enactment in a development project that lasted 2 years. However, despite the temporal description, a conceptual framework for their analysis was not used. Fitzgerald et al. (2002) put forward such a method-in-action framework,

but they treat its components—context, developers, information system, formalized method, method-in-action, the roles of method—as merely interdependent structural elements.

In general, methodology enactment and its reasons are described in a fragmented manner. Many of the studies either look at it from the perspective of the individual project manager, developer, or customer, whereas others consider the methodology as an independent structural variable.

In an attempt to contribute to the scientific documentation of methodology enactment, we provide an empirically grounded study of the practical use of development methodologies in a development project. On the basis of a defined systems development methodology a process unfolded, which resulted in the development of a multimedia information system (MMIS) to spread knowledge about software process improvement (SPI) and quality management in Europe. Relating to earlier research and appreciating the enactment of methodology as organizational innovation (Kautz and McMaster 1994), we take up the challenge put forth by Pettigrew, Robey, Wynekoop and Russo, and Mathiassen. We develop and present an integrative framework, which allows us to investigate the relation between individual actors, structure, action, and process of systems development in practice. This results in a richer understanding and supports the aim of the paper, namely to show how the methodology emerged in practice and to reflect on the emergence in order to draw lessons about systems development practice and theory.

The remainder of the paper is structured as follows: The next section describes the research framework and method. In the third section, the case is introduced, analyzed and discussed according to the framework. A summary of the results, emphasizing the main findings, provides some conclusions with regard to the concept of methodology, and finally points to future research possibilities.

Research Framework and Method

Based on earlier research (Kautz and McMaster 1994), the framework developed and presented considers the utilization and concrete enactment of a systems development methodology as an organizational innovation. Research on innovations in organizations has been carried out with a focus on different levels of analysis, and as a consequence with differing, partly contradicting results. Slappendel (1996) performed a comprehensive literature review and provides a framework which distinguishes the existing work in the field in three categories based on the applied perspective on innovative organizational change, namely an individualist, a structuralist, and an interactive process perspective. The three perspectives can be described in terms of their basic assumptions about who and what causes innovations, and what the accompanying core concepts in such descriptions are. The innovation itself and the innovation process are also conceptualized in these descriptions.

The *individualist perspective* assumes that single individuals are the main source of innovation in organizations. Their actions are not seen to be constrained by external factors; instead, they are understood to be self-directing agents, who are guided by the goals they have set. In this view, individuals are rational and make decisions in order to maximize value or utility. The approach assumes that some individuals have personal qualities, which predispose them to innovative behavior. Consequently, individual characteristics like age, sex, educational level, skills, values, personality, creativity, and cognitive style define the antecedents for innovation and concepts like leader, champion, entrepreneur, innovator, and change agent and are the focus of interest.

The *structuralist perspective* assumes that innovation is determined by objectively existing organizational characteristics. So far, no definite relationship between innovation and a range of structural parameters has been established, but various contingency models have been developed. The focus often lies on separately investigated variables such as an organization's size, resources, departmentalization, structure differentiation, task complexity, and employee job specialization and professionalism. The degree of an organization's job formalization and centralization of the execution of power or decision making have been other often-researched variables. This perspective also includes the attention to the relationship between the organization and its environment in terms of the role customers, suppliers, competitors, and government play as structural variables, which influence an organization's innovativeness.

In the original framework, both in the individualist and the structuralist perspective, innovations are often seen as static objects or practices, which can be described objectively. The process of innovation is often understood to be simplistic and to follow linear stages typically denoted as periods of design and development, followed by adoption, implementation, and diffusion.

