

AN INVESTIGATION OF THE USE OF METHODS WITHIN INFORMATION SYSTEMS DEVELOPMENT PROJECTS

Gaye Kiely
National University of Ireland,
Cork
Gaye.Kiely@ucc.ie

Brian Fitzgerald
University of Limerick
Brian.Fitzgerald@ul.ie

ABSTRACT

The development of information systems has always been and remains a volatile environment. Practitioners and researchers within the field of information systems development (ISD) have put forward a number of different ideas over the past thirty years to better monitor and control the process. The use of traditional ISD methods has been one such idea that has not only achieved widespread application but has garnered many criticisms regarding its application. This study seeks to investigate whether these criticisms are supported in terms of how present day organizations utilize traditional ISD methods in light of the increased diversity and sophistication of ISD projects. The findings of the study indicate that whilst methods are considered an integral part of the majority of development projects, they cannot be adopted without a significant amount of modification to suit individual development projects. In addition, traditional ISD methods were considered of limited use within the present ISD environment.

Key words

Information systems development, information systems methods

1. INTRODUCTION

The purpose of this study was to investigate the nature of information systems development (ISD) at the present time and in particular the nature of ISD method usage. Earlier studies have also addressed this area (Fitzgerald, 1997; Hardy et al., 1995; Sitek et al., 1986). However, the ISD environment has changed significantly in recent years and a new study investigating the use of ISD methods is timely. There is a multitude of literature criticizing the use of information systems development methods (Baskerville et al., 1992; Curtis et al., 1988; Korac-Boisvert et al., 1995). An investigation of how ISD methods are applied in actual development projects to uncover whether practitioners have the same opinions of ISD methods was conducted. This investigation sought to answer how methods are employed within development projects and how practitioners perceive methods. The basis of the study was an earlier survey conducted into ISD method usage within Irish development projects (Kiely et al., 2002). In the next section, issues relating to the ISD environment and the use of ISD methods are briefly presented. Following this, the research method chosen for this investigation is described and the findings of the research study are presented and analyzed in relation to the literature. Conclusions are then presented.

2. THE INFORMATION SYSTEMS DEVELOPMENT ENVIRONMENT

The field of information systems is a relatively new one. The first commercial systems were developed in the 1950s (Friedman, 1989) and in the intervening years information systems have become integral to organizational operations. Gradually, computer systems became

widespread within organizations and grew more sophisticated due to increased needs of users and advancing technology.

However, ISD was not a stable process. The emphasis was on the programming aspect of development and there was no set practice for how systems should be built (Friedman, 1989). That a new information system was functional, cost-effective and accepted by the intended users was largely a “hit-and-miss” affair. As a result of this environment, the term ‘software crisis’ was coined in 1968 to describe the problems which plagued the development of information systems.

The ‘software crisis’ is commonly taken to mean the high level of project failure; budget overruns and missed deadlines within ISD. These are standard problems, which have plagued the development of information systems and continue to do so at present (Korac-Boisvert and Kouzmin, 1995). Information systems projects continue to fail at an alarming rate and the problem of ‘runaway’ development projects is very serious due to the increasing importance of information systems to organizations. For example, a recent study estimated that American companies spent \$59 billion in 1995 in cost overruns on runaway IS projects (Johnson, 1995).

Initially in the 1960s, IS was a new area and there were no standards in place to monitor development and evaluate end-results. Practitioners in the IS field became concerned with the nature of development and how the process might be controlled. An early solution was found within the academic areas of science and engineering (Baskerville *et al.*, 1992; Quintas, 1996). The idea was to break up the development process into logical phases such as analysis and design to better manage the development process.

2.1 Traditional Information Systems Development Methods

Traditional methods are easily identifiable by their characteristics. Whilst each may differ in certain aspects, they are all coming from the same basic principle – the structured, scientific paradigm (Korac-Boisvert and Kouzmin, 1995). In addition, this approach has met with many criticisms since their creation (Bjorn-Anderson and Hedberg, 1977; Land, 1980; McFarlan, 1974).

2.1.1 Traditional ISD Methods are inflexible

These ‘hard’ approaches are defined by their ability to structure and control the development process. However, this emphasis on control has led to traditional methods being labeled as ‘inflexible’. By trying to control all the variables associated with development, the traditional methods tie developers in to a certain development path and it can be argued that this stifles creativity (Baskerville *et al.*, 1992).

