

36 DOES UNIVERSITY EDUCATION LEAD TO ADOPTION?

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Abstract

The diffusion and adoption of systems development methods have been a subject for research and a topic for discussion for a number of years. One important factor often emphasized is education and training. However, very little research focusing at the role of formal university education and the dissemination of systems development methodologies has been carried out. This is the background for this study. The study investigates to which degree a specific methodology—Multiview—taught in-depth for more than 10 years at the Copenhagen Business School, has been adopted by the students and the organizations they are working for. The main result is that very few examples of adoption were found. The paper investigates reasons for not adopting by using a grounded theory analysis.

Keywords: Information systems development, methodology, method, adoption, university education, Multiview, grounded theory.

Introduction

The diffusion, adoption, and use of systems development methods have been subject to research and discussion for a number of years. A number of studies reveal that methods are often under-used, wrongly used, not usable, or simply over-sold. Yourdon (1986) states that although 90% of world-wide computing professionals are superficially acquainted with structured methods, only 10% of the IT organizations use them in an appropriate way. Floyd (1986) argues that structured methods are inadequate for modeling major aspects of complex information systems and are therefore not adopted by system developers. Hidding (1997) claims that methods are used in a third of information systems practice and argues that this is based on the fact that most methodologies do not satisfy the different information needs of different groups of practitioners. Raghavn and Chand (1989) use innovation theory as introduced by Rogers (1983) to study the diffusion of methods and apply his framework concerning the relative advantage, complexity, compatibility, trialability, and observeability of innovations to explain that practitioners experience many problems with methods. They also argue that there is a gap between how method developers see methods and how possible adopters perceive them. Their conclusion is that methods are either oversold or poorly communicated. Their work is supported Fichman and Kemerer (1993).

Education and training are frequently mentioned as being of importance for the adoption and use of system development methodologies. A number of studies confirm this view. However, studies focusing at the role of formal university education training are sparse. Leonard-Barton (1987) emphasizes the significance of training not only for the direct users of a method, but also for their supervisors. She also refers to timing of the training. Training should be closely connected to the actual use of a method to facilitate the adoption of the method. Kozar (1989) surveyed the participants of a course on requirement analysis methods three months after the classes and found that the training itself had little influence on the adoption, but personal characteristics and organizational factors like management support seemed to be of more importance. Some of the participants actually attended the course with no intention for adoption but for social reasons or as a perk. Kautz and McMaster (1994) performed a case study on the adoption of a method in a large public service organization and found similar results. Although the developers there appreciated the training, the introduction process failed.

None of these studies, however, was concerned with the role of formal university education and the dissemination of system development methodologies. This is the background for this study. Since 1985, undergraduate students at the Copenhagen Business School have been trained in-depth in the Multiview methodology for the development of information systems. The research presented here aims at interrogating to which degree this methodology has been adopted by the students and the organizations they are working for today and what the reasons are for adoption and non-adoption.

The paper is structured as follows: In the next section, the Multiview methodology and the way it is taught are presented. Then the research approach of combining a survey study and grounded theory analysis is explained. Subsequently, the results of the study are described and discussed. The paper finishes with some conclusions.

Teaching the Multiview Methodology

The Multiview methodology covers five different stages of system analysis and design, each with its own view of the problem and with methods and techniques for solving that aspect of the problem. The methodology is documented in a textbook (Avison and Wood-Harper 1990) and covers the analysis of human activity systems, the analysis of information, the analysis and design of sociotechnical aspects, the design of the human-computer interface, and the design of the technical aspects. Many of the method components and techniques are borrowed from other well-known methods and placed in a common framework by the methodology.

In the human activity system analysis phase, emphasis is put on analyzing a problem situation as a whole from a systemic perspective avoiding a too early decomposition of the problem in distinct areas. Techniques from soft systems methodology (Checkland 1981; Checkland and Scholes 1990) are used to perform this stage. Rich pictures are a pictorial way of representing the perception of a problem situation in a graphical, but minor formal way. Root definitions are textual descriptions of relevant problems and issues on which to focus attention and conceptual models are diagrammatic representations of the activities performed in the problem situation.

The results from the human activity analysis forms a basis for the analysis of activities and information from a hard systems, or technical-oriented perspective, in the second phase of Multiview. Functional decomposition and data flow diagrams as known from structured analysis (DeMarco 1979; Yourdon 1989) as well as entity-relationship modeling techniques (Chen 1976) are proposed to provide a more formal specification of the information system being sought.

