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Method Emergence in Practice - Influences and Consequences

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- INFLUENCES AND CONSEQUENCES

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Abstract

This paper explores the relationship between <u>what</u> influences and shapes the unique and locally situated method-in-action and <u>how</u> it consequently emerges. Based on a synthesis of prominent Information Systems (Development) literature, an analytical framework is developed. The framework is organised into three perspectives: 1) the structuralist, 2) the individualist and 3) the interactive process perspective. Each perspective supplies a set of key concepts for conceptual understanding and empirical exploration. The analytical framework is used to structure and analyse a two-year longitudinal case study of method emergence in a web-based ISD project. The paper concludes with a summary of the research and its implications. We propose that this research and future theoretical and empirical contributions that address the relationship between the whats and hows of method emergence will support and improve ISD researchers' and practitioners' ability to pay attention to and act in accordance with the myriad characteristics, actors and events that shape the method-in-action in practice. Such contributions we argue will build up a vigilance and capacity for problem spotting as well as problem solving.

Keywords: Information Systems Development, Methods, Emergence, Practice

1 INTRODUCTION

Most prescriptive and empirical contributions within the field of information systems development (ISD) focus on formalised development methods: how they should be used and how they are used, respectively. A number of method authors recommend that the development process is tailored to fit the contingencies of the particular situation (Avison et al., 1998; Jacobsen et al., 1999). In line with this, empirical studies show that in practice IS developers adapt and apply methods and techniques in a pragmatic way (see e.g. Bansler & Bødker, 1993; Stolterman, 1991, 1992, 1994; Fitzgerald, 1997, 1998; Fitzgerald et al., 2002, Madsen & Kautz, 2002; Hansen et al., 2003). Others argue that the formalised method is just one element among many that influence and shape the actual development process and situated use of method – what has been referred to as the unique method (Truex et al., 2000), the local methodology (Vidgen, 2002; Vidgen et al., 2002) or the method-in-action (Fitzgerald et al., 2002). However, so far little research has addressed the issue and the details of how and why the method-in-action emerges as it does. The purpose of this paper is to contribute to ISD literature and practice by exploring the relationship between *what* influences and shapes the method-in-action in practice and *how* it consequently emerges.

The paper proceeds as follows. In the next section, the interpretive research approach is described. In the third section, the three perspectives that constitute the analytical framework are presented and in section four, the framework is used as the analytical device for structuring and analysing an empirical case study of method emergence in a web-based ISD project. The last section provides a summary of the research and its implications.

2 RESEARCH APPROACH

The research presented in this paper is interpretive. It is based on an empirical case study in the Market Research Company, a UK-based small to medium-sized consultancy, where an in-house web-based ISD project was performed during a two-year time period from October 2001 to October 2003. The development project was conducted in order to improve the Market Research Company's internal work practices and to support online sales to its customers by creating a Research Data Repository (RDR) that would contain details of companies and production volumes in the drinks industry.

The roles and length of stay in the field have varied for the three authors of this paper. One author has been involved in the project as an action researcher throughout the two-year time period. This author was actively involved in the hands-on development in the early stages of the project and had the title of Academic supervisor. A second researcher participated as an 'action case' (Braa & Vidgen, 1999) or 'involved' researcher (Walsham, 1995) for six months from March to September 2002, contributing primarily to the information analysis activity. A third researcher acted as an 'outside observer' (Walsham, 1995) and conducted interviews with employees of the case organisation, as well as with the action researcher and the involved researcher. The interviews were carried out in November 2002. The combination of intervention, interpretation, and collaboration between three academic researchers with different levels of involvement was chosen to bring interpretive rigour to the project. This design also helps counter the specific criticism of action research that it can become little more than consultancy (Baskerville and Wood-Harper, 1996).

The formal project organisation of the RDR project required quarterly steering committee and monthly technical meetings. During these meetings both the action researcher and the involved researcher captured 'the data' by taking hand-written notes, and as soon as possible after the meeting, the written notes and as many details as possible were recorded in two separate and personal project diaries. For each diary entry, the date, participants, location, and events as well as immediate interpretations and personal comments were recorded. Furthermore, a variety of documents such as the original project proposal, minutes of steering committee and technical meetings, company documents as well as

project reports and deliverables were collected. In addition, the study draws on the third researcher's independent analysis of the two project diaries and the seven semi-structured interviews performed with five project participants, i.e. the Company chairman, the Market research director, the Developer, the Academic supervisor and the involved researcher, and two future end users, i.e. two Market researchers.