A relevant concern may be the argument that traditional methods prolong the development process, as all phases are carried out in sequential order. Long development processes are not particularly welcome in the current, high-speed business environment.

2.1.2 Traditional ISD Methods are outdated

The majority of methods adopted by organizations are derived from ideas from the 1960s-1970s. This is a fact supported by much of the literature concerned with ISD methods (Baskerville *et al.* 1992; Brown, 1985; Fitzgerald, 2000; Kouzmin and Korac-Boisvert, 1995). These methods were designed in a time when ISD was in its infancy and the very nature of these traditional methods reflects this point. Typical traditional methods take a rational, incremental approach to development with an emphasis on the ability to control each facet of development.

Large organizations still utilize these project management methods originally borrowed from the engineering and construction industries during the 1960s (Kouzmin and Korac-Boisvert, 1995). This is a strange occurrence when the extent of technological and social

advances within the field of information systems is taken into account. This practice might be appropriate if the methods applied were effective and if the environment in which they are used had not changed but this is not the case. The environment has changed beyond recognition in the past 30-40 years (Korac-Boisvert and Kouzmin, 1995) and traditional methods cannot in any way be considered a perfect aid to development – in fact, the opposite is very much the case (Baskerville *et al.*, 1992).

Traditional ISD methods are structured to cater to the type of development projects which were taking place over thirty years ago (Pressman, 1987). Methods designed did not need to consider a wide range of application, as there was not a wide range in the type of development possible (Friedman, 1989). For the most part, these methods remain unchanged (Baskerville *et al.*, 1992).

The pace of business has accelerated in recent years - what Rockart and De Long (1988) refer to as the “faster metabolism of business today”. As a result of this faster pace, organizations seem to display increased instability, complexity, non linearity and non repetitive behaviour. If this is the case, then traditional methods are inappropriate to use in the development process as they cater to monolithic, unwieldy systems.

2.1.3 Flawed foundations of traditional ISD Methods

An additional criticism made against traditional methods is that the fundamental concepts upon which they are founded may be unsuited to the needs of the current environment. The origins of these concepts can be found in the engineering and science fields. Literature regarding the area frequently cites other academic areas as the source for IS methods (Kouzmin and Korac-Boisvert, 1995). In particular, ideas were drawn primarily from engineering and science. Adopting these concepts from established areas brought instant assurance in the development process because the concepts applied to the process were familiar (Baskerville *et al.*, 1992; Welke, 1994). The concept of “divide and conquer”, breaking the development down into manageable phases, was employed (Baskerville *et al.*, 1992).

However, the IS area is very dissimilar to the engineering and science areas in nature. IS is not just a physical science – it is far more than that (Kouzmin and Korac-Boisvert, 1995). ISD is part technical, part social and part business. In addition, IS development is emergent and ad-hoc in nature whilst engineering is an exact science and social influences rarely affect the outcome of research and development in these areas. If traditional methods are based on flawed concepts, then they can never truly provide the solution to IS development, which they were created for (Baskerville *et al.*, 1992; Welke, 1994). In addition, if these methods are flawed to begin with, modifying them does not detract from their basic ill fit for the IS area.

2.1.4 Traditional ISD Methods and social issues

Information Systems Development (ISD) is not solely a technical process. Any IS development incorporates a number of interrelated elements such as the technological, the business and the social. Zuboff (1991) contends that using the technology to its full potential means using human beings to their full potential.

This argument that ISD is more than a technical problem is a point supported by the literature (Baskerville *et al.*, 1992; Brooks, 1987; Fitzgerald 1996; Kouzmin and Korac-Boisvert, 1995; Vitalari and Dickson, 1983). Wastell (1996) states that “the development of software systems is a complex, sociotechnical process in which demanding technical challenges are confronted within a conflict-laden political context”. In addition, Goguen (1991) distinguishes between wet and dry cultures in computing. The dry culture sees

computer systems as structured and mathematically specifiable objects. The wet culture sees these systems as social, cultural and political factors.

However, although it is taken as fact that ISD is not just technical, this factor is not typically supported by traditional methods. Traditional methods for the most part, disregard the influence that the social aspects can have on development.

