Interpreting the Process Analysis and Design Method (PADM) as an Approach to Requirements Analysis.

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Abstract

This paper seeks to describe and position the approach taken to requirements analysis by the Process Analysis and Design Method (PADM). This method is founded upon an approach known as process engineering which is evolving as a distinct notion influenced by a number of philosophical schools. Developed first to address issues arising in the software process research arena, it is increasingly embracing ideas originating from the socio-technical and soft systems domains. This paper investigates the central tenets of PADM's approach to requirements analysis using a case example of its practical application. It positions the emergent characteristics within the context of some of the more philosophical ideas and debates in information systems thinking.

Introduction

Central to new initiatives surrounding the application of co-ordinative technologies the emergent concept of process engineering. The derivative Process Analysis and Design Method (PADM) has been developed at the University of Manchester. The theoretical and organisational underpinning of process engineering has been developed by work undertaken at the Manchester Metropolitan University. PADM is being developed and reported through the SERC funded Process Engineering Framework (PEF) project[2]. It is a methodology which has been influenced by research into socio-technical systems and soft systems. However, its origins lie in software process research through the Alvey funded IPSE 2.5 project (Warboys 1990) and the Esprit Promoter research programme (Finkelstein et al 1994). The process oriented approach underpinning PADM has come to be known as process engineering. It is viewed as an approach or set of principles of which the Process

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Analysis and Design Method (PADM) is seen as a particular interpretation and realisation. It is seen as distinct but related to Business Process Re-engineering (BPR), the common ground with which has been explored in Wastell et al (1994) and Kawalek & Kawalek (1995).

IPSE 2.5 was an ambitious project, which sought to provide a software to aid co-ordination of activities in organisations. Its initial focus was upon the work of software development teams. It aimed to raise the level of integration within the support system above '...the store-plus-tools' (Snowdon 1989) approach. It was applied to support the co-ordination of software developers and the tools they use at their work. It achieves this through an encoded process model which determines, to use blunt language, who can do what when. This process model has enabled the development of understanding of, and ultimately support of, some of the various coordinative behaviours that take place between different software developers, software developers and their tools and between different tools. Clearly then integration of certain human activities and tools through co-ordinative software technologies was a central concern of the IPSE 2.5 project. Furthermore, because processes are dynamic, the issue of evolution is also central. Change can be necessary to achieve goals, to rectify deficiencies, to meet changing requirements or to innovate. Therefore the IPSE 2.5 project sought to develop ways of supporting the change of processes and of their co-ordination.

It was hypothesised in 1990 that the process engineering approach to the support of software development could be extended to further application domains. Moreover, process engineering has formed the basis for the development of the Process Analysis and Design Methodology (PADM) which ambitiously seeks a better understanding of issues surrounding human work activity and organisational objectives and also seeks to relate these to the use of informatics and exploit the benefits of new technologies such as IPSE 2.5 and workflow. The shift in thinking has been shadowed by a shift towards qualitative and interpretive approaches in order to achieve richer pictures of processes and the achievement of work objectives within organisations. Figure 1 depicts the requirement for IPSE 2.5 technologies to harness some of the organisation based theory, which is the focus of this paper. It also depicts some influencing factors in the development of the thinking.

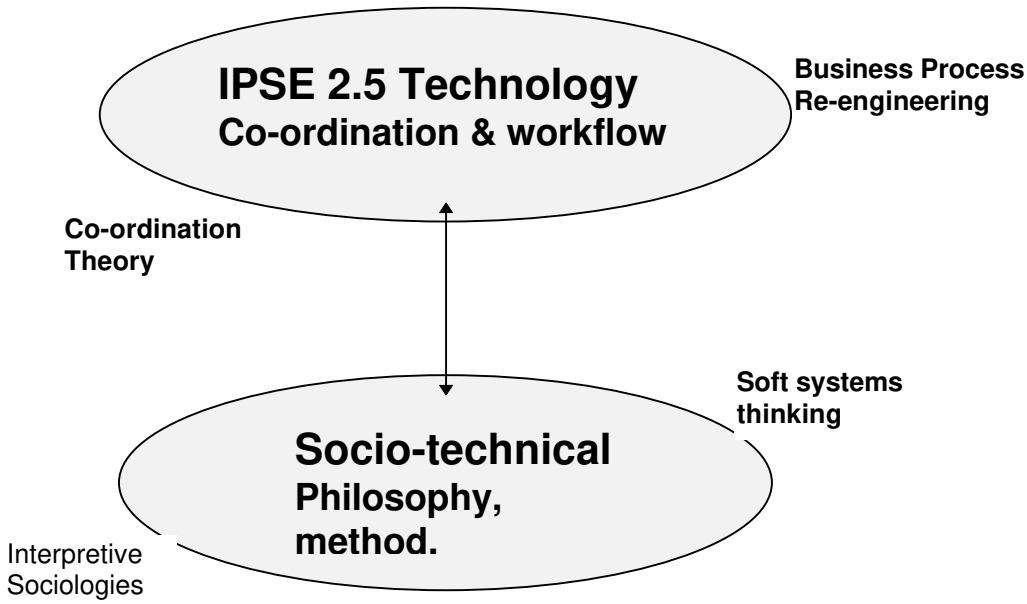

Figure 1: Process technologies are having to encompass philosophies and methods from organisation science