The *interactive process perspective* assumes that innovation is a dynamic, continuous phenomenon of change over time, in which various factors have mutual impact on each other. As the actions of innovative individuals cannot be divorced either from the

activities of other individuals or from the organizational structures within which they operate, innovation is the result of continuous interaction of the actions of individuals, structural influences, and the innovation itself. Slappendel acknowledges the limitations of the assumption of innovations as static, objectively definable objects and practices, of the stage-to-stage conception of the innovation process, and of the focus on environment as the only contextual variable. Unfortunately, in her framework, only a limited effort is made to overcome these problems. However, Pettigrew (1985, 1987) has made some inroads into these problems when trying to understand the importance of process and context, as has Walsham (1993) when studying change in the context of information systems development and use, where he utilizes the concepts of content (of innovation) the social context (of innovation) and the social process (of innovation) as interlinked units of analysis.

The framework presented here follows Pettigrew and Walsham and utilizes these concepts. In such a perspective, the content of an innovation, be it a product or a process, is perceived subjectively and is subject to ongoing reinvention and reconfiguration. In a longitudinal study of two SPI projects, Kautz and Nielsen (2004) overcome the mentioned shortcomings and integrate Slappendel's framework with Pettigrew's and Walsham's ideas and use the concepts of content of change, social context, and social process as interlinked units of analysis and constituting elements of the interactive process perspective in order to understand the unfoldment of the SPI. Here, the framework is now used to investigate and understand the enactment of an ISD methodology.

The context of an innovation is explicitly understood as a wider social context comprising both social relations and social infrastructure in and outside the organization. This allows initial ideas to proliferate into several ideas and innovations as the process ensues. This also comprises the historical circumstances from which an innovation emerges. Here, quite regularly, shocks, to which the organization is exposed, can be traced to the origin of an innovation. The social context (e.g., in terms of a combination of motivational factors and individual competence) is also considered to have an influence on an organization's innovative capacity as a whole.

Finally, innovation as a social process is characterized by politics concerning the distribution of power and the control and autonomy of the individuals involved. Their culture, subculture, and the interactions between different stakeholder groups and subcultures play a significant role as well. As such, methodology enactment as innovation is a complex, messy process, which is inseparable from its broader context. It should, therefore, be analyzed and understood in terms of the continuous interplay of content, context, and process of change.

In the resulting framework, despite its often formal description, methodology is neither from an individualist nor from a structuralist perspective understood as a static object or practice, which can be described objectively and which is enacted in a simple linear process. The framework, in which the individualist and structuralist perspectives build the basis for and complement rather than being an alternative interactive process, is summarized in Table 1.

The research is based on a project, which aimed at delivering a service to a customer, but the study of methodology enactment was not part of the original assignment. The author participated in the development team as overall project leader, analyst, and designer, and documented the development process in several ways. Minutes were taken from all meetings and shared with all involved. In addition to the product documentation, data was collected in the form of the researcher's diary as well as statements from e-mail and informal conversations. Finally, the project contract, the three official biannual project progress reports, and the final project report were available for this study. The research method applied in the project can be characterized as action case research, in which the researcher, while attempting to achieve practical value for the client, aims at contributing to the theoretical body of knowledge by analyzing and reflecting upon the course of events he or she was involved in (Braa and Vidgen 1999).

The Case of Developing a MMIS: Description and Discussion

The purpose of the project under investigation was to develop a MMIS to spread knowledge about SPI and quality management to IT and software managers and professionals. The project was based on a joint bid by two European software organizations, one being an IT consultancy, the other an academic organization, located in Norway and Denmark, respectively. The customer was the European Union.

The project contract was signed on a fixed price basis with a run time of 18 months. It included a plan for 616 person days of which 135 were assigned to 7 subcontractors and the remainder was distributed between 3 or 4 project participants, mainly system developers, from each of the organizations. The contract also included a description of the MMIS development methodology (Barry and Lang 2001; Bergman and Moore 1990; Sørensen 1997) to be applied in the project. Table 2 contains an excerpt from the original work package description with the planned time line (M = month) and resources (pd = person days).

