Methodologies Choice and Adoption: Using Diffusion of Innovations as the Theoretical Framework

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ABSTRACT

This goal of this paper is to represent the method choice and adoption factors in two organizations over the 43 years period. General theoretical framework, chosen research approach, the research problems concerning method choice, implementation and use (adoption), the research methodology, related research and historical background of the organizations are represented. Methods for validity and reliability checking of the data sources are checked. The method choice using the theory of Diffusion of Innovations is taken as a focal point in this research.

Introduction

The goal of the research was to find out how and why the Information Systems (IS) methods are adapted. The research was searching answers for IS methods choise, use and implementation. Theoretical framework was adapted from Diffusion of Innovations (DI) theory to help adopt the empirical data to the frameworks. The study is motivated by the fact that IS development work uses a lot of different methods, new methods are coming all the time, but how they are really used in practice is not known. The research started in spring 1995 and the study was carried out through a longitudinal case study of method adoption, use and implementation. The methods taken to this research are from years 1954 until December 1997 and it includes two Finnish organizations and three locals in this 43 years period. The author was a neural researcher having no personal interests or relationship to the organizations. This investigation is related to several research traditions but the focal point in this paper is in Diffusion of Innovations theory. Framework was adapted from this theory to study context, content of technical and organizational change.

Basic Definitions of the Research

IEEE- standard defines **Methods, Tools and Techniques** on a formal way: "... specify the computing system(s), development methodology(s), team structure(s), programming language(s) and other notations, tool, techniques, and methods to be used to specify, design, build, test, integrate, document, deliver, modify or maintain or both (as appropriate) the project deliverables. In addition, technical standards, policies and procedures governing development or modification or both of the work products, and project deliverables shall be included, either directly or by reference to other documents"[5] (IEEE). In this research **methods** are defined as the normative rules, which are defined beforehand or sentences how the system work should be done. The definition also covers project work tools, methods, phasing and actual notations. Because the definition is so general, phasing, programming methods, system design methods, strategic planning methods, "home-grown" or invented methods, project instructions, standards etc. are included. The term **local** is very general in literature and can have very many different meanings. According to

Giddens the term local means " A physical region involved as part of the setting of interaction, having definite boundaries which help to concentrate interaction in one way or another" [16] (Giddens). In this research the **local** can be a certain physical environment, where people have been in interaction with each other and have affected other people's thinking. In some circumstances it can be a organization unit, in some cases several units, in some cases only a half of the unit, if the unit is divided physically. I will define the local as the unit, which has developed methods and/or used them. Because the factors for the method adoption or non adoption, use and implementation in two organizations are tried to be found out, adaptation, rejection, use, re-invention and organization are defined. Method knowledge evolution is defined, because people learn from methods while they are using them and learning is an important aspect in adaptation process. The methods are handled as innovations. An improved method can be called innovation only when it is widely spread, it is used and perhaps modified in certain extend, changed to fit better the circumstances it was adapted. Rogers [725] says: "**Adaptation** is a decision to make full use of an innovation as the best course of action available. **Rejection** is a decision not to adapt an innovation. The decision stage in the innovation-decision process occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adapt or reject an innovation. Adaptation of an innovation is thus a process of social construction and **adaptation** is the decision to **use** an innovation" [725, p. 389]. Sauer and Lau define **adoption** as " adoption refers to the process that is directed to the acceptance and institutionalization of an already selected methodology "[726]. According Rogers [725] "**implementation** occurs when an individual (or other decision-making unit) puts an innovation into **use**." Rogers [725] defines **re-invention** as the " degree to which an innovation is changed or modified by a user in the process of its adoption and implementation." "An **organization** is a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and division of labor ", but the organization size and structural characteristics affect, too [725]. From software engineering definitions to **the program evolution** (including code and documentation) [828], [831], **the system evolution** ("maintenance of the validity of the embedded assumption set as the intended application, the application domain, perception of both and user objectives change and evolve" [829] and to **the evolution in Software Technology**, especially in the software processes [830]. The formal definition best suited to my own research was found from Lehman [832]: "**evolving** is developing, adapting and enhancing software that is normally defined as software that implies an application or addresses a problem in the real world. Continuing efforts to improve the process of software evolution have produced numerous concepts, methods, techniques and tools. " The methodology evolution means that a method is first taken in use and then after certain procedures and trials it has been improved to suite better to the purposes of that particular

organization or part of it, called a local. The method is evolving to another from one generation to another because of the improvements have been made. Sometimes the improvements come inside, sometimes from outside after a while when some development circles have been gone through. When people are using methods, their knowledge of them arises, so the definition of **evolution of methodological knowledge** is needed. When thinking of how the **methods use evolves** the **organizational learning** has to be defined. Huber [734] defines organizational learning to be related to four constructs: knowledge acquisition, information distribution, information interpretation and organizational memory and this definition is taken as the basis for evolution of methodological knowledge in this work.