To verify and legitimise the approach a number of action research projects have been undertaken with companies in a number of different domains. These include an insurance company, a computer manufacturer, a telecommunications company and local government. It is intended that results shall be published as part of the PEF project.

This paper investigates some of the emergent themes when linking the idea of work processes to that of the identification and provision for co-ordinative and more generally supportive technological applications. Part one contextualises the theoretical background, focusing on the subjective-objective ontological issues and debates linking the idea that some methodologies or elements of methodologies can be seen as solution development orientated, whilst others might be seen as problem analytical. Part two focuses initially on the traits, characteristics, and emerging properties of process thinking. Examples of cases where PADM has been used gives further insight into process thinking and enables clearer reflection on the relative merits of the ideas presented in part two. By doing this a clearer picture and future potential of a process approach emerges. In the final section a simple framework for discussion is developed stemming from the ideas presented in the first two sections. It depicts some characteristics of the types and nature of working activity within organisations linking the problem analysis / solution development idea explicated in the first section. The paper concludes by suggesting that although it is early days in the development of a process approach, initial signs are that it can lend insight into some aspects of the nature and characteristics of working activity and thus a better assessment of the likely success of

implementing various co-ordinative technologies within organisations. The very soft and dynamic philosophical stance that it is increasingly being adopted within process engineering enables rich insight into human construction of work tasks, and it is the inherent ability of the resulting data to contribute to requirements analysis which is the focus of this paper.

Interpreting Systems Analysis And Design

One of the fundamental issues which has influenced process thinking is the recognition of the meaning behind key terms. Given the term 'computing' is the media of information transfer and processing, then the term is one element of 'systems' of information handling within the term 'information systems'. Thus the media and the information provided by it are quite separable, though the study of this academic area within the context of organisations and decision making quite often necessitate integration of both concepts. The term information itself is usually seen as enabling better or more informed decision making in order to determine human action or work activity. This contrasts with the context free nature of data as the raw material for information. As a consequence of this type of definition of these terms a computing or information system involves data manipulation and interpreting meaning from data, and the design of the information system requires understanding of the decision making, human action and work activity requirements which it will serve. Thus information systems can be seen as data manipulation and meaning attribution systems. Therefore systems developers must understand user perceptions of their world, then they might be in a position to build appropriate 'human activity systems' (see for example Checkland and Scholes 1990, Chapter 2). This is true not only of current human activity systems and the information to support that activity, but of future or new human activity systems with associated data. The traditional view of information being somewhat a by-product of the automating process of manual functions using IT is not always case, because it does not necessarily account for the context in which information is required to be used (Galliers 1993, Zuboff 1988). This contextual stance for the use of information means that it is necessary to view the study of computing and information systems not only as a technical academic discipline, but as much as a business, social and behavioural science. Decision making, work activity and human action can be influenced by interaction with any information oriented system which includes a computer system. The lack of understanding regarding the contexts in which technology is placed is endorsed somewhat by studies such as Watson & Brancheau (1991), Clark (1992), Niederman et al (1991) and in Kraemer and King (1990).

Contextual stances require an approach to research to develop consistent alternatives to current research approaches. The interpretive approach as described by Walsham 1993 is a movement away from the natural science type approaches to research in systems development. When talking of the merits of computer hardware and software development, a positivist approach has perhaps quite reasonably dominated the research. This is a theme developed by Orlikowski, & Baroudi (1991), in which they identify and describe positivist, interpretivist and critical approaches to information systems research. However, when applied to the effective operation and application of information systems including the methodologies used for systems analysis and requirement specification then consideration of alternate epistemological positions may be usefully applied. Indeed this need for better contextually based information systems approaches is reflected particularly in the more complex installations of computing equipment. Computing equipment is no longer used only in relatively simple transaction processing application environments. The