**Table 1. Perspectives on Methodologies and Methodology Enactment
as Innovations in Organizations**

	Individualist	**Structuralist**	**Interactive Process**
Basic Assumption: Methodology is enacted	by individuals	by independent structural characteristics	over time through the interaction between the actions of individuals, structural influences and the methodology itself
Core Concepts	Leader Champion Entrepreneur Innovator Change Agents	Size Resources Centralization Departmentalization Differentiation Complexity Specialization Professionalism Formalization Centralization Environment	Contents • Social Context – Innovative Capability – Proliferation – History – Social Relations – Social Infrastructure – Crisis and Shocks • Social Process – Political perspective – Distribution of power – Autonomy vs. control • Cultural perspective – Stakeholders' interaction – Subcultures' interaction
Conceptualization of Methodology (Enactment) as an Innovation	The contents of methodologies is subjectively perceived and constantly reinvented and reconfigured		
Conceptualization of Methodology Enactment as an Innovation Process	Methodology enactment takes place in a complex social process, in which political and cultural aspects play an important role		

Table 2. Excerpt from the Original Work Package Description

Work package	Start date	End date	Planned Effort	Deliverable
WP 1 ANALYSIS	**M1**	**M3**	**95 pd**	
WP 1.1 Review literature	M1	M2	55 pd	Written literature reviews
WP 1.2 Index literature/Model information content	M2	M2	10 pd	Literature index and Information Model
WP 2 DESIGN	**M4**	**M8**	**105 pd**	
WP 2.4 Write lessons and questions/ Architectural Design and Storyboards	M6	M6	25 pd	Lessons/questions description
WP 2.5 Write script for Storyboards	M7	M7	15 pd	Script
WP 2.6 Write case study	M5	M6	10 pd	Case study
WP 4 AUTHORING	**M9**	**M12**	**135 pd**	
WP 4.1 Develop user interface	M9	M10	10 pd	User interface design
WP 4.2 Develop hypertext structure	M9	M10	10 pd	Hypertext design
WP 7 EVALUATION	**M16**	**M18**	**110 pd**	
WP 7.1 Develop questionnaire/interview guide	M16	M16	6 pd	Questionnaire and interview guide
WP 7.2 Complete telephone interviews	M16	M16	16 pd	Telephone interviews (minutes)
WP 7.3 Complete in-depth interviews	M16	M16	18 pd	In-depth interviews (minutes)
WP 7.4 Analyze answers and report	M16	M18	70 pd	Evaluation report
...	...	....	...	....
		Total	**616 pd**	

Table 3. Excerpt from the Project Planning and Monitoring Report

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22
WP1: Analy.	x O	x O	x O	O	O	O	O	O			F											
WP1.1	xO	xO	O	O	O	O	O	O			F											
WP1.2	xO	O	O	O	O	O	O	O			F											
WP2: Design				x O	x O	x O	x O	x O	O	O		F										
WP2.4					O	xO	O	O				F										
WP2.5							x	O	O	O		F										
WP2.6						x	x		O	O		F										
WP 4: Auth.				O	O	O	O	O	x O	x O	x O	x O	O	O	R	F						
WP4.1				O	O	O	O	O	x O	x OF												
WP4.2					O	O	O	O	x	xF												
WP 7: Eval.							O	O	O	O	O	O	O	O	O	x O	x O	x	O			
WP7.1							O	O	O	O	O	O	O	O	O	x F						
WP7.2																xO	C					
WP7.3																xO	C					
WP7.4																xO	xO	x	O		RR	

The subsequent analysis will concentrate on the two main contractors and comprises mainly the management, analysis, and design activities, which took place during the first 13 months and less on the technical production, distribution, and evaluation activities, which were performed in the last 9 months of the project. The resulting system consisted of components representing the relevant themes of SPI in the form of hypermedia linked textual and animated slide shows, a video film presenting a case company, a videotaped expert panel and a large annotated bibliography.