2.1.5 Traditional ISD methods and relevance

Discussion involving the flaws of traditional methods leads to the question of whether methods are relevant at all in the current age. Perhaps there should be no methods at all, that there should be no set method for development in organizations; that whatever ‘fits best’ should be utilized for individual development projects. This is an intriguing viewpoint but one that is probably not realistic at present in the area of ISD. People and organizations like to use methods, even if they are flawed because they project an air of stability and confidence in the IS area (which has picked up a reputation for being chaotic and unstable). This is an opinion supported by Wastell (1996) who states that there is a great belief today in the power of methodology, especially in the area of information systems (IS). Wastell further proposes that methods are elaborate devices used as a “social defense” for containing the acute and potentially overwhelming pressures of systems development.

The real question to be considered is whether these methods are relevant in their current incarnation. Judging from the many criticisms that are currently attached to traditional methods (Baskerville *et al.*, 1992; Curtis *et al.*, 1988; Kouzmin and Korac-Boisvert, 1995) their relevance appears to be in doubt. Traditional methods have only limited application in the present age because software development is no longer a predictable and static process. Development is now ad-hoc and emergent in nature. Therefore methods should accommodate the changing nature of development. In the majority of cases traditional, hard methods are not the ideal option and other alternatives should be considered. Korac-Boisvert and Kouzmin (1995) state that “all IT development projects are not amenable to a conventional methodology and conventional project management techniques”.

If this is true then what is the point in traditional, formalized methods when they are altered for individual development scenarios? A possible alternative is that of the “contingency” approach; using a method that best suits the situation; which has been mentioned frequently within the IS literature (Avison and Fitzgerald, 1995).

3. RESEARCH DESIGN AND METHODS

This study has two main research questions. Firstly, it sought to address how ISD methods are employed within development projects. The second research question looked at how practitioners perceived traditional ISD methods.

The research study was conducted on the basis of an earlier quantitative study of Irish development projects (Kely and Fitzgerald, 2002), which used the same research questions. Based on the survey findings from this study a number of respondent organizations were selected for further investigation.

The research method for this study was the case study (Yin, 1994). Although criticized on a number of points by Dutton (1988), this approach is the most commonly used qualitative method for research in information systems (Orlikowski and Baroudi, 1991). Benbasat *et al.* (1987) states that case studies are particularly well suited to IS research since the object of the discipline is the study of IS in organizations. Case studies are an effective approach for this study as the purpose was not to uncover a generalizable truth, but rather to explore and describe the development environment in three distinct settings. Schramm *et al.* (1971) argues that the essence of a case study, the central tendency among all types of case study, is

that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented and with what result.

This research study used three case studies. The organizations were selected on the basis of responses provided during the preliminary survey study. The first case study concerned a large multi-national corporation, Organization A, which has operations in Ireland. The organization was chosen as a case study both for its high levels of in-house systems development and the absence of a method within development projects. Two personnel involved within IS project development were interviewed; the project manager and a member of the development team.

The second organization used for a case study was Organization B. B is a small Irish-based web development company. B's suitability as a case study lay in its usage of an in-house designed method and small development team, which is in direct contrast to A. Both the project manager and a member of the development team were interviewed for Organization B.

Organization C was the third organization selected for a case study. C is a large multi-national involved in the telecommunications industry with operations in Ireland. C was chosen because of the number of large scale, critical projects currently in development. A project manager and two members of the development team were interviewed for Organization C.

The data collection within the organizations occurred using in-depth interviews with individuals who were involved in ISD. The researcher used a combination of 'focused' and 'open-ended' questions for the purpose of interviews, which were unstructured in nature (Yin, 1989). The focused questions allowed the researcher to acquire a 'grounding' early in the interviews, which was used as a basis upon which to ask open-ended questions. In addition, the open-ended questions allowed the researcher to gather richer information from the interviewees and allowed the interviewees in turn to discuss issues, which they felt, were important to the area of research. This is a factor which Remenyi and Williams (1995) highlight as a strength of using interviews as a data collection technique.

This research method is not without its drawbacks. Bell (1992) argues that case studies provide very little rigour, take a long time and provide little basis for scientific generalization. However, in this study the interest lay mainly in understanding and discovering the experiences of the individual projects, not in applying these findings to a larger sample (the earlier research study which surveyed over 100 Irish organizations had already investigated the area from this viewpoint – http://afis.ucc.ie/gkiely/survey_site).