In the third phase, the system is (re)designed from a sociotechnical perspective taking people's need and work environment into account to find an appropriate organizational and technical solution. Techniques and survey instruments to analyze the professional setting are based on the ETHICS methodology (Mumford 1995; Mumford and Weir 1979).

After this phase, the human-computer interface is designed. The methodology gives no explicit help for what techniques to use; only general guidelines for screen layout and man-machine interaction are provided. The same is valid for the fifth phase: the design of the technical aspects. General advice for the use of structured English as a specification language is given, but no further mention is made of techniques for the architectural and procedural design of the future system.

From a pedagogical point of view, Multiview appears to be an appropriate instance to introduce students to system development methodologies. As a contingency approach, it emphasizes the necessity of choosing and adjusting method components and techniques according to the problem at hand. At the same time, it provides some guidance for the transition between the individual phases that define a holistic, yet flexible, framework and distinguishes the methodology from a totally loose "tool kit" approach. The methodology has been developed and tested in practice (Avison and Wood-Harper 1990) and the claim made that it is well-known (Bennetts, Wood-Harper, and Mills 1998).

In the context of the education program of the Copenhagen Business School, Multiview is used in the third and last year of the undergraduate education for a degree in computer science and management accounting, a fairly unique combination. In 60

class hours, the students in a course on definition of information systems are introduced to the Multiview methodology in formal lectures and small exercises based on the textbook and supplementary original literature. Partly in parallel, in groups of four, the students have to apply their newly gained knowledge in a project for a commercial or public sector customer in Denmark. These projects last 10 weeks and finish with a 70-page report, which documents a proposal for the design of an information system. This exercise should provide them with the ability to choose, tailor, adjust, and use methodologies in general and the Multiview methodology in particular to define information systems in their professional life.

Since 1985, approximately 570 students have successfully passed this course. The authors of this paper have all, at different points in time, taught the course.

The Research Method

To investigate the relation between formal university education and the adoption of the methodology a survey instrument was developed to reach as many of the graduates as possible. The questionnaire consisted of five parts. Part 1 asked for demographic information about the respondent, especially the class year and the current occupation. Parts 2 and 3 were directed at those who use or have used the methodology and information about the kind of projects where the methodology was applied and which method components were utilized. The respondent's opinion concerning the education was elicited. Part 4 covered the non-adopters and their reasons for non-adoption and as well as their conclusions about the training they had received in the university. Finally, part 5 dealt with the general attitude toward the methodology independent of adoption or non-adoption and gave the opportunity to comment on the survey itself.

In total, the questionnaire contained 28 questions and about 70 different attributes and consisted of both multiple choice, Lickert scale-based, and open-ended questions. Three questions—one of each kind—from the questionnaire are shown in Figure 1. The original questions were in Danish. The questions shown in Figure 1 are translated to English as accurately as possible.

The questionnaire was first tested with three selected graduates who represented the adopter and the non-adopter group. Based on feedback, the instrument was revised.

The university has a complete record of all graduates, thus 572 questionnaires were sent out. Of these, 54 were returned as the recipients could not be reached by mail. Of the remaining 518, at the cut off date 142 had answered. This results in a response rate of 27.4%.

Out the 142 answered questionnaires, 23 (16%) in fact had used or were using either part of or most of the Multiview methodology after they had left the Copenhagen Business School, whereas 119 (that is, 84%) had never used the methodology in practice after graduation.

The numbers in the following presentation may vary as not every respondent answered every question and as some reported experience from more than one project where the methodology had been adopted.

The aim of the research was a first exploration of the relationship between university education and adoption of system development methodologies. At a very general level, one could say that we were testing the hypothesis that university education

Question no. 10
 In what type of project did you use Multiview ?
 A. Organizational change project
 B. Systems development project
 C. General problem solving
 D. Process evaluation
 E. Education and training
 F. Other (please specify)

Question no. 18
 How would you characterize the adaptations of Multiview you have undertaken?
 Radical Small adjustments

Question no. 19
 What are your overall judgement of the use of Multiview in this project? _____

Figure 1. Three Questions from the Questionnaire. A Multiple Choice Type, a Likert Scale Type, and an Open-ended Question Type

will contribute to the adoption of a method in practice. But beyond this, no hypotheses were preformulated and tested. This is also the reason why no statistical correlations of the different variables were sought.

The quantitative survey technique was, however, combined with a qualitative analysis of all answers to the open-ended questions using the grounded theory methodology (Strauss and Corbin 1990). This research methodology allows the development of a substantive theory of a problem under investigation without prior hypotheses. The chosen grounded theory approach is composed of an alternation between three different coding procedures to analyze the collected data: open, axial, and selective coding.