The General Theoretical Research Framework

There are two levels, two aspects concerning how the method use evolves. One is the general academic discourse, the other is how the method use evolves in local practice. In the local practice the organizational learning and how it can be explained is important. The local practice is people doing the system work. The theoretical discourse about methods, called method evolution, and the method evolution in local practice interact with each other, and between them exist method knowledge transfer mechanisms or marketing mechanisms, which can be education or communication channels etc. There is the academic discourse having some intermediate mechanisms, consultants, literature and seminars etc. using different communication channels and theoretical discourse receives information from these intermediate channels. Theoretical discourse from methods, called method evolution, leads to evolution of methodological knowledge. Academic community and some consultants are doing this theoretical discourse. Theoretical discourse evolves with the help of technological evolution, knowledge feedback, organizational evolution, with the help of theoretical frameworks. These things explain how the academic discourse from method use evolves. Then there is also a feedback from local practice, from people who have used methods, to the theoretical discourse from methods. In the local practice the question is how the method knowledge is chosen, adapted and taken in use. Organizational learning, Diffusion of Innovations and Actor-Network theory are the used theories explaining the latter, but only the Diffusion of Innovations is taken as the focal point in this paper. Each of the components have their own time and theoretical discourse and the local practice intermediate with each other. Figure 1.

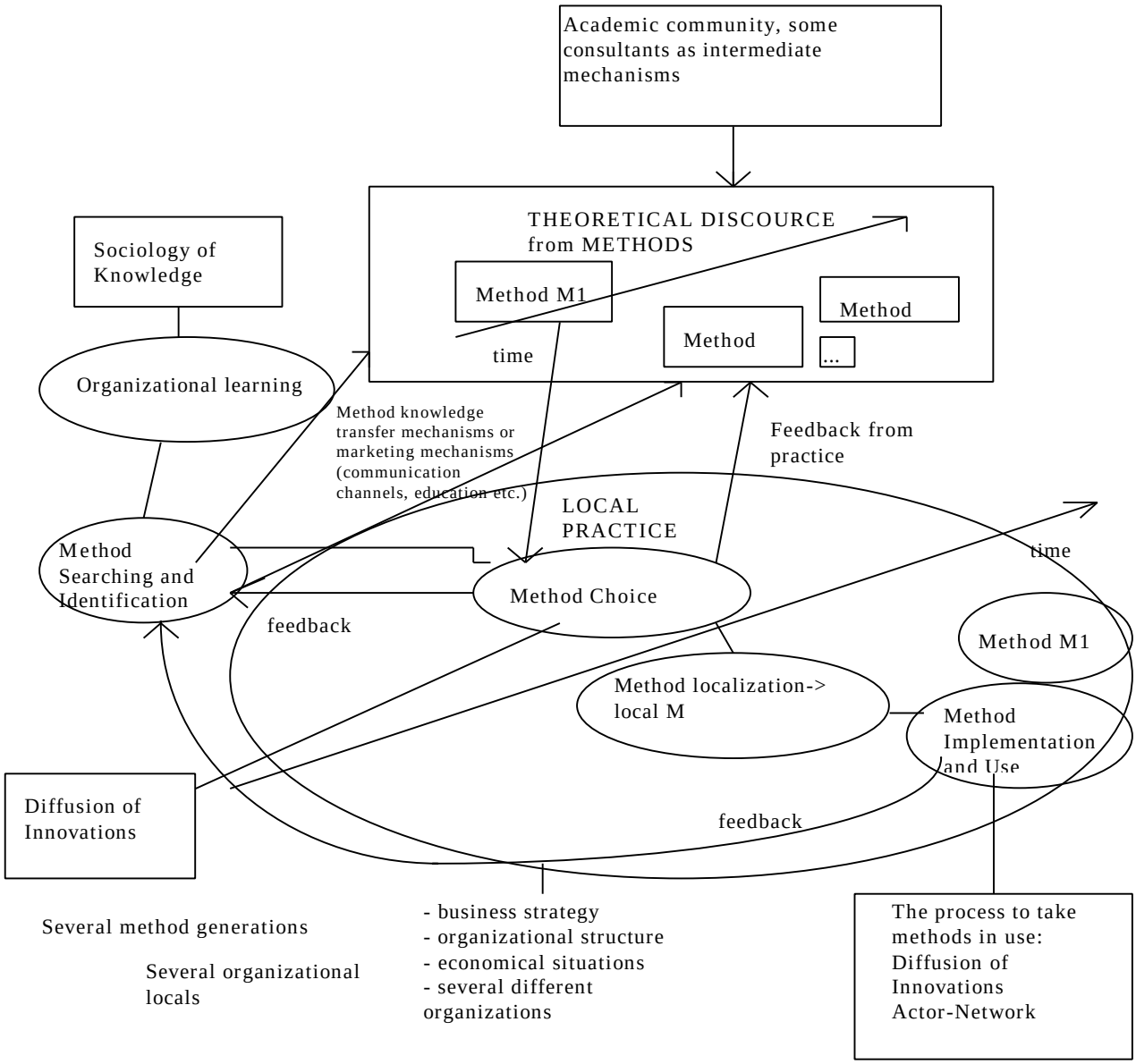

Figure 1. The Theoretical Framework of the research.