4. RESULTS

4.1 Organization A

Organization A has grown to become a large multi-national organization, mentioned on the Fortune 500 list and having operations in a number of countries around the world. The main purpose of A's Irish operations is the distribution of its products within Ireland and neighboring countries. A also has an ISD department which develops SAP based systems that are rolled out to other European operations and the majority of development is carried out internally (90%). Currently, the organization employs nearly 100 personnel in its Irish operations.

4.1.1 Development at Organization A

SAP is a type of software used for ERP (Enterprise Resource Planning) systems that caters for the integration of processes within and among enterprises and business communities. The organization underwent the first installation of SAP in 1997 and the software has been installed throughout the worldwide organization since then. Its Irish operations had its first

SAP installation in 1998. A has a number of SAP based developments in progress at present. These projects have to be developed from scratch in a number of cases due to varying requirements in different European countries (customization of previously developed systems is not an option). One such development project, which is the focus of this case study, is that of the budget and planning process, which is being converted to SAP. This SAP system will be rolled out to all of A's European operations.

4.1.2 Method Usage at Organization A

Organization A does not use a method (traditional or in-house) to aid the development of information systems projects. This is a conscious choice on the part of the IS department to exclude the use of ISD methods. The IS departments project leader states that the reasons for this lack of a method are mainly focused around A's need to be flexible and unconstrained when it comes to selecting the best approach towards an individual development project. However, the fact that there is no prescribed method used with Organization A's ISD does not mean that the development is without structure. Every development within Organization A is well planned before any actual work takes place and a significant amount of time is taken to ascertain user 'needs and wants'. All interested parties are invited to provide their opinion on the development and offer suggestions. The process is very well defined and is much to do with the experience of the personnel in the department (who all have significant development experience). The organization has found very few disadvantages to this ad-hoc approach to date and it seems to work successfully in terms of bringing in projects on time, within budget and to the satisfaction of end-users. A development team member believes that 'it really depends on the people and the project leader'. There is a highly selective approach in hiring personnel for the development centre. In fact, much of the success of the development projects is attributed to the project leader who drives the ad-hoc approach within the department.

The ISD team members also believe that it is difficult to create a method (traditional or in-house) that would fit every single development scenario within their organization and that traditional methods take too long to develop systems. This is time and money that a company cannot afford to lose. In addition, the IS department's project leader believes that the greatest benefit of their approach to development is flexibility. Organization A's development team can do what is needed to get the project completed successfully without worrying about adhering to any particular ISD method.

4.2 Organization B

Organization B provides consultancy services, creates and delivers websites and online marketing campaigns for SMEs (small/medium sized enterprises) and Blue Chip companies. B specializes in the development and promotion of websites and interactive multimedia. In addition, B is the first company in Ireland to have designed, placed and managed marketing campaigns across the UK and Irish online media markets. B serves clients all over the world, from Australia and China to Germany, the UK and Chile, in the design of corporate identity and company promotional brochures.

4.2.1 Development at Organization B

Organization B has a number of development projects in progress. Two projects are application development projects, one is an e-commerce project and another is an Internet site. The focus of this case study is B's e-commerce project which was the larger of the projects in terms of personnel, time and budget. The project is a site for purchasing software online. The site will allow users to browse and buy software, which will be sent direct to their designated address. The project is of high priority to B in that the organization's continued success

depends on the completion of the project. Previously, the organization had only undertaken straightforward website development so this project is a departure for them and their reputation as a software company is at stake.

4.2.2 Method Usage at Organization B

Organization B uses an in-house method that has evolved over the five years that the company has been in business. In addition, this in-house method is modified for each new project. However, these modifications are not too large. They are done mainly to accommodate the preferences of the client and secondly, to cater to the specific technology being employed in the project. One junior developer says ‘you see sometimes you have to backtrack in development and also the type of project will vary. One method will not suit all projects’. B’s lead developer stated that a method, which does not fit a development project, can also be a big headache for the development team. He also stated that in his previous experience working for a large development organization, ‘too often methods were enforced from higher levels in organizations without much thought given to what suited the development environment’.