technology has been used not just to automate, but to informate (Zuboff 1988) and to co-ordinate (Kawalek 1994). It is within this context of complexity of systems application within the organisation that it becomes increasingly imperative for a recognition of strong links between organisational infrastructural issues which include as only one component information systems and of its impact on other diverse infrastructural aspects in organisational design. In terms of the use of information systems in organisations, the contextual issues refer to diverse aspects such as organisation behaviour, management and the politics of power, the social processes, the psychological as well as cultural aspects. Handling such factors successfully is seen as increasingly important particularly in complex environments, and in ones with diverse actor views on work objectives and on the method of achieving those objectives. Indeed in a wider context utilising the interpretive stance and alternate epistemological approaches to the positivist is no longer considered a theoretical exercise for research, but has pragmatic implications for systems analysis and design in organisations (Lewis 1994). The idea of equating the work of the systems analyst and designer with that of a social theory is introduced in Hirsheim & Klein 1989, whose paradigmatic model is derived from Burrell & Morgan 1979. The paradigms of systems work highlights some of the theoretical difficulties that traditional 'technical expertise' oriented approaches has in defining and applying technology. It can be argued that this tends to be the focus and origin of methods such as SSADM, although interpreting how the method is used will depend to an extent on the systems analyst using it. On the other hand, the discipline of systems analysis and design can also be seen from other perspectives. Is it for instance a discipline which should only consider the views of managing organisations or indeed should it also consider the needs of those at the lower or operational levels of organisations. This theme is developed by Robey & Marcus (1984) who conclude that information systems work tends to reflect private interests and that most work in the area of requirement analysis results in the preservation of the status quo. A complementary theme is developed by Hammer (1990) who implicitly criticises piecemeal and small scale development from the perspective that efficiency gains can be dramatic if that status quo and traditional work activities are 'obliterated'. Thus it seems reasonable that attempting frameworks to better understand and model human work activity for both current and future system implementations is imperative.

It is recognised that analysing human work activity in order to suggest changes to that work activity is complex and dynamic. Power and conflict play key roles. This theme is developed in Newman and Noble (1990), who suggest that once conflict has arisen during the development process, consensus might be impossible and that coercive tactics by managers on prospective users will generally result. It could be argued that some methodologies tend to be most effective in consensual environments where there are common, agreed and reasonably well understood goals. In these environments it might be argued that traditional methods such as SSADM are more likely to yield a fruitful result. Other techniques such as SSM (Checkland 1981) might be seen an approach to help *develop* a consensual view on prospective systems. In the less consensual context, the importance and relevance of the systems analyst as facilitator may also be heightened (Hirschheim & Klein 1989). The logic of this would be that in non-consensual environments, interpretations of how work is to be done effectively and information requirements to achieve that effectiveness is encapsulated by individual users of technology, and is not widely agreed amongst multiple actors. Each user, perhaps doing the same sort of work, may have very different methods of achieving work, utilising technology as and when appropriate to meet perceived needs. (See for instance Checkland 1992, p.362 who comments on end user utilisation of technology and sees it as a movement away from a 'project' type approach).

Given that system requirement analysis is not impartial or objective and that this is particularly noticeable in complex, informational and non-consensual work environments, it is reasonable to question the ownership of the views expressed in the resulting requirement specification. For instance, is it a management perspective and thus is it valid to argue that the resulting system represents a tool of control or of power over others. Criticism can thus be laid on some of the methodologies, which treat system development in terms of project management, making little sense of and contributing little to the understanding of the complex inter-relationships between individuals involved in the process. These themes have been developed by Boland (1979). The multiplicity of views and inter-relationships may need substantial in-depth qualitative analysis in order to draw together common themes and understandings. It requires a certain theoretical sensitivity towards issues of power and control, and these are themes which are increasingly recognised in the process engineering research community when analysing current and new processes.

The result of the domination of 'hard' scientific method (see Checkland 1981, pp. 105) in system requirement specification was the emergence in the 1980's of what today might be seen as over-prescriptive approaches which the successes in the field have been limited to largely automating current systems rather than informative or co-ordinative (as primary task) systems. Methods such as SSADM for example have tended to focus on the management of system development through simple stages for project management with in-built tools and techniques and documentation standards. Close adherence to such a method it was supposed would produce the 'perfect' or 'near perfect' system application. The methods often had relatively little consideration for some of the contextual issues in which the system was to operate. The key to this over-prescription is largely in the area of requirement analysis and specification, sometimes making sweeping assumptions about the operation of the organisation, its power structures, the user requirements for information and utilising a basic assumption that information provided by the system is objective and generally unchanging over time. Literature based around such methods was dominated by assertions that techniques such as data modelling was an objective and rationalist exercise (see for example Cutts pp. 27). The data was seen as static and unchanging, and human processes and the resulting designs for computer programs which were equally static could harness the data and made sense of it in some way and thus providing information. The movement from current to future system (logicalisation in SSADM) is not a questioning or critical process, but rather one of optimisation of current work practices. Traditional structured approaches to the tools and techniques used in these cases are also being exposed as over simplified. Thus such approaches when transported to complex, dynamic and less consensual environments are being seen by some as over-prescriptive and oriented towards *'solutions'* rather than an adequate understanding of the business context, its culture, politics and ultimately a better interpretation of *problematic issues* surrounding organisation work activities. Thus at the heart of the shift in systems analysis thinking is the idea that on the one hand applying technology in organisations is best seen as a subjective rather than objective discipline (Hirscheim & Klein 1989) with associated requirement capture techniques, and also as a problem oriented discipline rather than perhaps a more traditional solution only exercise. Thus increasingly there is the recognition that the type of systems analysis approach taken will depend in part on the context in which they are to be applied. The emergent process engineering discipline is increasingly aware of the need in some circumstances for better contextual analysis, basing its focus around work activity and business processes to achieve certain objectives. The objectives being identified and articulated using soft and qualitative analysis of multiple actor views.