There are aspects like method searching and identification and how they evolve through time and method localization but they are not included. The main research question concerns the method choice. A person can have several methods, which he/she has searched for and what are the reasons that only one particular is chosen. The next main question is what are the reasons that the person or organization adapts this particular method, the use and implementation. When the method is looked at after a while in time being the next question is, is it really used and where is it used in the organization. We must find out are the factors for method choice and after the choice has been done, then there is the implementation and use processes. There are the questions in what way the introduction process of a new method has happened, in what way it has been explained, when a method has been taken in use or not taken in use, the adaptation of a new method, how is it used or is it used differently than it's purpose was. There can be a

feedback loops from method choice , implementation, use (adaptation) to method searching and identification and these feedback can lead to search for new methods. After a method has chosen, the factors affecting the choice can be explained with the Diffusion of Innovations theory. The next is the introduction process. In method implementation, use and adaptation Diffusion of Innovations and Actor-Network theory are taken into basis but only DI in now taken as the basis. There are other parameters, because of two organizations, three different locals in which these events have occurred and all of them have different variations concerning the method choice, implementation and use (adaptation). There is the time aspect, different method generations, different business strategies and changes in them, organizational structures and economical situations all of which are important time aspects in the research. The contextual aspect, the different places in which these changes have occurred, the two organizations and three different locals must also be taken into account.

Diffusion of Innovations theory

The original meaning of innovation is a technical improvement having diffused to a large use and because of this it effects largely to the technical level of some activities. For innovations it is characteristics they have diffused after certain developmental stages and they are economically important to their users and their producers [833]. It is important to look innovations as a process, which starts from an idea that something can be done in a better way. Normally the idea is a combination to full fill a certain need and to implement it. Then the development process begins, the trials and searching began for example with a prototype and diffusing it to a large use using marketing as a tool. Normally an innovation creates new needs after diffusing to a large extend and new innovations are born due to this. The innovation is bounded in time and it develops when the environment develops. It is also a step of the technical level and it is always a change process and a learning process including the stages of decisions describing the stages of choice and putting up the goals. When thinking of the organizations the environment is important, because it is changing all the time and affecting to an innovation. The environment is the most important source of an organization concerning the knowledge, the needs, the resources and the know-how. If an innovation succeeds it must win the older innovations which are in the markets and in use and the new products which are entering to the same markets at the same time. Because of this it must have certain advantages, technical or commercial ones and it becomes successful only when it diffuses in a large use, meaning that it is adopted. This adoption process consists of five stages: the initiation, becoming interested in, evaluation, trials and adoption/rejection. The initiation happens when people notice that something can be done in a better way. Becoming interested happens when after initiation the same or almost equal information is heard from different sources and people start to think themselves that this

innovation is good and practical to use. The acquisition of the knowledge and comparing them with other knowledge, the evaluation, comes next. In the trial stage the innovation is taken in use for a short period and finally the rejection/adoption occurs if the innovation is suitable or not for the use. In the two first stages there must be conditions (factors) to be full filled: a person trying an innovation must feel himself/herself to be in a secure position, her/his mental performance ability, the social status and independence must be clear. In the third and fourth stage the norms of the social environment, the economical restrictions and the resources in the functioning environment are effecting. In the rejection/adoption stage it is important to realize the characteristics of the innovation, the relative advantage, compatibility, complexity, the possibility to be shared in parts, and the communication ability. This five stage model emphasizes the unity of an individual and the organization in the learning process of an innovation. This learning process is dependent of different factors: it is essentially dependent of communication, which is dependent of the culture and atmosphere an individual or the organization is working. There can be organizations which are strong in learning and development ability or there can be organizations which are weak in learning and development ability. The latter ones emphasize to retain and control the present situation, status quo, and the first ones emphasize to make things in a new way all the time, meaning that adoption of innovation happens all the time [833, pages 44-64]. The methods can be handled as innovations and the diffusion theory gives certain factors explaining why an innovation was adapted or non-adapted. There are five stages in the innovation process according Rogers [725] and the process consists of two broad activities called initiation and implementation. Initiation becomes before the decision to adopt is made and it consists of agenda-setting and matching stages. Implementation comes after the decision to adapt is made and it consists of redefining/restructuring, clarifying and routinizing stages. The decision to adopt divides initiation from implementation [725, page 392]. There are certain types of innovation decisions which are optional innovation-decisions, collective innovation-decisions, authority innovation-decisions and contingent innovation-decisions. From diffusion Rogers [725] says: " ... a major technological advance in such fields as military weapons, medicine or agriculture requires not just one innovation, but a cluster of innovations, often as many as dozens." Rogers continues that "The innovation-development process consists of all the decisions and activities, and their impacts that occur from recognition of a need or problem, through research, development and commercialization of an innovation, through diffusion and adaptation of the innovation by users, to its consequences." According Wolfe [730] " Diffusion of Innovation (DI) refers to its spread through a population of potential adopters. Its unit of analysis is the innovation. The objective of DI research is to explain or predict rates and patterns of innovation adoption over time and/or space. DI research analysis focuses upon the fit of hypothesized innovation diffusion models to actual diffusion histories. An