The actual project lasted 22 months and used more work days than planned, but stayed within budget. According to the specified evaluation criteria, it was considered a success, both with regard to the product and software quality as judged by two external evaluators and testers and the feedback from the end users concerning the accessibility and information quality, which was collected through a survey instrument. The enactment of the actual methodology only partially followed the path outlined in the project contract and in the methodology description. Table 3 contains an excerpt from the project planning and monitoring report, which demonstrates the actual course of the project. The table has to be read as follows: "x" indicates the original start and end dates of a work package; "O" indicates the revised start and end dates of a work package according to the revised plan after 6 months; "R" indicates the revised end dates according to the revised plan after 12 months; "RR" indicates the revised end dates according to the revised plan after 18 months; "F" indicates the actual end date; and "C" indicates that the actual work package has been cancelled.

Finally, Table 4 shows an excerpt from the resource monitoring report, which illustrates changes in resource usage and allocation after 12 months (in person days). In the table, the most significant changes are marked by the bold, underlined numbers and IT means IT consultancy, while AP refers to the academic partner.

Beyond the project's development from a historical and a resource perspective as shown in Tables 2 through 4, how the methodology unfolded and what shaped it will now be described and discussed in the following sections. Historically in innovation research, the individualist perspective is the oldest one and therefore often used as the first explanation. Here, however, for a better understanding of the course of events, the narrative starts with the structuralist perspective.

Table 4. Excerpt from the Resource Monitoring Report after 12 Months

	Report Period 1 (month 1 – 6)					Report Period 2 (month 7 – 12)						
Task	Effort used in period					Effort used in period			Effort used in both periods			
	IT	AP	Tot.	Orig. Plan	Revised Plan	IT	AP	Tot	IT	AP	Total	Actual Effort/ Revised Plan
WP1.1	9	27.5	36.5	55	55	18	15	19.5	27	29	56	56
WP1.2	2	0	2	10	10	8	0	8	10	0	10	10
WP2.4	5	10.5	15.5	**25**	**35**	15	40	55	20	50.5	70.5	**70.5**
WP2.5	0	1	1	15	15	0	14.25	14.25	0	15.25	15.25	15.25
WP2.6	0	15	15	**10**	**20**	2	27.5	29.5	2	29	31	**31**
WP4.1	1	3	4	10	**10**	4	10	14	5	13	18	**18**
WP4.2	1	3	4	10	**10**	2	11.5	13.5	3	14.5	17.5	**17.5**
WP7.1	0	0	0	6	6	1	0	1	1	0	1	6
WP7.2	0	0	0	16	**16**	0	0	16	0	0	0	**6**
WP7.3	0	0	0	18	**18**	0	0	18	0	0	0	**8**
WP7.4	0	0	0	**70**	**50**	0	0	50	0	0	0	**35**

Structuralist Perspective

The environment for the methodology enactment was very much determined by the customer, the European Union, which required certain structural building blocks to grant project support. Thus, the formal contract defined the overall methodology, which consisted of a number of sequential steps (see subsection "The Contents of the Methodology"), milestones, and activities inspired by a waterfall model based approach for MMIS development, as recommended in a number of books and articles (see above). The project team committed to this approach.

In the comparably flat hierarchy of the project, decision making was largely based on negotiations of the whole project team. However, the ultimate and central decision maker was the project leader, who had the responsibility and mandate to sanction and justify all changes from the approved, official methodological path. This is noted to be the case in the subsequent sections of the text.

The contract also predefined the project organization with an overall project leader, the resources available, the distribution of work and responsibilities between the two development organizations and the relations to the subcontractors as well as the guidelines for project management, which beyond bimonthly project meetings prescribed the delivery of biannual progress reports and a final report as well as the technical deliverables. The production of the reports became part of the methodology. This kind of formalism is usually also associated with professionalism in the systems and software development business.

The organization's departmentalization with the geographical distribution and the size of the development team definitely had an impact on the methodology enactment: The relatively small size of the team led to an informal style of communication, consisting of face-to-face meetings, e-mail and free formatted documents at the start of the project. However, communication problems after 2 months, when specifying the information contents (WP1.2), led to a standardization of both the information content templates and the accompanying storyboards (WP2.4/WP2.5). The standardisation was a reaction to the distribution of labour and the differentiation of tasks with one part of the modelling of the literature reviews taking place in Norway and the other in Denmark; the standardisation was an attempt to communicate and synchronise the results of these activities through written documents.