The goal of open coding is to reveal the essential ideas found in the data. Open coding involves two essential tasks. The first task is labeling phenomena. This task involves decomposing an observation into discrete incidents or ideas. Each discrete incident or idea receives a name or label that represents the phenomenon. These names represent a concept inherent in the observation.

The second essential open coding task is discovering categories. Categorizing is the process of finding related phenomena or common concepts and themes in the accumulated data and grouping them under joint headings and thus identifying categories and sub-categories of data.

All three authors did the open coding independently on files including all answers to open questions and comments from all questionnaires.

Developing a better and deeper understanding of how the identified categories are related is the purpose of axial coding. Axial coding involves two tasks that further develop the categories and properties. The first task connects categories in terms of a sequence of relationships. For example, a causal condition or a consequence can connect two categories, or a category and a subcategory.

The second task turns back to the data for validation of the relationships. This return gives rise to the discovery and specification of the differences and similarities among and within the categories. This discovery adds variation and depth of understanding.

The first part of the axial coding was done by all three authors together. Each author presented the results of the open coding to the other two. Similarities and differences were noted and discussed. Over two long sessions, the blackboards in the room were filled with categories and relationships, they were discussed, corrected, changed, and so on, until a common understanding of the categories, subcategories, and their relationships were reached. Finally, one of the authors turned back to the data for validation. This added a few things.

Selective coding is the process of determining a core category, relating it to all other categories, validating these relationships, and elaborating those categories that need further refinement and development. The definition of only one core category is usually recommended to maintain clarity and precision and to achieve a tight integration of the categories. However, we decided that the structure of the questionnaire forced us to have two core categories, one for adopters and one for non-adopters.

Several alternations between the three coding procedures were necessary to find a satisfying categorization. This final categorization was supported by the quantitative analysis of the survey.

Results and Discussion

Strauss and Corbin clearly advocate grounded theory coding of the data until one core category stands out. However, we decided to have two core categories since we have combined grounded theory with a traditional questionnaire, and since the questionnaire was designed so all of the data clearly fell into two main categories: reasons for non-adoption and reasons for adoption.

Within both main categories, we identified five subcategories. Three of them—namely, the presentation of the methodology in the textbook and in the learning context, the methodology's appropriateness for different application areas, and its support for solving actual problems—provided reasons for those categories. Or said in another way: many of the concerns we found among non-adopters of the Multiview methodology were echoed among adopters.

Non-adoption was also influenced by the adopter's attitude to the basic concepts of the methodology and a number of reasons, which were independent from use of a particular methodology in system development. Adoption was affected by the adopter's appreciation of the basic concepts of the methodology and its capacity to provide an understanding of system development in general.

However, adopters also mentioned a number of problems and constraints for the utilization of the methodology. These fell into the same categories as the non-adopters' arguments for rejection. On the other hand, non-adopters made positive statements about the methodology, especially in the categories concerning the appreciation of the basic concepts and the capacity to support a general understanding of system development.

In the following, the results of the investigation are presented and discussed in more detail and an explanation for this seemingly paradoxical situation elaborating the main difference between the two groups of non-adopters and adopters is given. We start, however, with some general demographic information about the respondents.

General Demographics about the Respondents

The respondents of the survey work in different occupations, both in terms of industry sector and in terms of the respondents' job function in a company or organization. Table 1 contains a broad categorization and shows that most of the respondents—not very surprising—are employed in companies related to the software business. The rather large number of respondents in the “Other” category not only covers respondents in, for example, the production business, but also respondents who are studying at the graduate level and those who did not respond to this question.

A look at the respondents' job functions in their current occupation (table 2) reveals that most of the respondents are engaged in IT-related functions.

A classification of non-adopters and adopters according into business sector and job functions provides no distribution, which allows a conclusion about their use or non-use of the methodology. The same is true if the year of their graduation is considered (see Table 3).

No immediate relation between adoption and non-adoption, which might refer to the quality of a class in terms of the general abilities of the students or of a particular teacher and his/her style of education, can be found in this data.