outcome of DI research has been the identification of innovation attributes which ostensibly influence innovation. For example the attributes can be relative advantage, compatibility, complexity, trial ability, and observation ability, classification of adopters which are presumed to have different characteristics and tendencies to adopt. The process of diffusion of innovation among organizations, however, is very different from that among individuals. March and Simon [727] argue that communication between organization members and group resource allocation are important factors in the innovation process in the organization [727]. They say: " In the group situation the process requires interpersonal communication. For the superiority of group over individual problem-solving capacities are a) scattering of errors, b) extra influence of considered judgments, because not all proposed solutions will have equal weight with group members, c) extra influence of confident judgments meaning that those members who are most likely to be correct are also most likely to be confident of their answers and d) the division of labor. In handling some problems, the entire group need not deal with the whole problem, but may divide it up in some way and assign the parts to "specialists." This will speed up the solution process and may also improve the quality of solutions. According March and Simon [727], communication are the processes themselves made up by aggregating very large numbers of elements, each element, taken by itself, being exceedingly simple. One important element of organization structure is a set of understandings and expectations among the participants as to what bodies of information repose where in the structure. The set of expectations and understandings is a major determinant of the use of communications channels [727, p. 180]. But when decisions are satisfying rather than optimizing decisions, resource allocation to new programs will depend substantially on the communication structure through which proposals are processed from entrepreneurs to investors and on the order of presentation of alternatives. Interpersonal communication is a more primitive and limited coordinate mechanism than are the neural processes [727, p. 192]. When an organization has slack money or manpower not committed to going programs, various specialization of function may arise with respect to commitment to new programs and program elaboration. The investor is in a position to make decisions on the allocation of resources, including decisions among competing claims: the entrepreneur is the source of program suggestions [727, p. 187]. A solution model emphasizing the role of know-how and organizational learning as possible barriers to adopt an innovation was developed by Attewell [733]. It was a business computing in the United States. He suggested that this knowledge or learning burden of end users must be innovated in developing novel institutional mechanisms for reducing it and he described nine different mechanisms in his Knowledge-Barrier Institutional-Network Approach to lower the knowledge threshold for adapting computers. These mechanisms, which are called knowledge transfer intermediaries (diffusion and the question of expertise, the importance of computer bureaus for diffusion,

manufactures and knowledge barriers, the role of consultants, recycling software, standards, shells and interfaces, the troubleshooting expertise: help lines and users group, dynamics within the user firm (centralized to self-service) and mavens and gurus, who are informal expertise) did not eliminate learning and knowledge on the part of computer users, but simply shifted the locus of that learning [733].

Related Research

Wynekoop and Russo estimated 127 studies in their article [732] about how many system development methods (SDM) were selected, adapted, used and developed empirically and it showed that "surveys have indicated that whether organizations develop their own methodologies or buy commercial ones, SDMs are usually adapted, but there exist no knowledge about the process by which these SDMs are selected, developed or adapted. Existing studies of SDM selection and adaptation reveal that some companies select and adapt SDMs in an ad hoc. Individuals acquire the skills necessary to adapt SDMs primarily from experience. Little in known about the motivations or processes for SDM selection, adaptation or development or whether current practices are satisfactory. SDM adaptation, selection and development is longitudinal and the reasons for, and methods of, selecting, developing and adapting methods are determined largely by context. Little is known about the use of SDMs. It is not known why only half of all projects use an SDM. It is not known when an SDM is viewed as a help and when as a hindrance. Insight into these areas could be offered by practitioners describing SDM use in their organization [732]."

Fitzgerald [731] says "experienced developers are likely to use methodologies, albeit ones which have been heavily customized to the exigencies of the particular situation." He points out two relevant factors to methodology usage and non-usage: for non-usage of commercial methodologies he argues to be based on a position of knowledge, rather than ignorance. The factor concerning developer experience and methodology usage according him is due to the fact that experienced developers do not object to methodological guidelines that make sense and they used a methodology if it was logical and made sense" [731]. Tailored made methodologies are more likely to be adapted by experienced developers than generic methodologies which are touted as universally applicable". He continues: " practitioners will not adopt formalized methodologies in their prescribed form and they may be modifying and omitting aspects of methodologies in a very pragmatic and knowledgeable fashion" [731]. Sauer and Lau examined SSADM methodology adoption in a government agency [726] and they found out factors effecting business managers adaptation decisions to reject the methodology, who were influenced by changes in the strategic environment, pressures from client agencies and indirect pressure from interest groups.

The Organizations and Their Historical Background

These two research organizations, companies, have a common history from year 1984. From literature Friedman and Cornford have written a similar research [40]. The Companies are XX Oy, YY Oy later called ZZ Oy . XX Oy is a big paper producing corporation in the area of wood processing industry and YY Oy is specialized in designing, implementing and maintaining information systems. From 1993 ZZ Oy has belonged to the KK Oy [809], which is a large Information Technology company in Finland. The first to follow are the roots of the XX Oy's Automatic Data Processing (ADP) function in it's historical context from 1954 until 1969. The ADP began in Imatra in 1954 and it expanded to Helsinki in 1961. In 1969 the Central Administration's ADP department was established and it ended in 1984. In 1984 XX Oy's ADP department's personal was sold out, outsourcing occurred, and they established ZZ Oy. At the same time Central Administration's Information Systems Department, called the CAIS department was established in XX Oy [4]. After 1984 the roots of ZZ Oy are followed concerning the used methods and their evolution in the information systems, which ZZ Oy has designed, implemented and maintained for XX Oy . The time frame of the study covers the following four phases: years between 1954-1969 in XX Oy, 1969-1984 in XX Oy, 1984-1995 in ZZ Oy and finally 1995-1997in YY Oy.

Chosen Research Approach

In the literature in the area of "to adapt methodologies and take them in use" there exists several parallel or one of top of another theoretical traditions in which these kinds of adaptation problem in the social systems are examined. In Finland there has been official committees to standardize the methods in system development work [36], [37], [38](SFS Handbooks), but they have not succeeded in standardizing because normally every company, every automatic data processing department or information systems department, organizations and also people working in these departments and organizations use and adopt methods in their own way. The system development methods have been classified according to five different categories in the literature [32] (Lyytinen),visions of future system development and method development have been written [33] (Lyytinen). How the organizations actually adapt the methods and how they really use the methods has been studied only little [42] (Smolander &co.). This research is important because there are a lot of unanswered questions in method adaptation according to Wynekoop&Russo [35].