In general, the development team was of the opinion that there were quite a lot of traditional methods that were outdated, took too long and should not be used with current developments. In general, however, the opinion was that the majority of methods had their particular applications and that it all comes down to the type of development to be conducted. For example, a small project with a small number of developers would not necessarily benefit from the application of a method whilst a large-scale development with a significantly large development team would most likely benefit from a method being in operation.

4.3 Organization C

Presently, Organization C is a global leader in providing integrated communications solutions and embedded electronic solutions. C is located in the South of Ireland. Employing 500 plus engineers, the operation involves the design, testing and support of telecommunications networks for markets in over 30 countries.

4.3.1 Development at Organization C

The project concerns the network management of digital cellular telephone networks, UMTS. UMTS is a Third Generation (3G) mobile technology that will deliver broadband information at speeds up to 2Mbit s/sec. The goal of UMTS is to enable networks that offer true global roaming and can support a wide range of voice, data and multimedia services. Besides voice and data, UMTS will deliver audio and video to wireless devices anywhere in the world through fixed, wireless and satellite systems.

4.3.2 Method Usage at Organization C

The method utilized by C is in-house designed. It was designed taking the 7 phase systems development lifecycle used at the organization into consideration. The in-house method covers areas of development, such as testing, project management and quality. In addition the method explicitly states the roles of those areas (work assignment/role clarification) within the development process.

There is an emphasis on control and structure within Organization C’s in-house method. This element is partly due to the industry and technology used by the organization, which ‘flourishes in a well structured development environment’ (project manager). This focus on structure is also due to the criticality of many of the development projects that are conducted at C. Projects cannot afford to go over schedule or cost more than initially estimated. Whilst

this is true of any project, in Organization C's industry the competition is fierce and contracts with clients hard to come by and maintain.

The in-house method at C is applied and adhered to across the organization. However, this method is not static and is tailored for specific project purposes. To aid this process, development personnel use pictorial representations, called 'PROMPT maps' (Fitzgerald and O'Kane, 1999) to illustrate the method used for the individual project and 'highlight deviations from the standard method'.

A development manager explained the reasons for the modification of the method further, by stating that in the case of smaller, simpler projects, the overhead required to follow the complete method would be unwieldy and not always a necessity to project success. A second example of where methods were modified was 'to speed up the development process where phases of development overlapped'. This overlap is usually driven by tight project schedules. The development manager also stated that although methods were by no means outdated for current development projects, they did think that in some cases methods (in general), needed to be adapted for the technology used within development. The development manager cited an example of methods, which are influenced by the structure of the Waterfall SDLC. They were of the opinion that such methods did not lend themselves to object oriented development, where 'it helps to interactively design and code (or prototype)'.

The development manager at Organization C stated that the method utilized by the development team was ideal for development because it has the ability to be adapted or tailored to suit individual projects. In addition, it was felt that the project could not have been completed successfully without the presence of the method. The reason given for this belief was that 'it is a large scale project with a lot of people working on it and it is necessary to apply a methodology which is known, understood and adhered to by everybody concerned'.

5. DISCUSSION

The organizations which have partaken in the case studies are both similar and different at the same time. Whilst both A and C are part of large multinationals, which receive much support and guidance from their US operations, B is a small Irish-owned company trying to survive in a very competitive Internet development market. However, despite being different in structure and the markets in which they operate, all three organizations have common concerns within the area of ISD project budgets, schedules and related method usage.

The following section discusses the use of ISD methods within the case organizations, the perception of traditional ISD methods and the relevance of ISD methods to current ISD practice.

	<u>Org. A</u>	<u>Org. B</u>	<u>Org. C</u>
<i>Project Size</i>	Medium	Small	Large
<i>Timescale</i>	2 years	2 months	1 year
<i>Method Used?</i>	No	Yes	Yes
<i>Method Type</i>	N/A	In-House	In-House/ Commercial
<i>Modified?</i>	N/A	Yes (continuous)	Yes (controlled)
<i>Importance of Method</i>	N/A	High	High
<i>Reasoning for method choice</i>	Projects require less formal control and greater flexibility within the development process	Cut-throat market – need to do it faster Diverse projects require greater flexibility in relation to ISD methods	Stiff competition requires flexibility in the development process but industry regulations require a controlled development environment

Figure 1 Summary of similarities and differences between case organizations

5.1 Use of Information Systems Development Methods

Within the use of ISD methods, the organizations differ. A does not use a method whilst both B and C utilize an ISD method.