Data analysis and understanding of the Market Research Company case has - in line with the research topic and interpretive method - been an emerging process. Our understanding of method emergence has come about through an iterative process of interpretation, comparison and interlacing of prior research and empirical data. The arguments for and choice of the theories and frameworks that constitute the analytical framework are therefore equally informed by both literature and practice, by deduction as well as induction (See Madsen, 2004 for a full account).

3 THE ANALYTICAL FRAMEWORK

This section develops the analytical framework for understanding method emergence in practice. The framework will be used to structure and perform a detailed analysis of the Market Research Company case. As a structure for the analytical framework, we draw on the structuralist, the individualist and the interactive process perspectives delineated and used by Slappendel (1996). Markus & Robey (1988) apply similar perspectives in their paper on causal structure in theory and practice, while Kautz & Nielsen (2004) use Slappendel's framework (1996) for understanding Software Process Improvement in practice. The three perspectives provide a frame for focusing on structural characteristics, individual action, and the complex and dynamic interplay between socially constructed structure and purposeful human action over time (Slappendel, 1996; Kautz & Nielsen, 2004). Thus, Slappendel's framework (1996) addresses one of the major underlying theoretical discussions in the social sciences - that of structure and agency. Therefore, we contend that it also has a general relevance to ISD. Below, the structuralist, the individualist and the interactive process perspectives are applied to combine existing contributions from or previously used in the field of ISD into a coherent framework for understanding *what* influences and shapes the method-in-action in practice.

Within the structuralist perspective, it is assumed that structural characteristics influence and shape the method-in-action. The perspective is inspired by Fitzgerald et al. (2002) who suggest that characteristics of the context, the developers and the information system under development as well as the formalised method and the rational and political roles it plays all influence and shape the method-in-action (Fitzgerald et al., 2002). Here we assume the concept of *method-in-action* as the analytical framework's general object of study, while the structuralist perspective includes the key concepts of: *context, developers, information system* and *formalised method*. These concepts introduce the particular development setting, the project under study and allow for an understanding of how certain structural characteristics affect the method-in-action. The emphasis is primarily on descriptive and static characteristics, and the structuralist perspective does not as such address the influence of the individual developers' actions or of the interaction between structure, individual action and time.

Within the individualist perspective, the actions of the individual IS developers are seen to influence and shape the method-in-action. The perspective is inspired by Schön's concept of the reflective practitioner (Schön, 1983) and his notion that the practitioner uses his entire repertoire of prior knowledge, language and media to engage in a reflective conversation with the situation. The individualist view draws on Schön (1993) to suggest that the individual developer's repertoire of prior methodical and practical knowledge, language and media preferences shape his actions and that these actions in turn influence the method-in-action. Therefore, the key concepts of the individualist perspective are: *repertoire, language* and *media*. These concepts allow for an in-depth understanding of the individual developers and their influence on the method-in-action, but lack a focus on the emerging method-in-action as an inherently social change process, which may also be influenced and shaped by the actions of many other involved or affected actors and organisations.

The interactive process perspective is based on the assumption that the method-in-action emerges over time through the interaction between structural influences, the actions of individuals and the content of change, i.e. the method-in-action and information system under development. The perspective builds on and supplements the structuralist and the individualist perspectives through a focus on the key concepts of *social context*, *social process* and *content of change* (Walsham, 1993) as inter-linked units of analysis (Pettigrew, 1987; Kautz & Nielsen, 2004). Social context addresses social relations, infrastructure and the history of previous procedures, structures and commitments (Walsham, 1993). Social process focuses on the political (i.e. the distribution of power and balance between autonomy and control) and the cultural (i.e. sub cultures and the interaction between sub cultures) aspects of ISD (Walsham, 1993). Content of change refers to how the planned and actual process and product of change (Kautz & Nielsen, 2004) emerges in interaction with the social context and social process. Thus, the interactive process perspective allows for an understanding of the development process as a complex, dynamic and social process of change, in which political and cultural aspects play a central role.