The research problems and methodology

Our research problem was to study how and why the methods were chosen, adopted and how they were used in practice in time being. This field study began in spring 1995 and ended in December 1997 .We collected perceptions of the decisions to take or not to take a certain method in use and implementation process, the trials to adopt it, how method is chosen. The general theoretical research framework in figure 1. concerns one method and the history of this

one method is found out. Several different methods were found over this 43 years period all of which occurred for different reasons and times and we are trying to organize the history from each of the found methods and explain the factors with the theory of Diffusion of Innovations. The main idea is to adjust all these methods into this framework. The methods, the contextual events and development, the historical data of the organizations are gathered by a field study the approach of which Johnson gives a detailed description and analysis in his book on field-research methods [836]. This empirical data, tape recorded semi-structured interviews and tape recorded stories people were telling freely from their experiences about their method experiences etc. and changes in the organization environment, and the archival data received from them in their private files and from public files included data, experience and knowledge, which these different stakeholders, system designers, end-users, Automatic Data Processing managers, method developers, project managers, programmers, client service managers, automatic data processing consultants, design managers**,** system design group's foremen, system designers, operation and maintain managers, development managers, managing directors, quality manager, personal manager, information technology managers, director of IT, operators and economy manager have from 1954 until December 1997. The study is qualitative [9](Markus), [39](Newman), retrospective, processual [721], [723], historical [721], longitudinal [723], [728] and a case study, and it takes the context into consideration. Following Yin's arguments about different case studies this study is a descriptive case study [838]. Yin argues that "case study is appropriate when investigators desire is to (a) define topics broadly and not narrowly, (b) cover contextual conditions and not just phenomenon of study, and (c) rely on multiple and not single sources of evidence." In this case the context means the inner and outer context of the ADP department in XX Oy and ZZ Oy. The inner context takes into consideration the structural, cultural and political environment and the outer context takes into consideration economical, social, political and line of business environment [7](Järvinen), [8](Pettigrew). Advises of Kalela [53] were used while thinking of the research subject. The data collected by interviewing people will serve as primary data. Archive materials serve both as a primary and a secondary data [6](Järvenpää). The historical books from companies found in this field study serve as a secondary data. The ideas of Friedman & Cornford [41] and Pettigrew [42] were used in organizing the field data in a practical way and giving hints what kind of data should be worth of gathering. The analyzing process is in a pre stage. The found system development methods are put in a table [837] which has to be made more specific and the data must be checked before analyzing. In adjusting the field data to the theoretical framework, the advises from Sauer and Lau [726] are used and in analyzing historical analysis, diachronic and synchronic analysis are used. In IS research historical analysis belongs to the qualitative analyzing methods [7] (Järvinen), examples are [720] (Igbaria& al),

[722](McKenney & al.).Historical analysis is finding different factors in the past, whether they were internal or external [721]. Copeland&McKenney [718] wrote about the evolution of airline reservations systems finding industry factors and Carrier-specific factors as the meaning factors while using historical analysis. The dynamic processes in organizations are possible to be searched for with the historical analysis. Mason, McKenney and Copeland [719] show there are several processes, competitive, organizational and management processes which can be discovered and with these processes it is possible to find out what were the most important events in organizations. With the historical method it is possible to " find out the factors that shape it's use and understand the processes by which IT (information technology) is introduced into organizations". The authors developed a framework, a Contingency Framework and they describe the phases as cascade which three key historical roles are guiding [719]. From Mason, McKenney and Copeland [721] was found a historical seven-step methodology in chronological order as an analyzing method. The methodology included detailed instructions in finding out the right research questions, specifying the domain, gathering evidence, critiquing the evidence, determining the patterns, telling the story and writing the transcript. Barley [723] used diachronic and synchronic analysis in which in synchronic analysis he "highlighted the differences and similarities in tasks, roles and role relationships of the two different people groups working together with the new technologies." In diachronic analysis he showed how "diachronic analysis would seize time and examine the development path of a specific technology's use". Barley made the data analysis by developing categories, grouping data, identifying scripts or patterns and comparing the scripts synchronically and diachronically [723]. After the data has been analyzed the next thing is to build up a theory from the data. The Grounded theory approach based on Glaser&Strauss [43] will be used. Searching for the proper research methodology was a hard and time consuming effort and mostly common qualitative methods were useful [816], [817], [818], [819], [820], [821], [824].

The Research Background from Spring 1995 until December 1997

The research domain was chosen through the authors previous contacts to XX Oy [724].

The author was invited to a project "kick off" meeting held in March 1995 in Lappeenranta. The research ideas were introduced and the author was directed to meet the director of IT of XX Oy, who became the contact person between the author and organizations. While the subject and knowledge about the area expanded through interviewing different stakeholders in the XX Oy, ZZ Oy as a vendor of IS systems to XX Oy was included and also because XX Oy's ADP personal established this ZZ Oy in 1984 after the outsourcing XX Oy's ADP department.