Interpreting The Process Analysis And Design Method (PADM)

Through the theoretical debate, the concept of 'process' remains somewhat pertinent. The focus on goals, work activity, skill groupings around processes, inter and intra organisation process links and content and construction of activity to support different types of goals remains central to the process engineering. The focus is on work practices and the official and unofficial methods through which objectives are achieved. Thus a soft interpretive ontologial stance remains central to much of the thinking. A definition of process used in the development PADM has been:

> '... a set of repeatable actions which are in some way ordered and contribute to the fulfilment of an objective.'

Whilst recognising the dangers of an over rationalist and functionalist approach (Kawalek 1994), some of the strengths and perceptions developed in the BPR tradition have been drawn upon in PADM. Broadly, PADM attempts to analyse the process work activities of an organisation characterising formalised and routine as well as less formalised and more chaotic or fuzzy work activities with the aim to enhance the provision of service. It aims at better understanding of human roles, objectives and activity to creatively articulate alternate methods of working. Many of the theoretical perspectives that surround this area are central to academic debate at the moment, and the approach taken by PADM is seen as a pragmatic response to the need to ensure a close bond between systems design and individual and human needs at work. The theory is that through a study of process it is possible to identify, monitor and understand the repeating patterns of work in organisations, identify activities which are suited to current technology applications and to gain greater perspective (and benchmark development) of advantages gained by the utilisation of technology for process co-ordination. Co-ordination involves the linkeage between the work activities of different actors which may involve intra or inter organisation communication. It is then possible to make more informed designs which may involve technology on the basis of the understanding gained. The rationale underpinning the PADM is essentially concerned with the recognition that technology is increasingly being utilised in areas of business which are increasingly complex and dynamic. Thus there is increasing awareness for the necessity to implement technology whose primary focus is not merely automational, but informational and co-ordinative. It focuses on the structure and purpose of actions, the repetition of actions, the nature and structure of information which supports work actions, and the control, monitoring and co-ordination of that work activity. The complexity involved, particularly in non-consensual type environments requires highly qualitative and interpretive stances in order to scratch surface assumptions and sets of criteria.

This focus on action requires the investigator to confront a practical issue of granularity. On one level human actions can be seen as an intuitive response to sets of criteria, which it is recognised are largely indeterminable by cause-effect type analyses. This is a fine grained consideration of action which might focus upon primitives such as ‘sit at desk’, ‘log in to terminal’, ‘open window’, ‘type invoice’, ‘print invoice’. This is not the level of focus which process engineering seeks. It is the contextualisation of work activities within the context and constraints of everyday working activity.

The emphasis upon human activity and process tends to promote a more abstract level of consideration. Thus the focus might be ‘create invoice’, ‘seek authorisation’, ‘mail invoice’; these being actions which serve an objective such as ‘request customer payment’. It is recognised that the dymanics of objectives and of work construction by individuals is constantly shifting and PADM attempts to seek patterns over long periods within this context.

The development of PADM is ongoing, having originally started in 1991 as part of a collaboration between the IPG and British Telecommunications plc (Kawalek 1992). The core dynamic of the method is a learning cycle which involves iterating phases of process representation and process redesign. In the first phase a process model is built and utilised for the development of shared understanding. In the second phase this understanding is used to inform and guide the development of the process. Like traditional methods each of the phases incorporates defined activities. Unlike traditional methods, PADM recognises the importance of a subjective ontological position, and current extensions being investigated utilise qualitative data analysis techniques in the analysis and construction of current and future working activities. The focus is on work objectives and activities that support those objectives. Human construction of those objectives and activities as well as the relationship of the processes to customer need is central to PADM. The representation phase of PADM emphasises the importance of dialogue with the participants of processes to discover how work is carried out. It is concerned with knowledge elicitation so that the resulting process model describes a user's interpretation of his or her work and not some procedural or managerial view of it. In this it recognises the need for interpreting the meanings behind actor conceptualisations and constructs. The method is currently developing ideas to better interrogate and analyse the qualitative data extracted.