Table 1. Business Sectors Represented in the Survey

	Public Administration and Education	Banking/ Insurance	Software Development	General Consulting	Other
Total	19	21	48	12	37
Non-adopters	18	17	37	11	32
Adopters	1	4	11	1	5

Table 2. Job Functions Represented in the Survey

	IT-related functions	Non IT-related functions	Unknown
total	107	23	9
non-adopters	93	15	9
adopters	14	8	-

Table 3. Non-adopters' and Adopters' Graduation Years

year	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	total
non-adopters	6	11	6	8	2	11	18	13	14	16	12	117
adopters	5	1	3	-	-	1	3	1	2	3	3	22

Non-Adoption of the Methodology

In total, 117 respondents (83% of the sample) replied that they did not use the methodology. However only 23 (20%) of the non-adopters, definitely did not want to recommend Multiview to other potential adopters. In addition, 10 were insecure whether they would advise the utilization of the methodology or not. Various reasons have been stated for non-adoption. These will be presented and discussed in the next subsections.

Methodology-Independent Reasons

One respondent declared that he had totally forgotten the methodology, as he did not work in system development. As such, he was part of the 25% (30 individuals) who answered that they did not work within system development and had jobs where Multiview was irrelevant. Company standards represented a significant obstacle for the adoption of the methodology: 17% (20 people) said that Multiview was incompatible with their organization's procedures for method use and 11 respondents answered that their company had its own methodology which they used. The survey did not investigate if the respondents were not in a position to introduce a new methodology or if they did not see any benefits in a potential introduction of Multiview. A few non-adopters stated that Multiview is not widely known in Denmark. Finally, 10 former students reported that they worked in companies that do not use methodologies for system development at all. These would be part of the potential adopter group; possible reasons for the non-adoption of the methodology are given below.

Application Area

The companies' business areas seemed to be a major constraint for the utilization for a particular methodology: 25% of the non-adopters named this as a reason for not using Multiview, 35% affirmed that the methodology had not been applicable in their company's problem areas, and 15% were not sure whether the methodology was suitable for their problem fields. As examples they mentioned the definition of IT strategies, the design of technical, "userless" software systems, the development and adjustment of standard packages, the development of multimedia systems, and the development of workflow-oriented systems. Ignoring possible benefits of a thorough early analysis of the problem at hand, the main criticism was that Multiview gave too little concrete help for the technical activities of these application areas. An interesting statement was made by one individual who put forward that Multiview dealt explicitly not only with technical development, but also with organizational change and that this might be a

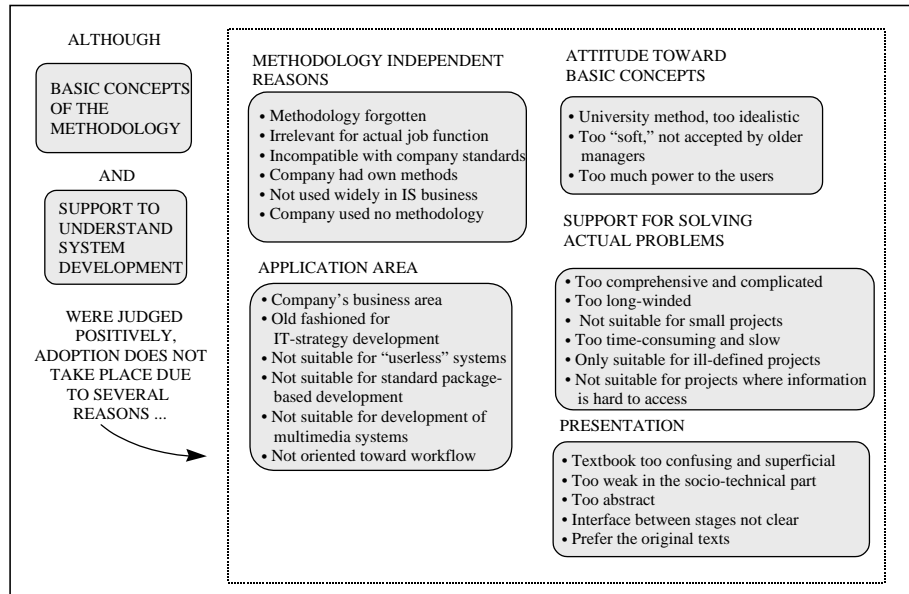


Figure 2. Rationale for Non-adoption

reason why more technical-oriented companies and system developers did not want to apply the methodology. This argument will be deepened in the next subsection.

Attitude Toward the Basic Concepts of the Methodology

A few (eight) respondents expressed that the methodology was opposed to their company’s culture. Multiview was considered as too idealistic and too soft. Some argued that this might explain why more traditional, older managers in both supplier and customer organizations did not appreciate the approach. But by far the largest group of non-adopters, 36% (42 individuals) agreed to the statement that it had never felt natural to them to use the methodology. A possible explanation might be Multiview’s orientation toward organizational issues. One respondent put forward that these and socio-technical aspects should lie with the customer and not with the system developer, another claimed that the methodology gave too much influence to the users, and a third totally disagreed with the basic ideas of the methodology.