Determining the reliability and validity of the data and the data sources

Mason's, McKenney's and Copeland's methodology includes three steps in analyzing historical data, interviewing people, collecting archival data and the critique of the evidence [721]. In this research the interviews were first checked by the interviews themselves and the mistakes were corrected. After this the historical events got from interviews were put in a chronological order. The archival data was used in this step and the reliability and validity of the data improved. In out case these instructions were followed. People remembered the same thing in a different name, events had occurred a long time ago and it was not possible to remember things exactly. The years, the dates and events were mixed, but were clarified through cross checking between different interviewees and looking for archival data. The interviewed people had been involved in those occurring situations and events. Some people had worked over 30 years in the ADP matters, some people over 20 years, and some people 10-15 years. The second checking occurred when the first Base Line Story Data manuscript [840] was sent in May 1997 to the XX Oy's director of IT concerning XX Oy and it was corrected according his suggestions. In November 1997 two separate parts including the data of XX Oy and ZZ Oy were sent to the director of IT of XX Oy and managing director of YY Oy. The first part included the historical data from 1954 until 1990 and it was sent to the director of IT of XX Oy, because his previous position in ZZ Oy until 1990. The second part included historical data from 1984 until 1997 and it was sent to the managing director of YY Oy. The separation was made because of confidence matters to each of the two companies and wanting the data to be checked in these two different stakeholders.

Analyzing the Problems of a Method Choice using the theory of Diffusion of Innovations

Rogers's [725] model of diffusion of innovations and innovation adaptation includes characteristics of compatibility, complexity, relative advantage, trial and observatibility, which characteristics Sauer and Lau mention in their own article as the emphasis of DOI's (Diffusion of Innovations) [726]. According to Wolfe [730, p. 408] using the factors from Rogers [725], the factors explaining diffusion of innovations are the following: 1) adopter characteristics, 2) the social network to which the adopters belong, 3)innovation attributes, 4) environmental characteristics, 5) the process by which an innovation is communicated and 6) the characteristics of those who are promoting an innovation. In the DOI model of Kwon and Zmud [740], organizational characteristics means structural factors (specialization, centralization, formalization, informal network), innovation characteristics means technological factors (relative advantage, compatibility and complexity), individual characteristics means individual factors (job tenure, cosmopolitanism, education, role involvement), task characteristics means Task-Related factors (task uncertainty, autonomy, variety, responsibility (significance), identity, feedback) and environmental characteristics means Environmental Factors (heterogeneity, uncertainty, competition, concentration/dispersion and inter-organizational

dependence). Prescott's and Conger's DOI Process model [729, p. 21] is based on Rogers [725] and the model includes Innovation Characteristics, Communication Channels and Social System all interacting over time. Social System characteristics include characteristics of the individual, group, organization, decision makers and specific goal players such as champions and senior management. Communication Channels include internal or external to the organization, informal or formal communications. Innovation Characteristics include trialability, relative advantage, compatibility, observatibility and complexity. An enlarged DOI model of Kwon and Zmud [740] about the factors affecting diffusion-innovation process was presented by Prescott and Conger [729, p. 22]. This model of characteristics [5, p. 22] is the base DOI model on my own study about the factors influencing the diffusion of innovation - in my case innovation is a method- and the methods' adaptation. Figure 2.

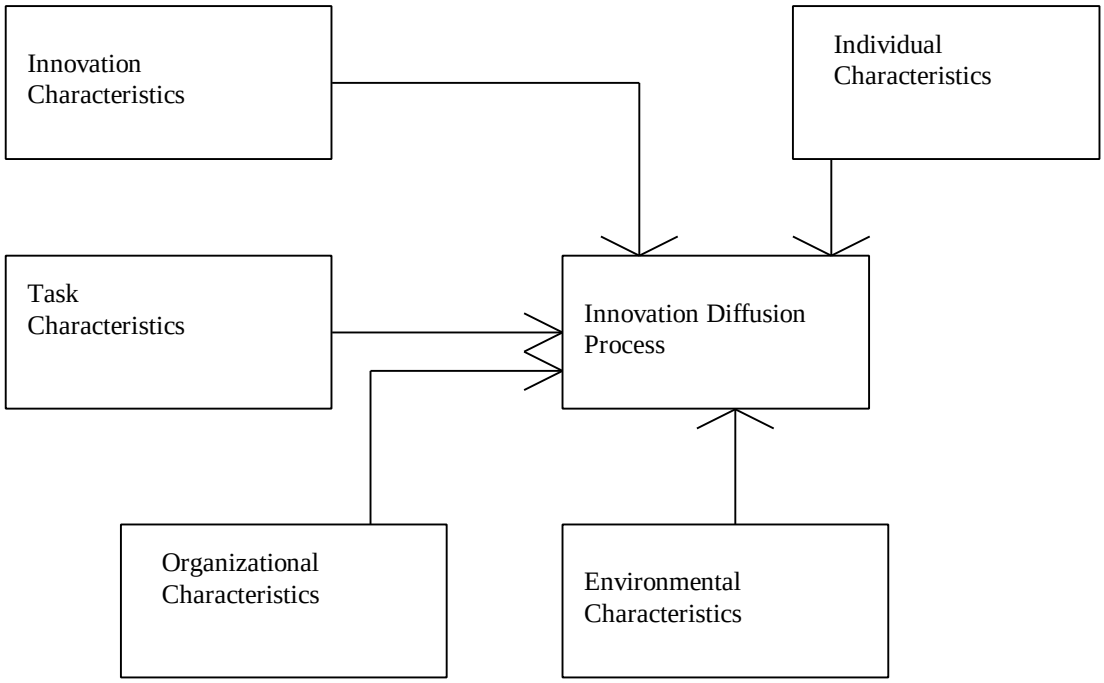

Figure 2. Diffusion/implementation model [729] based on Rogers [725], enlarged by Kwon and Zmud [740] adapted by Prescott and Conger [729].