Together, the three perspectives provide an integrative frame and a set of concepts for describing and explaining how the method-in-action emerges in practice. They thereby enable an explicit focus on the influence of structural characteristics, the individual developers and the interaction between structural influences, individual action and the issue of time.

Object of study / Three Perspectives	Key concepts
Object of study	*Method-in-action* – temporal outline of actual development process, activities and use of methods, techniques and tools
Structuralist (Structural char.)	*Context*, *developers*, *information system, formalised method* - characteristics hereof influence and shape the method-in-action
Individualist (Individual action)	*Repertoire, language, media* - influence and shape the individual developer's actions, which in turn influence the method-in-action
Interactive Process (Structure, action and the issue of time)	*Social context* - social relations, infrastructure and the history of previous procedures, structures and commitments influence and shape the method-in-action *Social process* - political and cultural aspects of ISD influence and shape the emerging method-in-action *Content of change* - the planned and the actual method and information system emerge in interaction with the social context and social process

Table 1: The Analytical Framework

4 THE MARKET RESEARCH COMPANY STUDY

This section analyses the factors and interactions that contributed to the method emergence in the Market Research Company case. The aim is to provide a reading of why the method-in-action took the form that it did. In the next section, the method-in-action is described. The following three sections emphasise different aspects of the case according to the structuralist, the individualist, and the interactive process perspective and their key concepts.

4.1 The unfolding of the method in practice

The contingency approach Multiview/WISDM was chosen as the formalised method in the RDR project (Vidgen et al., 2002). In practice, the method-in-action emerged as a time-boxed prototype driven approach supplemented by the choice and use of analysis and design techniques such as entity-relationship diagramming, use cases, flow charts, think 'aloud' tests and a job satisfaction survey. The key activities in the RDR development project are shown in table 2.

Time	Activity
Oct 2001 – Jan 2002	*Initiation*: Newly employed Developer trained in technology used by the Market Research Company; review of content management (CMS) and online analytical processing (OLAP) software conducted leading to decision to custom build software.
Feb 2002 – Jul 2002	*Database modelling*: database is recognized as core to RDR. The plan allowed for six weeks elapsed time to design database on the assumption that a CMS would be implemented – due to the complexity of the RDR data structures analysis and design took five months to reach a stabilized database.
Apr 2002 – May 2002	*HCI development 1*: an early prototype was developed to provide the users with a tangible output, allowing feedback on look and feel and a first test of the database structure.
May 2002 – Jun 2002	*Formal requirements analysis*: the informal notes and analysis of business processes were written up using flow charts and UML use cases.
Jul 2002	*Job satisfaction investigation*: application of the Multiview framework suggested that attention be given to job satisfaction of market researchers. The ETHICS questionnaire was rejected by the human resources manager (see Vidgen & Madsen (2003) for a full account). A revised questionnaire combining job satisfaction and use cases was developed and this highlighted that users felt they spent too much time collecting and formatting market data as opposed to analyzing, summarizing, and commenting.
Aug 2002 – Dec 2002	*Technical architecture*: the original three-tier architecture was superseded by a four-tier architecture based on XML. This was a response to the complexity of the RDR application and the desire to build a flexible platform for data sharing.
Sep 2002 – Jan 2003	*Development of company detail reports*: the emphasis of the project was on Web delivery, but the Company chairman wanted the RDR to produce an exact facsimile of the current paper reports. This required the introduction of a more sophisticated formatting technology, XML-FO (formatting objects), to deal with page headers, page breaks, etc. for output in PDF format.
Jan 2003 – Feb 2003	*HCI development 2*: the Market research director needed a deliverable from the RDR project to sustain interest and credibility within the Market Research Company. If company detail data were entered into the database then a directory of companies in the water cooler industry could be generated. To support data entry of company detail data the user interface was redeveloped.
Mar 2003 – May 2003	*Water cooler company directory*: Company data entered into the database, the water cooler directory report produced automatically in PDF format, and marketed and sold to clients.
Jun 2003 – Jul 2003	*Market summary analysis*: detailed company volume data summarized into market overviews (e.g., top 50 bottled water companies in Europe).
Jul 2003 – Sep 2003	*HCI development 3*: testing of interface with users identifies extensive modification needed to support needs of market researchers in the production of live reports.
Oct 2003 – Jan 2004	*Market report production*: the first full market report, West Europe Bottled Water, is produced using the RDR.
Feb 2004 onward	*Extension*: further reports produced from the RDR, new technologies explored (e.g., OLAP), external access for clients via the Internet, and new business initiatives (e.g., sales data pooling) launched.