The redesign phase also requires dialogue with participants. This dialogue is concerned with perceived problems and objectives. Where these problems and objectives require change to the process there is the opportunity for modelling the proposals and the analysis of their likely implications. Checkland argues that there is a need to explore user's perceptions of reality and that methodology should be systemic (Checkland 1990). PADM has a similarly interpretive stance in so far as it recognises the likely requirement for a reconciliation of perspectives when considering process change. Thus PADM seeks to investigate work process and through this explore the inter-relationships of activities, people, objectives and support technology.

- The process model provides a standpoint from which the interlocking components of IT support for a process can be viewed.

- PADM provides a framework for process evolution. In doing so it recognises that a process is dynamic and that changes to a process are likely to have implications for support technology requirements.

It is important to recognise that the process engineering approach which underpins PADM has broader concerns than requirements analysis and does not approach it in a conventional way. Starting with the issue of evolution it is concerned with a requirements to design cycle. This cycle develops the relationship between an operational process, the organisational objectives and the supporting technology over time. Thus, instead of viewing the development of an IT system as a project, with a beginning and an end, it is viewed as a non-terminating series of activities. In this

way evolution becomes of central concern. Moreover, process engineering recognises that IT systems play informational, automational and coordinative roles in organisations. Recognising the breadth of this concern, and the fact that IT systems are increasingly becoming made up of disparate technological tools, the issue of integration between people and tools is also emphasised. In some senses this can be seen as a coordinative issue which focuses upon the provision of services to users. Therefore coordination between users, between tools and between users and tools is of prime concern in the process engineeering approach. It should be acknowledged that some these themes of process engineering are only just emerging in current case material. It is seen as part of the remit of the PEF project to work towards an assessment of the importance of some of these areas of thinking. Some of the ideas can be seen as rather traditional. The study of humans at work has been the primary focus of requirements analysts for some time. Important methods such as Ethics (Mumford 1981; Mumford & Wier 1979) adopt a user-task perspective which is very similar to PADM's user-process perspective. PADM is differentiated by the drawing together of this background with sensitivity to current theoretical perspectives, a concern for evolution and a focus upon coordinative role of IT systems.

A PADM Case Study

An ongoing collaboration between the IPG and an international insurance company is one of a number of projects which have been used in the evaluation and development of PADM. The company is a specialized commercial insurance firm operating in the City of London. It has been undergoing a period of expansion. The first phase of the collaboration was concerned with the requirements for and development of a prototype IT system. This was used as a contribution to the decision making process over the company's IT strategy for Europe. The prototype phase of the project began in November 1993 and ended in March 1994 with a series of workshops. Later phases of the system development have been carried out by an international consultancy using their own well known method. The IPG have a reviewing and advisory role. For this reason there has not been much scope to apply the longitudinal, evolutionary concerns of PADM. Nonetheless this case study is a suitable vehicle to describe PADM as a requirements approach.

Twelve users took part in the prototype phase. Three of these are administrators and two are administrative managers. Two are trainee underwriters. Four are underwriters of various levels of seniority. One is an IT specialist. In addition, two of the company's senior managers joined in the workshops which concluded the prototype phase. Throughout the project was overseen by an IT strategy manager.

The company have invested heavily in two worldwide databases, one for in progress work and one for active policies. However, currently their business processes are characteristically manual. Most work is done using bulky paper files which contain the policy submissions received from brokers. These arrive by post or are brought into the office by the brokers themselves. The files are used by underwriters who scour the details of the submission as part of their risk assessment. They add handwritten notes to the files which describe the reasoning which underpins their decisions about premium quotes and so forth. Administrators use paper forms upon which they hand write summary details of each submission. These are attached to the files. At specified points in the process the information contained in these forms is

transferred to a database. Cases which progress to the successful negotiation of a premium will be entered into both databases thereby requiring duplication of effort. Locally, in order to remedy perceived information shortages, initiatives have resulted in the development of new databases (e.g. containing brokers names) using systems such as Paradox. Although these do rectify the information shortages, they add to the problem of repeated data entries. They require that additional actions are carried out by users so as to keep the databases up to data and in accord with other databases. Certain items of information are entered in triplicate to databases and at least once to paper forms. This is an example of succeeding with analysis but failing with synthesis. That is, although these databases might of themselves be well designed and able to satisfy some requirement, when we consider how the IT system as a whole serves the company's staff it is apparent that the relationship is not satisfactory. The desire to be served by a system which requires data items to be entered once and once only was a something of a leitmotif for the study.