This DOI model has the following extended characteristics: "Organizational Characteristics" , Innovation Characteristics" (trialability, relative advantage, compatibility, observatibility, complexity), "Individual Characteristics" (willingness to take risks, motivation, interested on subject etc.) and "Task Characteristics" (uncertainty, autonomy and variety)**,** "Environmental Characteristics" (heterogeneity, uncertainty, competition, concentration/dispersion and inter-organization interdependence) [729]. Rogers's [725] Diffusion of Innovations included 27 case examples with relevant factors in different events in which an innovation adaptation and diffusion occurred positively. In 11 case examples from Rogers an innovation failed and the factors in these events affected to the nonadaptation of an innovation. Four (4) other case examples from Rogers first succeeded and then failed in

adaptation and diffusion. Four (4) case examples from consequences of an adaptation of an innovation were represented, too. In my own model of DOI the factors found from Rogers [725], all together 46 case examples, are used as attributes and they are put in French lines below the characteristic boxes from Prescott and Conger [729]. All the factors were not put as French lines to the DOI model, especially the factors from consequences, because some of them were hard to put in any of the boxes from Prescott's and Conger's DOI model [729, p. 22]. Figure 3. represents the DOI model X of Diffusion/Implementation based on Rogers [725], enlarged by Kwon and Zmud [740], adapted by Prescott and Conger [729] and attributed added from Rogers's [725] case examples and put below the boxes.

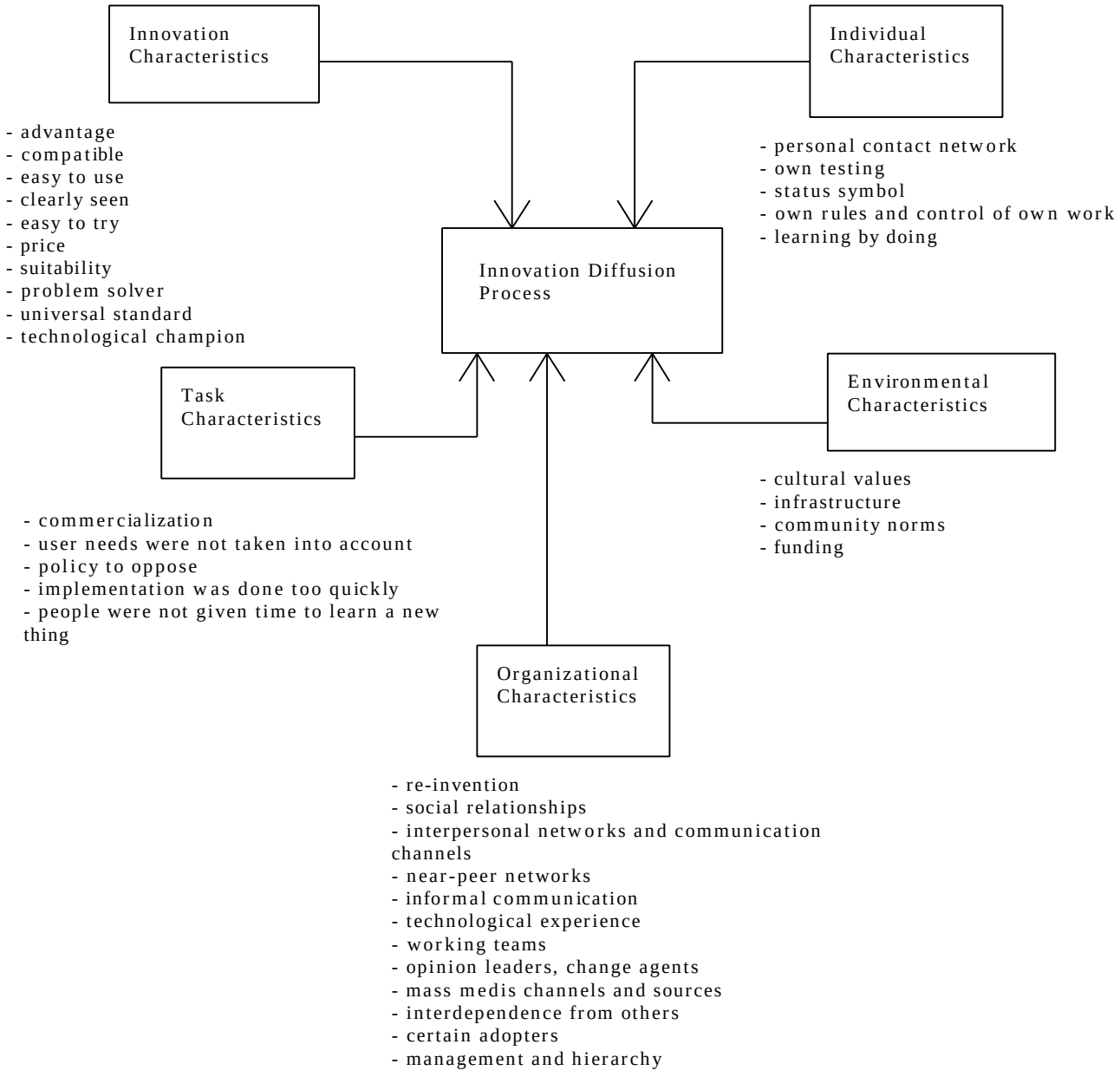

Figure 3. DOI model X: Diffusion/Implementation model based on Rogers [725], enlarged by Kwon and Zmud [740], adapted by Prescott and Conger [729, p. 22] and attributes added from Rogers's case examples [725] and put below the boxes.