Both B and C use an in-house designed ISD method. Organization B's method evolved through the experience of its personnel and a multitude of previous projects whilst C has an in-house method which is flexible but strictly documented.

All three organizations were focused on the need for speed in relation to the development process and the decision to adopt an ISD method was based on whether it would accelerate the development process or slow it down.

Control was also an important issue in relation to ISD method usage. The main motivation for method usage at Organization C is control. C wants to ensure clarity and structure within development projects. This structure ensures that organization-critical development projects will stay on track, which is a major concern. All three case organizations agreed that control was crucial to all development projects but that the required levels differed from one project to the next. Organization A had no ISD method but still had a structure in place which ensured the desired levels of control.

Flexibility was integral to each organization's development approach. A's reason for not applying an ISD method was that it would prevent the development team from using the best approach possible for development. B's reason for adopting an emergent in-house ISD method was that it allowed for greater flexibility throughout the life of the development project. If required it was easy to modify the method and thus provide the flexibility necessary for the organization. C also had an ISD method which had flexibility at its core.

The frequency with which the ISD methods were modified supports the importance of speed, control and flexibility to ISD projects. Both organizations B and C undertook large amounts of method modification for each ISD project and within the projects themselves. Organization C even had a formal documentation process in place to record the modifications made to the ISD method.

5.2 Perception of Traditional ISD Methods

In the three case organizations, traditional ISD methods were not employed for a number of reasons, some of which were discussed in relation to the ISD literature in Section 2. The main criticism was that traditional ISD methods were very inflexible and prevented the development teams from making adjustments to the course of the project and the method itself. Organization A stated that it would not use a traditional ISD method for this reason. B and C concurred with this opinion and opted instead for flexible in-house methods. Lack of flexibility is a criticism which appears frequently in the literature associated with traditional ISD methods (Baskerville *et al.*, 1992).

Kouzmin and Korac-Boisvert (1995) put forward the argument that traditional ISD methods are outdated as they were tailored for the types of development projects which were prevalent in the 1970s and 1980s. This is an issue which is supported by the three case organizations. Organization B would not adopt a traditional ISD method because they were generally considered dated and did not fit the types of development projects which the organization undertook. A and C concurred with this opinion, that traditional ISD methods catered to the types of monolithic, unwieldy development projects which were scarce in the present development environment.

The argument that traditional ISD methods are based on flawed foundations (Baskerville *et al.*, 1992) derived from other disciplines such as engineering was not an issue raised by the development teams in the case organizations although it is a criticism which is often made against such methods within the literature (see Section 2).

The importance of end-user participation and the sociotechnical elements of information systems development were highlighted by the case organizations to varying degrees. Organization A's development team stressed the importance of involving end-users in the development process whilst Organization C's development manager mentioned the limitations of traditional ISD methods which did not lend themselves towards interactively developing systems solutions with end-users/clients.

Traditional ISD methods were generally perceived to be of limited use and application within modern ISD projects. They were considered too cumbersome, inflexible and dated to be of significant use to the case organizations.

5.3 Relevance of ISD Methods

All three organizations had differing opinions on the relevance of ISD methods. Organization A promoted a development environment which used no ISD method. A's development team were of the opinion that an ISD method had no real bearing on the successful outcome of a project. Although it is important to note that while A had no explicit method, there was a structure of sorts in place. Organization B supported the use of ISD methods for the development process but eschewed traditional methods in favor of an in-house method which evolved from one project to another.

Organization C also adopted an in-house designed ISD method for its development projects. However, C's development manager stated that traditional ISD methods had a part to play in the ISD environment.

Generalizations cannot be made on the relevance of ISD methods on the basis of three case organizations. However, an earlier study (Kiely and Fitzgerald, 2002) which involved a survey of organizations undertaking IS development in Ireland showed that the majority of projects used some sort of IS method.

Both organizations B and C are typical of the organizations surveyed in that earlier study as they both use in-house methods which are frequently modified to suit individual development projects.

6. CONCLUSION

The nature of method usage, which was uncovered by the case studies, reflects a much more ad-hoc development environment. The variations on development projects have widened and method usage reflects this factor. The methods within the case studies were typically in-house and modified as the situation warranted changes. In addition, method usage is much more of a flexible, emergent process within the development teams.