However, the complexity of the tasks, which ultimately manifested itself in 50 analysis and design documents and 86 different files necessary for system execution, had not been foreseen: Given this, it was realised that the originally envisioned sequential approach was not sophisticated enough to deal with a number of complicated tasks. Hence, it proved difficult to develop storyboards (WP2.5) for the individual information elements without specifying the overall information architecture (WP2.4). In addition, attempts to define the relationships between the different information components, in the form of interlinked

hypermedia elements, were also difficult. This made the related task of determining the user's access to the features describing the navigational possibilities (WP4.1/WP4.2) equally problematic. Thus, from month 4, these activities were performed in parallel. In month 6, they were officially assigned to and performed by one sub-team, which was geographically gathered at the same place. The other sub-team, from that period on, largely provided input for the modelling and design tasks in the form of literature reviews. This specialization of tasks led to a reallocation of resources and thus shaped the enactment of methodology. In this context, the role of resources as structural element has to be emphasised. Resources were scarce in the project and caused a permanent time pressure, which explains the parallel work.

Finally, the project team and the individuals comprising it as well as the methodology could also further be considered as structural variables; for a more detailed account of their impact, here they are looked at separately from the individualist perspective and as contents within the interactive process perspective, respectively.

Individualist Perspective

The project team consisted of a group of highly educated and comparably young (the project members were between mid-20s and late 30s) individuals, all with a university degree in computer science, but with a varying degree of practical experience and knowledge in the areas of ISD, SPI, and MMIS.

The project was overall lead by a project leader with a number of years experience with work for the customer, the EU, in ISD and SPI, but no experience with multimedia. He also acted as a local project manager at one of the sites. The methodology author, who was also a member of the team, had developed and tested his approach in a number of educational projects and was an experienced teacher in the fields of ISD and multimedia, and an expert in SPI. He was also installed as local project manager at the other project site.

The project leader and the methodology author had written the project proposal and the project plan and thereby laid out the overall methodological approach. They were both in favour of methodological approaches, but had a constructively critical attitude toward methodologies, which did not see movements away from the original path as a problem and which would allow them to deal productively with such situations.

The team had a principal designer with experience in MMIS development and knowledge in ISD, but little acquaintance with SPI. She was very skillful and formulated the original information strategy together with the project leader. She developed the overall treatment for the system with input from the project leader and the methodology author, and in cooperation with the latter she formulated the overall requirements and design documents. Together with him, she was also most influential when the standards for the information model and the storyboards were set. Her insight, supported by the methodology author, that the detailed information models and the detailed storyboards could not be designed before the information architecture, the hyperlink structure, and the overall user interface had been outlined, shaped the methodology. She started working in parallel with these system components and she introduced flow chart and scripting techniques to subsequently finalise the functional and technical design of the system. This approach was approved by the project leader. The principal designer produced most of the storyboards and the technical specifications and took care of the cooperation with the subcontractors during the technical tasks of production and programming. In addition, the principal designer, the project leader, and the methodology author stayed on the project team for the whole project.

Two further system analysts and developers with a strong ISD background, but little domain and multimedia knowledge assisted the information modelling and design work throughout the first 12 months. The team was further complemented by two younger developers with Multimedia, but little ISD and domain knowledge. They supported the production of documents and technical components such as sound and video files.

The high skill levels of the project team explains in general their and, in particular, the principal designer's willingness and confidence to explore and experiment with methodological aids to develop the MMIS, which influenced the actual enactment of the methodology.

Interactive Process Perspective

The interdependence of the structural elements, as well as the relationship between the individuals involved in the methodology enactment and their relation to the structural elements has been indicated in the two previous subsections, but will now be explicitly explored by applying the interactive process perspective. This exploration starts with a brief description of the

methodology. As methodology enactment is a process, here we explain the methodology as it was planned and defined in the project planning documents.