Support for Solving Actual Problems

Further reasons for non-adoption clearly lay in the perception of how the methodology could be used to solve actual problems. Some non-adopters emphasized that Multiview was too comprehensive, complex, and long-winded to be applied, especially in small projects. As a result, 15% regarded the methodology as too time-consuming and only

fitting for large projects. The close cooperation with users was also named as a problem, making the methodology not suitable for projects that involve management or external customers. Finally, non-adopters argued that the methodology is only appropriate for ill-defined problems. One thought, however, that it could not be used in areas where knowledge was not easily accessible and varying. Even if many of these reasons seem to be based on a misunderstanding of the basic principles of Multiview, they are valid concerns for non-adoption. The only experience that non-adopters had with the methodology came from their university education. How they deemed this training is the subject of the next subsection.

Presentation of the Methodology in an Education Context and Positive Attitudes of Non-Adopters

One non-adopter reasoned that Multiview was not known in Denmark in the commercial field and that consequently it was not used. His conclusion was that training in the methodology, therefore, was a waste of time. Others were more specific with their perception of the education. The textbook was characterized as confusing and superficial; the part about socio-technique was especially felt to be very weak. The description of the methodology and its component methods was experienced as very abstract and the component methods were perceived as having a very little connection with each other. Therefore, non-adopters recommended the use of the original literature to provide a better understanding of the techniques used in the different stages.

Concerning the quality of the education, only four respondents thought that the training had been so bad that a major effort by themselves would be needed to use the methodology in practice; nine were not sure whether they mastered the methodology. In contrast 24% (28 former students) answered that the education had given them the necessary understanding to completely master the methodology in a use situation. The majority, 77%, 90 individuals, meant that the education had given them an introduction to Multiview which they could develop into mastery through further use in practice. This, together with some of the problems listed above, indicates that one system development project might not be enough even in an educational context to pass on the message of a methodology. On the other hand, a number (seven to be quite exact) of the respondents stressed that the training had given them a good introduction to system development and system development methodologies in general. It had provided them with knowledge about how methods and techniques could be combined and how important social and human issues were for system development.

One respondent summarized his opinion by stating that Multiview could not be applied stringently, but that the principles and ideas were very useful. Others supported this by explaining that the methodology built their basis for the selection, adjustment and use of other methodologies and that they appreciated having background knowledge about a holistic, multiperspective approach to system development. Thus 44 (38%), although not using the methodology themselves, would recommend it to other developers. With such a positive evaluation, what makes the difference between non-adopters and adopters?

Adoption of the Methodology

The 22 methodology adopters provided detailed information about 23 projects in which Multiview had been used: seven adopters had deployed it in more than three projects, 12 in just one project, and the rest in two or three projects. In the projects, 15 adopters acted as project leaders and the remainder as project members. This allows no conclusion about the relation of adoption and the adopter's position in a project

Only in four projects was the methodology the officially approved standard. This may indicate that the use of the Multiview methodology was not deeply anchored within the adopting projects and organizations.

Concerning the projects' objectives (the outcome of the first question shown in Figure 1), eight projects aimed at general problem solving, four explicitly at organizational change, and 16 were systems development projects. This shows that the methodology was applied in various situations.

The adoption of the methodology was, however, accompanied by a number of constraints and impediments, which are described here before an analysis of why and how these obstacles were overcome is presented.

Adoption Constraints

The constraints for the adoption of Multiview have been classified in the same categories as the arguments for non-adoption.

Methodology-Independent Reasons. A few adopters mentioned that many companies have their own methodologies, which they do not want to change. More emphasis, however, was put on the fact that Multiview is little known in the Danish industry and public sector and that methodologies in general require training, both formally and on-the-job. In addition, methodology use often requires the capability and willingness to abstract from a concrete situation as a starting point for a thorough inquiry and elucidates the difficulty of identifying the proper boundaries of a system to be analyzed and developed. Rather than adopting an unknown methodology, organizations interested in fast solutions might choose to ignore these general considerations and not adopt a methodology at all.