Soft qualitative analysis of current processes revealed that the work of the underwriters has been shaped by the traditions and practices of the City of London. Brokers, who act on behalf of a client, will visit the company's offices by prior arrangement or sometimes on spec. They will present a submission to the underwriter and may require an initial assessment as to the likelihood of the company issuing a quote. The personal relationships between brokers and underwriters can be of critical importance. An important part of an underwriter's job is to develop and maintain relationships with brokers who can bring valuable business into the company. There are several benefits to this from the broker's point of view. For example, a good relationship with an underwriter means that he/she can be more confident of the terms that can be obtained for a client. Thus, the work of the underwriters can be characterised as being concerned with the assessment and management of submissions and the development of links with brokers.

The administration work is concerned with recording and distributing files and maintaining database records. Corporate and legal standards have to be adhered to. For example, the company requires that a completed policy document be mailed to each client within a specified length of time after the acceptance of a quote. To help maintain these standards a quality tracking system is used through which administrators record the completion of various work actions.

The prototype phase began with the intention of establishing the activities that individuals and teams in the office carried out. All users were treated in the same way through interviews and summary feedback of the ideas expressed by them. The initial interviews focused upon their current work activities. These activities were mapped as role activity diagrams (Kawalek 1994) where appropriate which showed the actions undertaken by different roles and the interactions between them. These interactions are used as a basis for understanding the coordinative aspects of an organisation’s operation. The diagrams were used to help the participants and investigator express the activities that were carried out and the important dependencies and interactions. They were not a rigorous definition of how work is carried out, such a thing is probably both unattainable and unnecessary. However they conveyed enough of the activities and structure of current work practices for process redesign issues to be considered. The high degree of consensus expressed by the users with regard to actions and objectives was of note.

The potential for process redesign increasingly became the major topic of concern as the study progressed beyond the first round of interviews. In considering process redesign the participants were concerned jointly with how they might want to work, how IT might serve them and the additional possibilities IT might afford them. A whole range of issues were discussed. For example, issues raised included the repeated data entries into different databases, ambiguous field names, and the possibility of radically reinventing the process around electronic submissions from brokers. It has been noted already that PADM shares characteristics with Ethics in that it supports the involvement of users in the design of their work activities. The users were not required to explicitly express the motivations for their ideas but often they did so voluntarily. In many cases their motivations concurred with those expressed by the senior management of the company (e.g. greater efficiency, improved job satisfaction) but there were also personal motivations (e.g. a better c.v. through experience of working with advanced IT systems). The focus of PADM on processes as well as the qualitative analysis of sets of interviews, gave insight into both official methods of doing work for different goals, and the less obvious hidden agendas and ways work was achieved. The matching of activities to objectives was significant. It was possible to identify a hierarchy of objectives from the corporate, strategic to the tactical and personal. At any point it was possible to ask “What are we trying to achieve through these activities?” It is notable that the senior users tended to focus on more strategic objectives whilst the less senior tended to concentrate upon the contribution their work makes to the process.

The redesigned process was represented in much the same way as the existing process had been. Diagrams were used where appropriate to help develop a list of services which the prototype would have to provide. Some activities obviously implied or relied upon the use of an IT system (e.g. 'search database of policies'). In other activities there was a less obvious relationship. For example, 'transfer file to underwriter' could have been handled manually. Through consideration of coordination issues it was decided to make this a partially manual, partially IT system based activity. So, throughout the process, by considering what activities were to be carried out, and by revisiting issues as new possibilities and needs arose, it was possible to tease out heightened understanding of the relationship between the business process and the services the prototype would provide. It was recognized that this "heightened understanding" was in fact a snapshot of an evolving relationship between served and serving systems (see Lehman 1992, p.4). This phase of the case study was constrained to go only as far as a prototype and it was not appropriate to consider the evolutionary characteristics of the process. The priority was to move from modelled snapshot to a working prototype as quickly as possible.

The required IT support services which were identified through the analysis of user actions were developed using ICL's ProcessWise Integrator[3] and Powersoft's Powerbuilder tool. The former was employed to give a coordinative harness to the actions which were presented in the latter's GUI environment. The presentation of services to users was carefully considered. It was sought to maximize the flexibility of the serving system so that it was suitable for a contingent and dynamic work environment. The actions which can take place in the prototype relate closely to the administrative tasks which are carried out (e.g. 'record submission details')

[3]ProcessWise Integrator is the productised derivative of IPSE 2.5 technology.

and the risk assessment tasks (e.g. 'calculate rate'). Aspects of the work of underwriters, such as the development of links with brokers is secured by unstructured activity between humans and consequently was not supported by the prototype (except for the fact that it made it easier to communicate with brokers via word-processors and fax).