Table 2: Method-in-action for the RDR project

4.2   The Structuralist Perspective

The setting for the RDR project was the market research department, which consists of six full time employees, including the Market research director. Each year the department produces a number of market reports, with the two most important ones being the 'Bottled Water' and 'Water Coolers' reports. The reports are based on data gathered from as many companies as possible in a line of business, such as bottled water. The reports are then sold to companies in the drinks industry, such as manufacturers (who provided the original detail data), packagers, and distributors. From initiation to publication, each report takes around three to four months to produce. Each report is led by a single market researcher who does the bulk of the work and gains a deep insight into the data and manages the structure of the report. A large volume of data has to be collected, stored, processed and formatted and information overload is the norm.

"We've got loads of information on paper, on Excel files, all floating around"
(Market researcher, interview quote, November 2002)

The RDR project was undertaken as in-house development by a relative small project organisation, where the steering committee involved 6-8 people and the project team consisted of 3-4 people with one full time developer. The project concerned the development of a technically complex web-based information system. It was performed collaboratively by the Market Research Company and Bath University within the Teaching Company Scheme (government funded programme that promotes collaboration between industry and university) and involved the active participation of academic researchers. The active involvement of academic researchers in the formal project organisation explains the choice and espoused use of an academically developed approach, i.e. Multiview/WISDM, as the formalised method. At the same time, the characteristics of in-house development, a small project organisation, and project team members with a high level of methodical knowledge explain the little explicit use of the formalised method. This is in line with e.g. Stolterman (1992) and Fitzgerald et al. (2002), whose empirical evidence suggests that knowledgeable and experienced developers are less likely to follow a formalised method. Instead they will "enact a method-in-action which is better suited to their skills and ability, the actual needs of the development context, and the system under development" (Fitzgerald et al., 2002, pp. 133).

"I think that [the Academic supervisor] used Multiview/WISDM and I think that I also used Multiview/WISDM...not as an explicit framework...saying this is what the model says, now we are going to do this. It was more like, I'm sure [the Academic supervisor] just had it in mind, thinking we have to do the technical design, we have to do the information analysis and the same thing for me. It was more just a framework for thinking..." (Involved academic researcher, interview quote, November 2002)

As such, the method-in-action emerged as a time-boxed prototype driven approach, where techniques such as E/R diagramming, use cases, flow charts, think 'aloud' tests and a job satisfaction survey were chosen and used at the discretion of the project team, when and as they thought it relevant during the course of the project. Table 3 shows which and how structural characteristics influenced and shaped the method-in-action.

Elements	Characteristics	Influence on method-in-action
Context	In-house development; Small project organisation (6-8 people involved, 3-4 people in the project team); Joint university - company collaboration within the TCS scheme	→ The involvement of academic researchers explains choice of Multiview/WISDM and the application of a job satisfaction survey → TCS specified the project duration and the project organisation
Developers	Long formal educations, from 0-15 years of practical experience	→ The project team possessed a high level of methodical knowledge knowledge which explains little explicit use of formalised method
Information system	Technically complex web-based system	→ Emphasis on data modelling, back-end functionality and systems architecture
Formalised method	Multiview/WISDM supports the choice of methods and techniques; no pre-specified process model supplied	→ Multiview/WISDM guided the project activities as an implicit 'framework for thinking', but was only used explicitly on one occasion to inform the choice of a job satisfaction survey

Table 3: The Structuralist Perspective

A structuralist perspective on the Market Research Company case provides insight into the case study setting, the project under study and the choice and little explicit use of Multiview/WISDM. However, the descriptive characteristics do not in themselves explain why the project team chose a prototyping approach, why the prototypes were conceptualised, scoped and developed as they were or why data modeling was chosen as the critical point of departure. This is examined in more detail from the individualist and interactive process perspectives.