The Contents of the Methodology

The content of the methodology enactment was determined by the planned methodology itself. It had been developed in-house, and was largely sequential and based on known analysis and design techniques for information content modelling, as well as for functional, interface, and technical design of MMIS such as treatment writing, story boards, flow charts, and scripting languages. It was also determined by the phased work plan, which the customer had required. This plan specified 8 work packages such as analysis, design, media (sound video) production, authoring/programming, media (CD) print, dissemination, evaluation, and project management segregated into 30 activities with the same number of specified deliverables (see Table 2). The development tasks were supported by a number of software tools for multimedia development such as Photoshop, Sound Forge, and Director. The following subsections will provide a further account of the course of events, which will show the actual enactment less as a linear or sequential, but more as what some would call an iterative, evolutionary, adaptive, amethodical, agile, or improvised process (for examples, see Bansler and Havn 2003; Cockburn 2002; Floyd et al. 1989; Highsmith 2000; Truex et al. 2000).

The Context of the Methodology Enactment

Size lead to informality; departmentalization, geographical and task distribution, and differentiation lead to formalism in form of standards, but this can not be seen independently. It also was a reaction to the task complexity, and shows how the structural elements were interrelated.

They were, however, embedded in a wider context, where a project team of, in general, skillful, professional individuals presented a group with enormous innovative capability and proliferation. This was expressed through the development of an overall methodological approach through the cooperation of certain individuals and the subsequent standardization and adjustment of existing techniques to fit the project's assignment by one team member in cooperation and, after negotiation, with the other project participants. In more detail, the social relationship between the project leader and the methodology author outlined the overall approach and their collaborative relationship with and support for the principal designer, a person with a broad skill set, shaped the enactment of methodology.

Historically, the project leader's earlier experience with EU projects and his knowledge about the importance of reporting adequately and in time to the EU shaped the project as status meetings were regularly held to gather project information, reflect on the status, take adequate action, and report progress and intermediate results. He, however, also had to handle the high degree of uncertainty with regard to the customer's approval of the intermediate and final results, as the EU regularly gave very late feedback. Resource scarcity—it also belonged to the history of the project that the EU had cut down the duration of the project as well as the budget and the estimated workdays—had an influence on methodology enactment, but the time pressure has to be seen in context. Two contributing factors should be noted. First, there was staff absence through sickness. Second, the premature departure of the original project leader led to his post being filled by the coauthor of the project proposal. One related problem was that the latter could not make as great a contribution with regard to the more technical tasks compared with the original project leader. This all lead to the hiring of relatively young, inexperienced staff, who worked for a relatively low labor rate. This, and the fact that there was a general low level of experience with MMIS methodologies, slowed down the work, yet also stimulated experimentation and improvisation, and cannot be viewed independently.

The different background and knowledge of the project members, both with regard to MMIS development and SPI, as a consequence, meant that the standards were not fully and equally understood and applied by all project members. This lead to numerous, resource-demanding and time-consuming design meetings to come to a shared understanding of the overall architectural design and the form and content of the theme-related information elements. It also resulted in a considerable amount of rework as the storyboards were not approved by the project leader and the other local project manager and had to be redesigned to meet their requirements for the envisioned MMIS. This, in connection with the insight that the overall design was needed and the interrelationship of the information architecture with the hyperlink structure and the user interface layout, explains the emergence of the parallel work.

The explanation can even be extended. In the early stages of the project, the two project managers based on a certain personal rivalry had, despite the defined information strategy and the existing treatment document, different, but not clearly articulated,

levels of ambitions with regard to the MMIS. This is also true for the other members, who either based on their knowledge and experience with SPI, the influence of their respective managers, or their other work assignments produced inconsistent results. These were expressed in widely differing styles and contents of the information elements, which contained the material about SPI approaches and literature review summaries. This lack of clarity together with the uncertainties with regard to the stability of the overall architectural design culminated in a crisis expressed through frustration and temporally harsh disagreement of various project members. It was only partly settled through the introduction of standards, and through parallel work—the resulting extra work was also part of the crisis. Ultimately, the problem was resolved by and resulted in the reorganization and reallocation of development tasks and resources as described earlier (see Table 4 and subsection "Structualist Perspective"). Exploring the enactment of the methodology further beyond the social relations and infrastructure leads us to an analysis of the social process of methodology enactment.