Adapting the empirical data to the framework and method adaptation decisions

Out main research question is to study "Why methodologies are adapted and taken in use". The factors affecting to a decision maker in making the decision to adopt an innovation, the decisions to choose a method, the factors affecting a method to take in use or not are found from the empirical data. Each of the decisions are analyzed with the theory of diffusion of innovations using the model in figure 4. as the basis. We have made a table which includes the decisions, the methods etc. [837]. Both unformal and formal decisions are included and the methods are chosen according the definition in the chapter 1.2. The table includes answers to the following questions: 1. What was the method ? 2. What factors effected to the choice decision?, 3. When was the decision made? 4. Who made the decision in the organization level? 5. What were the adaptation factors affecting method was taken/not taken in use after the decision? 6. In what stage in the system work life cycle process the method was taken/not taken in use? 7. What was the method concerned (data modeling, function modeling, user interface, project control etc.)? 8. What was the time frame when method was used? The adaptation of the data to the theoretical framework in figure 4. is made using model which Sauer and Lau have used in their analysis [726]. They made a survey focusing on two types of adoption outcomes: IS developers' adoption decisions and IS managers' adoption decisions. They pitched the explanations in three levels: methodology/task, individual and organizational. In their study methodology/task level influences relate largely to the appropriateness of the methodology to the task. The individual level influences relate to the attributes and preferences. The organizational level influences comprise a variety of factors. The decisions were put in the vertical level and in the horizontal level they put the IS developers and IS managers. The vertical level included attributes/factors of methodology/task, individual and organizational and the horizontal included the decisions (individual IS developer decisions and IS management decisions) [726]. There are a huge amount of decision makers in this study in these two organizations and they presented in the figure 4. in a hierarchical form from 1954 until 1997: the project groups, the project manager, the IS designer, the management board of the company, the management board of the project, the ADP manager, the ADP staff, the ADP department, the programmer, the cooperative work groups, the management group of the design department, the board meeting of the design department, the ADP board of directors, XX Oy, Education and Consultation Unit, ADP board of XX Oy, end users, designers, CAIS department of XX Oy, SR groups of ADP department, counting systems and personal IS group, OHS group, Transport Control group, ADP committees, business management, ZZ Oy, ZZ CDS unit, working groups, control commission, factory accounting group of XX Oy, project group of Accounting IS, XXnet department in ZZ Oy, board of directors in DS group in ZZ Oy, accounting

development group in XX Oy, business bookkeeping development group, data base development group of accounting in XX Oy.

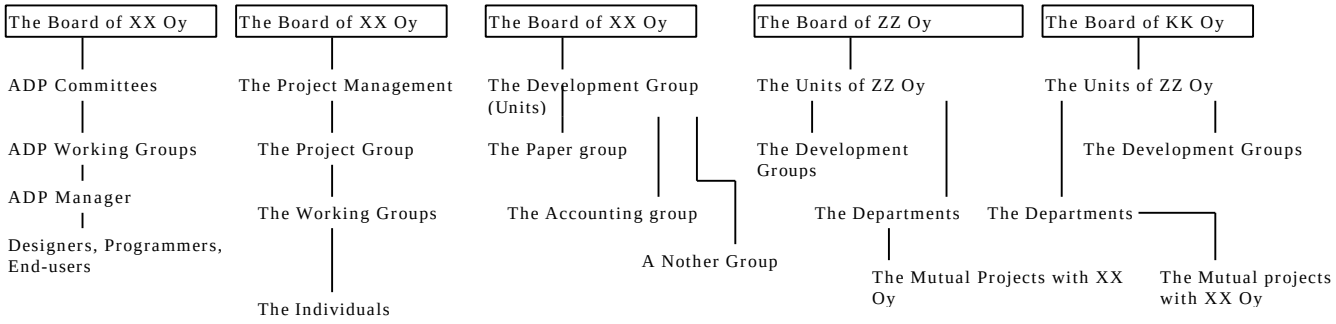

Figure 4. Different decision makers of IS in the XX Oy, ZZ Oy and KK Oy from 1954 until 1997.

Time frames of 1954-1969 and 1969-1984 in XX Oy, 1984-1995 in ZZ Oy and 1995-1997 in YY Oy are included in the analysis. The division of the level of the attributes/factors is the same as in Sauer and Lau used [726]: methodological/task, Individual and Organizational. When modeling this time frame- decision makers-attributes/factors analysis will be made with the help of the study of Sauer and Lau [726].

Conclusions

Even though the data analysis has just started and results from it are missing in this paper, the importance of method choice, the found difficulties in choosing the proper method to the system development work are still in organizations and the author hopes to give some valuable to the people in practice and academic circles who are struggling with these problems in their daily work.

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