A simple state model was used to provide a loose governance over which services were available to the user at any particular point in the progress of a submission. An on-screen 'in-basket' shows the user which items of work are allocated to him/ her. Thus, if an underwriter selects a new submission from his/ her in-basket a range of possible services will be presented on screen. If he/she then selects a different item from the in-basket which has reached a later state of process (e.g. a quote has already been issued to a broker), a rather different set of services would be made available. Many services are available in more than one state. The range of services available is also affected by the organisational status of the user. That is, non-managerial administrators are not able to undertake the activities concerned with policy underwriting.

The prototype phase culminated with a number of workshops in which the users were able to view and suggest modifications to the support system. It was enthusiastically received by the users. Of note was the fact that the users could clearly correlate the action choices presented on menus with actions they wished to carry out. This contrasts with the approach taken in subsequent, non-PADM, stages of the development process. Although users have been involved in interviews and workshops they report that they do not know what to expect from the system that is being developed. Perhaps this is due to the fact that the methodology now employed in the project places the emphasis upon the data needs of the organisation rather than upon actions and process.

The consensus expressed by users in this case study has not been true of all of the IPG's case studies (see the case of 'Pineapple Computers' in Wastell et al, 1994). In less consensual case studies, users have not always been able to agree on the activities that they currently carry out or those that they should seek to undertake. Aspects such as the relative importance of different activities and the objectives they serve have proved to be still more problematic. In such circumstances the expression of activities in diagrammatic form has tended to be both arduous and fruitless. When faced with such difficulties PADM suggests the use of techniques from SSM to try and establish what is common or uncommon ground between users. Then, PADM proposes, that it may be possible to proceed stepwise to the development of activity models. This approach reflects the view that techniques such as SSM can help *develop* consensus. Experience of projects supports the suggestion reported earlier that in non-consensual environments the importance and relevance of the analyst as facilitator is heightened (Hirscheim & Klein 1989).

Thus, PADM can be seen as a methodology which is extensible according to the contingent circumstances of the process it addresses. Just as it is possible to refer to SSM where the focus upon activity does not achieve a consensus, so too it may be possible to learn from or utilize techniques which address socio-political, cultural or psychological factors. In such circumstances PADM would provide a hub in the form of process and activity investigation, for a much more wide ranging investigation of an organisation. Thus, it may be possible to consider concerns such as those referred to earlier and expressed by Robey & Markus (1984),

Davis (1992) and others. The relationship between an investigation of process and these other investigations needs further consideration.

Conclusion

Traditional systems investigation and development methods have been dominated by steps and stages by which a systems analyst and designer might put together a new system. Methods such as SSADM and others gained credence largely in the 1980's were highly prescriptive regarding the types of systems being applied and the types of information that a systems analyst as expert is required to capture and analyse. The content of the methods focused on the method stages and a number of supporting tools and techniques. The new SSADM version four has now implemented a much more modularised perspective to enable the systems analyst to pick up modules and use them depending on the context within which he/she is working. By studying the activities of users, it is now contended that such approaches are most appropriate in well structured, automative (Zuboff 1988) and database application development environments. Thus better understanding of the method of work activity, the cross link with intra and inter-organisation activities in complex, unstructured and informative organisation environments are precisely those environments which process engineering lends itself. Analysing human activity in working environments is seen as fundamental to effective ultimate use of technology and the provision of appropriate tools sets. Thus the process engineering perspective has a special view on the discipline of requirement capture.

Requirements analysis is increasingly seen as a subjective, non quantitative discipline requiring appropriate methods for the analysis of data. In complex, informational environments, it also requires greater understanding of the roles played by culture, politics and power inherent in the requirements expressed and identified by users and managers. Thus utilisation of technology for increasingly complex variety sets of business operations which interlink internally within the organisation and with external trading agents, requires the capture of numerous subtleties, nuances and differing interpretations of the method of current, and the vision of future, working activity. It is argued in process engineering that effective use of IT within organisations needs recognition particularly at requirement capture time that expressing judgements and explanations on working method makes base assumptions about component systems, procedures and data requirements. Thus practitioners working on system requirements in complex environments require heightened awareness of such judgements in order to interpret the complexities, actor concerns and differing interpretations within a business organisation. In order to penetrate understanding and make inroads into the activity and mind set of central actors, the analyst needs to be careful of the meaning attached to the language used by the observed and be aware of the subjective nature of assertions, findings and generalisability of conclusions made. Thus lessons can be learned from practitioners active in the research field who aim to penetrate surface assertions and speculations in order to build robust rules of thumb, frameworks of analysis and models to explain phenomena within the complex world in which we live.