Speed, control and flexibility are the overriding factors in the decision to use an ISD method. If an ISD method is employed it is because it has a positive affect on the speed of the development process; it provides suitable levels of control and has the flexibility to accommodate ad-hoc changes in the development process. In addition, if a method is applied it is modified to tailor it specifically for the individual ISD project.

The perception of traditional ISD methods, on the part of the case organizations, was overall, a negative one. Many reasons were put forward for the non-usage of traditional methods. Firstly, traditional ISD methods are considered outdated and do not cater to modern ISD projects. Secondly, traditional ISD methods are perceived as being inflexible and that they prolong development. These methods are seen as being 'set in stone' and prevent developers from making quick turnarounds on the direction of a development if the situation warranted such an action. Thirdly, traditional ISD methods are considered to be an ill-fit and to typically neglect the sociotechnical aspects of the development process.

In-house methods were the type of ISD method applied within the case organizations. In-house methods can be built using the past experience of personnel as they could incorporate what worked best within past development projects and discard the elements that caused problems or achieved little for the development process. Also, the method could be modified as personnel attained more experience within various developments.

The conclusions made on the basis of the three case studies are in line with the findings of the earlier survey study, which was conducted (http://afis.ucc.ie/gkiely/survey_site). In both studies, there was evidence of widespread use of ISD methods. The methods were typically in-house designed and modified on an ad-hoc basis during development projects.

This study focuses specifically on traditional ISD methods. Further research within this area is required. In an earlier stage of this study, mail survey findings indicated that contemporary methods did not play a significant role within ISD in Ireland. Whether this is still the case or not warrants research. An investigation of more contemporary methods (such as agile methods, web methods and object oriented methods etc.) and their applicability within projects such as those within the three case organizations would be useful. Due to the prevalence of in-house methods (Kiely *et al.*, 2002) a study which investigates the formulation and application of in-house ISD methods is also warranted. In relation to this study, the focus has been on ISD projects, which were in the middle of development. It would be useful to return to the three organizations once the development projects have concluded to re-evaluate the use of the ISD methods or lack thereof in light of project success or failure.

Finally, this study has concerned itself with ISD method usage in Irish ISD projects and cannot be generalized to an international context. An investigation of ISD method usage internationally would provide a clearer picture as to the general usefulness of these methods in the present ISD environment.

The real question is what this all means for the ISD environment and ISD methods. When ISD methods were first designed in the 1970s, they were an unknown quantity and thus, ascribed with capabilities that had yet to be proven true. However, in the past thirty years practitioners and researchers have had time to investigate the usefulness and effectiveness of ISD methods. Methods are not a cure-all for a development process but can aid development if applied prudently by experienced personnel.

As such this is reflected in the way that methods are currently used within development. Practitioners are not cynical about methods as such, but have a better appreciation of a method's worth within the development process as seen by the case organizations views on traditional ISD methods as opposed to the in-house designed methods employed. For this reason, methods are no longer applied blindly to the development process in the optimistic hope that they will ensure a successful development process but are instead tailored for the particular development project to which they are being applied.