Application Area and Support for Solving Actual Problems. Several adopters put forward that Multiview does not contain any assistance for project management, which might be a reason to reject the methodology in total. More severe reasons, however, were that the methodology comprises too many problems areas and thus too many methods and techniques, which make it very time and resource consuming such that the customers will not pay for it. One adopter named explicitly functional decomposition and entity analysis as requiring too much detail and effort. The demand for conscientiousness and accuracy—although requested by methodologies in general—was emphasized especially as important, but difficult to fulfil for a methodology with many component methods. Finally, one adopter presented his opinion that Multiview was only suitable for uncomplicated systems, whereas another postulated that the methodology presupposes the problem to be solved to be imprecise. Both statements show a clear misunderstanding of the methodology, but have to be taken as possible obstacles for the adoption of the methodology.

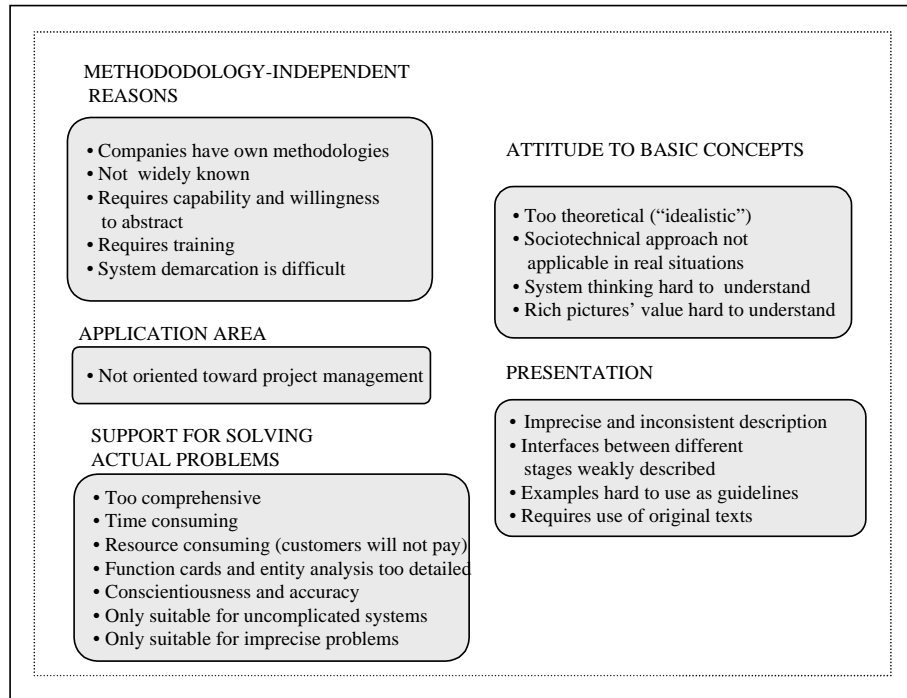


Figure 3. Adoption Constraints Stated by Adopters of the Methodology

Adopter’s Attitude to the Basic Concepts of the Methodology. Some adopters stated that Multiview, as a whole was very idealistic and theoretical as opposed to the reality of commercial life. This might impede its dissemination. Especially the socio-technical approach was brought up as not applicable in real life. System thinking was qualified as being very abstract and thus hard to understand and apply outside academia. It was also said that the value of rich pictures in an area characterized by a preference for more formal techniques was not easy to understand and therefore not appreciated.

Presentation of the Methodology in an Education Context. Strong critique was stated with respect to the Multiview textbook. Many adopters complained that the component methods were described imprecisely and inconsistently and that the interaction between the different stages of the methodology was weakly explained. The examples in the book were judged to be hard to use as guidelines as they appeared to be too straightforward for a complex real-life problem situation. Thus, several respondents concluded that learning the methodology required the use of the original texts explaining the component methods. This was especially emphasized by one adopter, who stated that Multiview in particular applies the soft systems methodology in a way that could be debated as it in contrast to the original, delimiting the number of possible problem solutions very early in the development process.