4.3 The Individualist Perspective

Together, the project team members' repertoire of prior knowledge explains the choice of methods and techniques. Especially, the Academic supervisor's background played a significant role in shaping the method-in-action. His way of thinking about and taking action in the RDR project were influenced by 1) his knowledge of ISD methods in general, and Multiview/WISDM in particular as one of the method authors hereof, 2) his preconceptions of and practical experience with ISD, i.e. he favors tangible prototyping results as well as a data and technology driven approach, and by 3) his knowledge about the Market Research Company, the cyclic nature of the report production processes, the paper-based reports and the amount of data they contain.

> "I had it very clear in my mind. There was no doubt that we had to start by getting the database structure right, because my approach to systems development is data driven and really when you looked at the output of the [market] research process, at the [paper-based market] report, you know that you have to add a whole lot of data" (Academic supervisor, interview quote, November 2002)

As such, the Academic supervisor's background allows for an understanding of why a prototyping approach was chosen and used as the dominant method, why the database model was considered the natural starting point and critical success factor and why other analysis and design activities were "squeezed in" or performed in parallel with the prototype development. Table 4 provides an overview of how the individual project team members' repertoire of knowledge, language and media preferences influenced and shaped the method-in-action.

Elements	Project team	Influence on method-in-action
Repertoire and language	Project team members' repertoire and language shaped by: • Academic supervisor: data modelling, prototyping and technology • Developer: no practical experience, guided by the Academic supervisor • Involved researcher: requirements specification and process modelling	→ Academic supervisor's background explains the choice and use of prototyping as dominant method for getting the job done → Explains the choice and use of methods and techniques, i.e. prototyping, E/R diagramming, use cases, flow charts and think aloud tests → Explains the sequence of the unfolding development process, where prototyping was dominant in time and effort with analysis activities "squeezed in" or performed in parallel
Media preferences	• Preference for code and spoken language as medium for reflection-in-action • Little use of written documents to control and perform the work	→ Explains choice of and extensive reliance on prototyping → The E/R diagram was used throughout the process, other analysis and design documents were only marginally used and maintained once developed

Table 4: The Individualist Perspective

4.4 The Interactive Process Perspective

When the RDR project commenced, the social context was already well established and structured through long-term, trust-based social relations between company management and the Academic supervisor and their shared understanding of the project vision, the appropriate development approach, the technology to be used and the required project organisation specified by the Teaching Company Scheme. The social process and its content, i.e. the emerging method-in-action and the RDR application, were guided by the decisions and actions of the influential company management and Academic supervisor as well as the significant meaning that they assigned to the paper-based market reports – as one of the Market Research Company's core products - and the market report production process. The paper-based reports were consequently used as direct specifications for the database model and the RDR application's reporting facilities. Moreover, the project team drew on their

understanding of the report production process to conceptualise, verbalise and scope the emerging development process and prototypes. Table 5 presents the influence of the social context, social process and content of change on the emerging method-in-action.