REFERENCES

- Avison, D.E. and Fitzgerald, G. (1995) *Information Systems Development: Methodologies, Techniques and Tools*. 2nd ed., McGraw-Hill International (UK).
- Baskerville, R., Travis, J. and Truex, D. (1992) *Systems Without Method: the Impact of New Technologies on Information Systems Development Projects*, In Kendall, K., DeGross, J. and Lyytinen, K. (eds.), *The Impact of Computer Supported Technologies on Information Systems Development*, Elsevier Science Publishers B.V., North Holland Press, 241-269.
- Bell, J. (1992) *Doing Your Research Project*, Milton Keynes: Open University Press.
- Benbasat, I., Goldstein, D. and Mead, M (1987) The Case Research Strategy in Studies of Information Systems, *MIS Quarterly*, **September**, 369-386.
- Bjorn-Anderson, N. and Hedberg, B.L.T. (1977) Designing Information Systems in an Organisational Perspective, *TIMS Studies in Management Science*, **1**, 5, 125 - 142.
- Brooks, F. (1987) No Silver Bullet: Essence and Accidents of Software Engineering, *IEEE Computer Magazine*, **21**, 4, 10-19.
- Brown, P. (1985) Managing Software Development, *Datamation*, April, 15, 133-136.
- Curtis, B., Krasner, H. and Iscoe, N. (1988) A Field Study of the Software Design Process for Large Systems, *Communications of the ACM*, **31**, 11, 1268-1287.
- Dutton, W. (1988) Letter to the editor, *MIS Quarterly*, **12**, 4, 521.
- Fitzgerald, B. (1996) Formalised Systems Development Methodologies: A Critical Perspective, *The Information Systems Journal*, **6**, 1, 3-23.
- Fitzgerald, B. (1997) The Use of Systems Development Methodologies in Practice: a Field Study, *Information Systems Journal*, **7**, 201-212.
- Fitzgerald, B. and O'Kane, T. (1999) A Longitudinal Study of Software Process Improvement, *IEEE Software*, **May/June**, 37-45.
- Fitzgerald, B. (2000) Systems Development Methodologies: The Problem of Tenses, *Information Technology & People*, **13**, 3, 13-22.
- Friedman, A. (1989) *Computer Systems Development: History, Organization and Implementation*, John Wiley & Sons Ltd.
- Goguen, J.A. (1992) *The Dry and the Wet*, IN: *Proceedings of the IFIP TC8/WG 8.1 Working Conference on Information Systems Concepts: Improving the Understanding*, 13-15 April, Alexandria, Egypt. IFIP Transactions, A-4 North-Holland, 1-17.
- Hardy, C., Thompson, B. and Edwards, H. (1995) *Problems Associated with the Customisation of Structured Methods*, in Jayaratna, N., Miles, R., Merali, Y., and Probert, S. (eds.), *Proceedings of Third Conference on Information Systems Methodologies*, 211-220.
- Johnson, J. (1995) Chaos: the Dollar Drain of IT Project Failures, *Application Development Trends*, **2**, 1, 41- 47.
- Kiely, G. and Fitzgerald, B. (2002) Information Systems Development: Methods and Lifecycles, *In proceedings of 2002 American Conference of Information Systems, Dallas, Texas*, 1289-1296.
- Korac-Boisvert, N. and Kouzmin, A. (1995) IT Development: Methodology Overload or Crisis? *Science Communications*, Sage Publications, **17**, 1, September 1995, 57-89.

- Land, F.F. (1980) Adapting to changing user requirements, Infotech State of the Art Report Series, *Life Cycle Management*, **8**, 7, 137 – 161, Infotech Ltd., Sydney.
- McFarlan, F.W. (1974) *Effective EDP Project Management in Managing the Data Resource Function*, Edited by R. Nolan, 223-307, St. Paul, MN: West.
- Orlikowski, W. and Baroudi, J.J. (1991) Studying Information Technology in Organisations: Research Approaches and Assumptions, *Information Systems Research*, **2**, 1, 1-28.
- Pressman, R. (1987) *Software Engineering: A Practitioner's Approach*, McGraw-Hill, New York.
- Quintas, P. (1996) *Software by Design ICTS*, Edited by Mansell, R. and Silverstone, R., OU Press.
- Remenyi, D. and Williams, B. (1995) Some Aspects of Methodology for Research in Information Systems, *Journal of Information Technology*, **10**, 191-201.
- Rockart, J. and De Long, D. (1988) *Executive Support Systems*, Dow Jones-Irwin, Homewood, Illinois.
- Schramm, W. and Roberts, D. (1971) *The Process and Effects of Mass Communication*, University of Illinois Press, 1954. Revised Edition.
- Sitek, J. and Sumner, M. (1986) Are Structured Methods for Systems Analysis and Design being Used? *Journal of Systems Management*, 18-23.
- Vitalari, N. and Dickson, G. (1983) Problem Solving for Effective Systems Analysis: and Experimental Exploration, *Communications of the ACM*, **26**, 11, 948-956.
- Wastell, D. (1996) The Fetish of Technique: Methodology as a Social Defence, *Information Systems Journal*, **6**, 25-40.
- Welke, R. (1994) The Shifting Software Development Paradigm. *DATABASE*, **25**, 4, 9-16.
- Yin, R. (1989) *Case Study Research: Design and Methods*, Sage Publications, California.
- Zuboff, S. (1991) Informate the Enterprise, An agenda for the Twenty-First Century, *National Forum: The Phi Kappa Phi Journal*, **LXXI**, 3, Summer 1991.