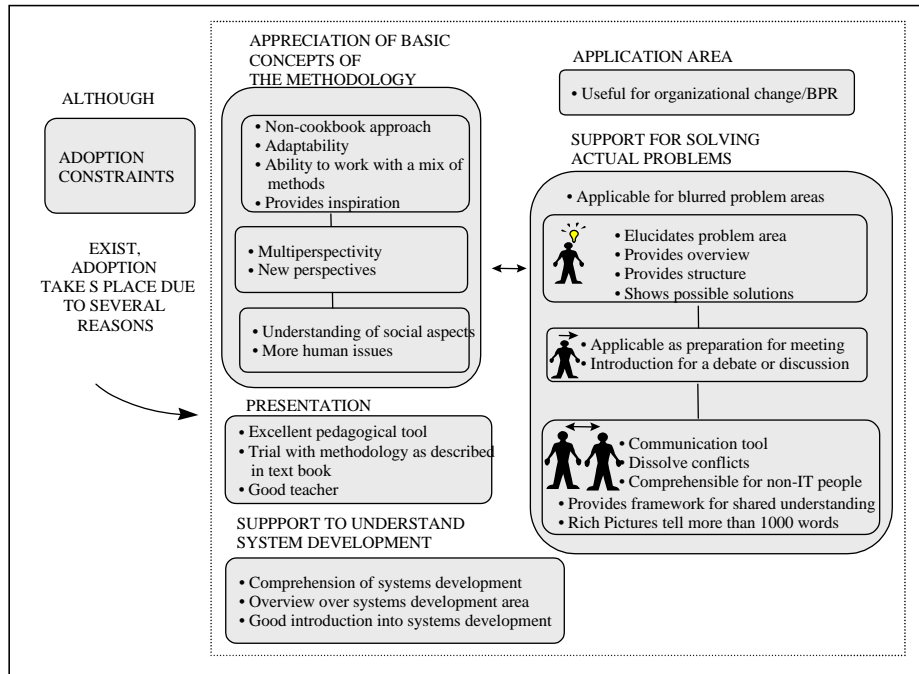


Figure 4. Rationale for Adoption

Reasons for Adoption

The constraints did not, however, prevent the adopters from using the methodology.

Appreciation of the Basic Concepts of the Methodology. Adopters stated that Multiview is not a cookbook-like approach which has to be followed, as in the examples in the textbook, but accentuated the adaptability of the methodology to a given problem situation as an important feature. The methodology provided them with inspiration to develop a suitable approach themselves and as a flexible framework fostered the ability to combine methods and techniques to carry out specific projects. Its multiperspectivity was mentioned as allowing different views on one problem situation and supporting an understanding of social aspects and the inclusion of more human aspects. These characteristics assisted the development of appropriate problem solutions.

In accordance with the ideas of Multiview, not all parts of the methodology were used to the same degree. Table 4 shows that only in three projects were all of the methodology components applied. In the rest, adjustments in the form of selection of methodology components, the use of the original methodologies like soft systems methodology or structured analysis and not the Multiview interpretation, or supplements with methods for project management, cultural analysis, stakeholder analysis, work flow analysis, prototyping, or formal specification techniques had been performed.

The degree of the adjustments was judged differently, but were felt legitimate as part of the adoption of Multiview (see Table 5).

As a result, the majority of the adopters were satisfied with the utilization of the method components and their outcome (see Table 6).

Application Area and Support for Solving Actual Problems. No application area for the methodology was especially emphasized with the exception of its support for organizational change in general or organizational change through the introduction of information systems. One respondent stated that to his knowledge Multiview was the only methodology providing this combination.

Table 4. Use of the Methodology Techniques

Project no./used technique	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	tot.	
Rich pictures	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x			x	21
Root definitions	x	x		x	x			x	x		x						x		x	x	x			x	12
Conceptual models	x			x				x	x		x					x	x				x	x		x	10
Function charts			x	x			x	x	x							x	x								6
Data-flow diagrams	x		x	x			x	x	x	x						x	x				x	x	x	x	13
Entity descriptions	x		x	x			x	x	x	x						x	x				x	x	x	x	13
Sociotechnical	x	x		x				x	x							x	x	x					x		9
User interface		x		x				x				x				x	x	x				x			8
Technical aspects				x				x				x				x	x	x				x			7

Table 5. Degree of Adjustment Judged by the Adopters

degree of adjustment	radical	considerable	mediocre	minor	very little
no. of adopters	1	5	5	5	4

Table 6. Adopters' Satisfaction with the Used Method Components

	very satisfied	satisfied	ok	less satisfied	not satisfied	total
Rich pictures	15	4	1	1	-	21
Root definitions	6	3	2	-	1	12
Conceptual models	5	4	-	-	1	10
Function charts	1	-	2	2	1	6
Data-flow diagrams	5	1	6	-	1	13
Entity descriptions	5	2	4	1	1	13
Sociotechnical	1	4	3	-	1	9
User interface	-	-	3	4	1	8
Technical aspects	-	2	1	3	1	7