The way individuals construct the processes is of focal concern, and the method by which this is done is dependent upon the world view of central actors. The approach has enabled insight into the regularity of actions and the relationship between actions in order to support the achievement of

objectives. It is recognised that analysing processes in this way is only one way of looking at work activity and actor construction of it in order to identify the structured components that over time remain constant. It is a way of analysing work, its de-construction and its re-constitution and at the same time recognises it is only one insight into the complexities of work and activities. It is a method of gaining insight into the organisation context and the work activity of individuals involved in the organisation. The relationships between activity structures and the dimensions of the concept is central for future research in process thinking. The application of these sets of ideas relate to the simple model depicted in figure 2. This represents how the roots of process approaches are moving from a set of support technologies and ideas to incorporate work activity in increasingly complex work environments. The activities of potential users of co-ordinative software in these situations are increasingly difficult to model using conventional techniques and thus require new ways of thinking and capturing data which pertains to the work activity. The theoretical underpinning for this as well as tools and techniques for pragmatic implementation of a process approach to requirement capture is of key concern to the development of PADM.

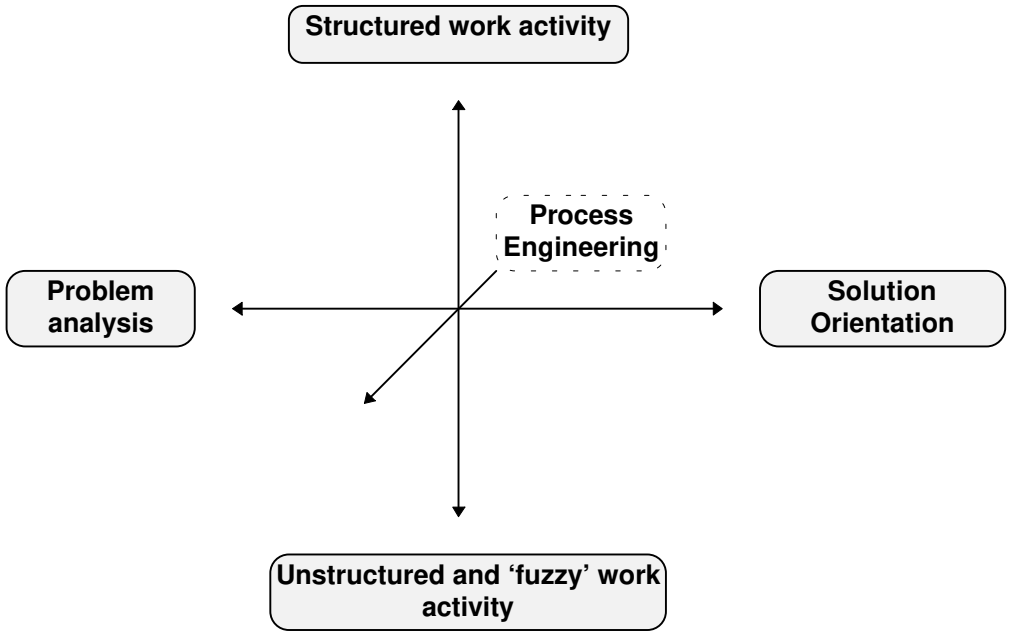

Figure 2: Future directions of Process Engineering

Also depicted in figure 2 is the concept developed in section 1 that some systems analysis and design methods tend to focus on business issues and problems, whilst others tend to be solution oriented. Of course the simple model represents a view of the world which may help how the IPG are focusing attention, and its importance and relevance for mapping or influencing alternate systems analysis and design methods could be the focus of further study.

It is recognised that the focus and philosophy of PADM is not entirely new, but there are some emergent themes which differentiate it from that of some established systems analysis and design ideas and themes. The emergence of some of the theoretical constructs which lie behind the approach still requires assimilation in many areas. In some respects the ideas inherent in process engineering are derived from or related to BPR but with a human activity stance and approach and one which has a certain theoretical grounding in the interpretive sociological tradition. This is a modern approach and one which is attempting to gain greater critical awareness of contexts and as well as limitations behind the application of traditional tools such as IDEF-0, DFD's, RAD's and petri-nets in order to model human activities within an organisational framework. It recognises the complexity of organisation activity, and thus the philosophy distances itself from the *means-end project* oriented methods that some of the traditional methods aspire to. Rather, PADM is concerned with insight into working activity and at the same time recognising the transience of

observations made in the process of process engineering. Thus the approach requires iterative and on-going approaches with high levels of critical awareness. In this way it can gain some insight into the dynamics of work activity in order that it can enhance in a processual manner the utilisation of technology and human interaction with software objects as well as the way those software objects are constructed and co-ordinated. The approach in philosophy and in the pragmatic application of PADM is seen as a problem analytical approach, rather than being a problem solving or solution only exercise. It is seen as potentially important as data analysis is for database design. By better understanding some of the issues which surround working activity and its construction by humans it is hoped that enhanced understanding of the appropriate use of software support systems will ensue.

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