The Social Process of the Methodology Enactment

Both from a political and a cultural perspective, various stakeholders had an impact on the enactment of methodology. The structural elements formalism and professionalism, which characterized the general methodological approach, were not independent variables. They were enforced on the project team by the customer, the EU, which as the financial sponsor was in control of the overall project.

The stakeholder demands proved a challenge for the project leader, who was in control of the internal financial resources. Indeed, one prominent challenge involved having to balance the customer's requirement for the developments process and product (as agreed in the project contract) with the managing of the actual day-to-day activities. The enforced methodology enactment with the production of regular project progress reports gave him the opportunity for post-rationalization and reflection. It allowed him to regain control over the course of the project and the emergence of the methodology, while, despite his competence as formal decision maker, still leaving space, autonomy, and a mandate for the project team to get the job done. Together with the methodology author, he approved or disapproved all intermediate results.

In the flat hierarchy of the project, here two other power relationships played a crucial role. The methodology author controlled the principal designer, who was a former student of his, and together, through their in-depth knowledge of MMIS, they had a dominant position over the project leader and the team members from his organization, who had no MMIS experience. This determined to a certain extent the enactment of methodology, both through the introduction of the standards and the initiation of parallel work with different tasks.

The power struggle became apparent through the delivery of different, incompatible information models and story boards, which lead to further work, thus impacting on the methodology enactment.

Beyond power, the different subcultures also had an impact. The developers from the commercial IT consultancy were accustomed to working under tight resource and time constraints, in addition to working on multiple projects in parallel, and were most geared toward fulfilling the customer demands to a minimum within budget and deadlines. However, the academic personnel were largely committed to this one project and were much more willing to deliver more, even if this meant working overtime and lowering labor rates. In this field of tension, considering themselves as professional practitioners, the IT consultancy team were more willing to compromise and let the university team have it their way.

Although, on a management level, the teams were slightly competitive, the overall culture of the project was characterized by an open atmosphere, an open-mindedness concerning each other's arguments, and mutual respect based on the team members' educational background. This enabled any conflict to be brought into the open and supported by the standards for the development tasks, the matter could ultimately be resolved by the power of the project leader who with his authority sanctioned the approach and, after negotiations with the methodology author and in agreement with the rest of the team, reallocated resources and relocated tasks to a core team with MMIS experience, which was physically gathered at one place to finish the analysis and design activities.

Summary and Conclusion

When we revisit and recap the case, we can see the value of the framework and how methodology emerged and was shaped during the project as described in Tables 3 and 4. Individuals and their characteristics as well as structural elements and, in particular, the interaction between (the actions of) individuals and structural influences shape and explain the enactment of methodology as a complex, social process.

Table 5. A Structuralist Perspective View on Methodology Enactment

Environment	Customer (EU) required building blocks defining the overall methodology Contract defined organization of the development process
Formalism	Writing project progress reports Defined milestones and deliverables Defined Standards
Professionalism	Defined Methodology Project planning, monitoring and reporting
Size	Informal communication
Centralization	Flat hierarchy with project leader as the ultimate decision maker to sanction methodology enactment
Departmentalization	Development of templates and adjusted standards Gathering a core team on one physical site
Differentiation	Development of templates and adjusted standards
Resources	Parallel work on different activities
Task complexity	Parallel work on different activities
Job specialization	Reallocation of tasks and resources

The presentation of the structural elements provided a number of explanations, but it also showed how these elements were interrelated and not independent from each other. Table 5 summarizes the main findings from this perspective. Applying the structuralist perspective alone provides useful insights, but it is limited and gives only a partial explanation.