Elements	Characteristics	Influence on method-in-action
Social Context		
Social relations	Long-term social relations between management and Academic supervisor; Have previously worked together in a similar TCS project	→ Long-term, trust-based relations explain little use of formalised method and written documents → Management and Academic supervisor defined the project and its boundaries through decisions about project vision, development approach and technology → TCS specified formal project organisation, thereby shaping the social relations and rules of interaction
Infrastructure	Social infrastructure characterised by involved management and Academic supervisor	→ Shared understanding of company, project vision and established work practices passed on from management and Academic supervisor to Newly employed Developer
History	Management and Academic supervisors' long-term social relation; Market Research Company defines itself in terms of the paper-based reports and report production process; two market reports chosen for implementation	→ Shared understanding of what (vision) and how (project organisation and work practices) to develop → Paper-based reports used as direct specification for data model and automatically formatted reporting → Report production process used to divide the development process into prototypes and activities
Social Process		
Politics	Power distribution in favour of management and Academic supervisor	→ Project vision and development approach defined by management and Academic supervisor → Management influenced method-in-action through participation in steering committee meetings and daily contact with Developer → The Academic supervisor had extensive influence through his role as project manager, hands-on developer and supervisor for the Developer → The Developer had discretion in daily work, but was strongly influenced by management and Academic supervisor
Culture	A number of sub cultures involved; Sub culture interaction mediated by formal project organisation and informal dialogue	→ Management interested in strategic benefits; Academic researchers interested in academic results; Teaching Company Scheme interested in knowledge development and exchange → Little use of methods and techniques at steering committee meetings; Methods and techniques used for reflective interaction within project team
Content of change		
RDR application	Planned: Based on web CMS; Focus on both internal process and external sale; Online delivery	Performed: → Custom-made; Focus on internal process; Implementation of paper-based report with possibility of running online queries
Method-in-action	Planned: Prototyping; Bottled water and water cooler reports as point of departure; Focus on web front-end and organisational change	Performed: → Prototyping; Bottled water and water cooler reports as specification; Report production process used to envision process and future prototypes; Focus on DB modelling, back-end functionality and systems architecture

Table 5: The Interactive Process Perspective

5 CONCLUSION

In this paper we have developed and presented an analytical framework based on a set of theoretical assumptions about *what* influences and shapes information systems development and the method-in-action in practice. The framework was organised into three perspectives: 1) the structuralist, 2) the individualist and 3) the interactive process perspective. Each perspective supplied a number of key concepts for conceptual understanding and empirical exploration of how the method-in-action emerges in practice. The analytical framework was subsequently applied to a two-year longitudinal case study of method emergence in a web-based ISD project, i.e. the RDR project, performed in the Market Research Company. The framework was used as a narrative and analytical structure for detailed exploration of *what* influenced and shaped the method-in-action in the RDR project and *how* the method-in-action emerged as a result thereof.

The application of the analytical framework supplemented by tables containing a large body of empirical data lead to a deep appreciation of the Market Research Company case, where 1) structural characteristics helped explain the choice of and extent to which the formalised method Multiview/WISDM was used, 2) the individual project team members' repertoire of prior knowledge, language and media preferences helped explain the selection of and sequence in which method elements were pasted together to form the unique method-in-action, while 3) the focus on the interactive process facilitated identification of the structural elements and influential actors that played a major role in shaping the method-in-action over time. The three perspectives provide different types of insight yet they complement rather than exclude each other, thereby allowing for an in-depth understanding of method emergence in practice. The analytical framework's ultimate strength is the way in which it facilitates a focus on the complexity of relationships that are often viewed as much more simplistic.

The analytical framework have been developed and demonstrated as a reflective tool that facilitates a comprehensive appreciation of the particular case. On this basis we propose that the framework is relevant for both ISD practice and research. In practice, the analytical framework can be used for: 1) planning the method through anticipation of potential opportunities, obstacles and countermeasures which characteristics, individual developers and the interactive process might represent in the given situation, 2) for coping with the interactive process during development and 3) for after-the fact reflection and collection of lessons learnt. For the researcher, the analytical can be used to perform, analyze, present and compare longitudinal case studies of how the method-in-action emerges in practice and over time. As Checkland (1991) points out, the complexity of practice is such that an explicit framework of ideas is necessary as a vehicle for data collection and identification of important research findings. In line with Schön (1983), we argue that detailed studies of practice and subsequent formulation of empirically grounded theories serve to enhance the researcher's and the practitioner's repertoire of knowledge and introduce new concepts and distinctions into the language they bring to their practice. This in turn will cultivate their ability to pay attention to and act in accordance with the myriad characteristics, actors and events that shape the unique and emerging method-in-action in practice. With this paper we wish to make the point that unique cases and abstracted theories, frameworks and concepts concerned with the relationship between the whats and hows of method emergence will allow researchers and practitioners to build up a repertoire of knowledge about what can be expected in practice and what might be done to cope with the situation. Such contributions - whether primarily about the unique, the abstract or both - will instil a vigilance and capacity for problem spotting as well as problem solving.

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