Concerning the support for solving actual problems, it was stressed that the methodology was applicable for blurred and ill-defined problem areas. Most adopters emphasized that Multiview helped in elucidating the problem domain and gave an overview of the problem. A third of the methodology users stated that the methodology structured both the problem situation and the solution process. It was seen as an advantage that the methodology supported not only the development of one solutions, but that it assisted the elaboration of several, alternative ways of resolving a problem. Beyond the deployment of the methodology as a structuration device for individual users and for project group, the adopters listed some characteristics of Multiview that related to the presentation and communication of thoughts and ideas to other project members or stakeholders in the development process. The results produced with techniques of the methodology were appreciated as a means for the preparation of meetings and for the introduction of discussion and debate. Especially, the value of rich pictures was underlined in this context. Finally, in addition to serving as a presentation means, Multiview was considered as a good coordination device and communication tool. Again, rich pictures were named in particular; one respondent paraphrased a well-known saying and put forward that rich pictures told more than 1,000 words. Others saw the value of the methodology in its support for constructively dissolving conflicts. The techniques in the early stages were, furthermore, described as being understandable to non-IT people. This was supplemented by nearly half of the adopters by the opinion that the methodology and the intermediate products developed by its utilization provided a framework for a shared understanding of all people involved. In addition, the use of rich pictures was experienced as enjoyable and pleasant. This might contribute to a positive atmosphere and motivation in the project.

The positive aspects presented in this subsection barely dealt with technical issues; they dealt with social matters of system development. The adopters' attitudes toward Multiview with regard to these issues was discussed in the previous subsections. The section built on the methodology's broad understanding of system development. The role the training played in this context is subject of the next subsection.

Understanding System Development and Presentation of the Methodology in an Education Context. Some adopters stated that Multiview had given them an overview of the different aspects of system development and an understanding of the activities that have to be performed in system development projects. The methodology and the training they had received were considered a good introduction into the subject field. One respondent described the methodology as an excellent pedagogical tool and another underlined the value of the student projects in which the methodology and most of its techniques were tried out extensively and mainly as described in the textbook. Some former students emphasized the role of good teachers in this context and reinforced the role of education for most of the aspects discussed in the previous sections.

Concerning the quality of the education, the majority stated that the training had either given them an understanding of the single techniques to master them completely or at least provided them with an introduction they could develop into mastery through practice. Only a few adopters thought that parts of the education had been insufficient. This was true especially for the analysis of the sociotechnical aspects, the development of user interfaces, and the technical design activities. They meant they had needed an extra effort to achieve mastery of the techniques in practice. The assessment of the training in the individual method components and techniques is presented in Table 7.

The overall judgment of the methodology was very positive: 14 adopters would recommend Multiview to other developers, but not for direct use. The methodology was suggested as a device for training and education in system development or as a resource for the selection of methods. Some adopters limited their recommendation to parts of the methodology, especially to the parts from the Soft Systems Methodology. Others advocated Multiview as a basis for a methodological approach or as a background for tailoring a methodology suitable for the respective organization or problem situation. This was one of the major differences between non-adopters and adopters. Despite a critical attitude, adopters had tailored and adjusted the methodology such that it served their purposes and could be appropriately used in their projects.

Table 7. Quality of Training in the Techniques Included in Multiview

	mastery of the techniques	good introduction	insufficient introduction
Rich pictures	12	10	
Root definitions	9	11	1
Conceptual models	8	13	1
Function charts	4	13	1
Data-flow diagrams	6	12	1
Entity descriptions	9	12	1
Sociotechnical	4	14	5
User interface	2	10	7
Technical aspects	1	15	5

Conclusions

Quite few—16%— of the former students use or have used the Multiview methodology after their formal university education at the Copenhagen Business School. Among the arguments for non-adoption were methodology independent reasons, the methodology's suitability for certain application areas and for solving actual problems. An important factor was the respondents' attitude toward the basic principles of the methodology—the "Weltanschauung" as it would be named in the Multiview methodology.

Criticism was also put forward about the quality of the textbook as a major source for presenting the methodology in an educational context. Non-adopters and adopters shared many of these issues. The overall evaluation of the training was, however, positive. This indicates that reasons other than education have a significant influence on adoption and non-adoption.

Adopters seemed to understand the principles of the methodology, namely combining technical and social aspects of system development and the contingency approach promoting the selection and adjustment of method components and techniques as being

far more advantageous. It looks as if they abstracted from the concrete application in the training situation and utilized the methodology to fit their problem situation.

Taking into account the environmental and methodology-inherent reasons for non-adoption and adoption, the remaining questions are:

- To what extent is education connected to the ability or willingness to reflect about and abstract from the concepts of a methodology as presented as part of a formal education?
- To what extent is education related to appropriate application in practice?

We believe these two questions should be subjects for further research.

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