The individualist perspective supports both complementary and additional explanations. Table 6 summarizes the main findings from this perspective.

The richest picture and fullest explanation, however, first come to light when the individual actors and the structural elements are thought about together and the interaction between them is taken into account.

The interactive process perspective goes beyond a mere combination of elements from the two other perspectives. It considers the complex interplay of the various factors and focuses on the process aspects of innovation-related variation. Thus, utilizing the interactive process perspective allows us to analyze the case in more detail. Table 7 summarizes the methodology enactment from this perspective.

The work presented provides an empirical study investigating the enactment of ISD methodologies in practice. By considering the utilization of a methodology and the development process as innovation processes and applying an innovation research framework, it confirms and extends the existing body of knowledge in the field and offers an empirical documentation identifying characteristics of individual actors, structural components, and elements of process and their interplay and relationship, which affect the application of ISD methodologies.

Table 6. An Individualist Perspective View on Methodology Enactment

Leader(ship)	Project manager and methodology author defined the overall methodology Project manager and methodology author approved intermediate results Project manager produced status reports and initiated action Project manager approved the actual enactment
Champions	Principal designer had high skill level, which allowed for exploration and experimentation with methodological aids Principal designer and methodology author advocated the establishment of standards and templates Principal designer introduced the concrete development techniques
Change agents	Principal designer started parallel work on different work tasks

Table 7. An Interactive Process Perspective on Methodology Enactment

Contents	Planned methodology: • In-house developed, sequential approach • Phased project plan with analysis, design, production, programming, evaluation and management activities • Supporting software tools • Known development techniques Enacted methodology (course of the process): • From linear, sequential to iterative, evolutionary, adaptive, agile, amethodical, improvised process
Social Context • Innovative capability • Proliferation	High capability and proliferation expressed through the development of overall approach and subsequent standardization and tuning of existing techniques
• History	Project leader's experience with EU projects influenced status discussions and reporting EU's initial decision to cut down the duration, budget and workdays lead to the hiring of young, inexperienced staff
• Social relations	Close relations between project manager and methodology author outlined overall approach and their collaboration with the principal designer had an impact on standardization, tuning of existing techniques, and parallel work
• Social infrastructure	IT consultancy and academic team members related mostly to their respective managers in guidance for performing their tasks.
• Crisis	Disagreement over task execution lead to frustration, parallel work, rework and reorganization and reallocation of resources and tasks
Social Process • Political perspective ▪ Distribution of power	EU was in power of the overall project Project leader had financial control, but had to balance the EU's requirements with the challenges of the actual course of events Methodology author controlled the principal designer, and together they dominated project leader and IT consultancy team Power relations were expressed through reporting routines and the ways intermediate deliveries were produced
• Cultural perspective ▪ Subcultures' and stakeholder groups' interaction	Open atmosphere brought conflict into the open as a prerequisite for resolution Despite different attitudes to professional work of IT consultants and academic personnel open-mindedness enabled compromise

Applying the individualist and structuralist perspective helped structure the analysis and the presentation of our results, but would in itself be a too limited explanation. However, their presentation laid the foundation for a richer understanding provided by the interactive process perspective. This, in turn, in itself, is so complex that a less structured description would hardly be comprehensible.

The description and discussion show the role and usefulness of methodologies as a means for communication, coordination, and (re)direction, rather like sketchy maps and plans and less as a rigorous and rigid means for control. Thus, our work is also a contribution toward a redefinition of the concept of methodology, but against the abandonment of the concept as a whole as it might be put forward by the proponents of mere tinkering, improvisation, or amethodical-based approaches to information systems development (see Ciborra 1999; Truex et al. 2000).

On this background future research should strive for an even deeper understanding of how and why methodologies are used. More reports that provide an understanding of methodology enactment might help to broaden the repertoire of possible enactments. Finally, the framework can also be used during development projects to reflect over the course of a project and methodology enactment, not as a problem, but as a situation or challenge, which has to be handled.

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