There are basically two approaches to measuring processes which can be attempted: the exhaustive approach and the high impact approach. The exhaustive approach attempts to identify all the processes within an organisation and then prioritize them in order of which needs to be redesigned first [Davenport, 1990]. A technique which can be used in this approach is the value chain method by Porter and Millar 1985. This method traces "upstream" processes such as operations through to "downstream" processes such as marketing, sales and services. The method identifies the role of IT whilst tracing the processes throughout the organisation. Once all the processes have been identified each process can be evaluated as to it's strategic relevance, using a strategic management method such as the critical success factors method [Teng *et al*, 1994]. The second approach is the high impact approach which attempts to identify only the most important processes or those most in conflict with the organisations business vision.

Davenport suggests that most organisations can sense which business areas or processes are most crucial to the firms success, and those which are inconsistent with the organisations business vision. These can also be extracted through the use of interviews or company surveys [Davenport, 1990]. Hall, Rosenthal and Wade [1993] found that the key to which process to reengineer is to identify which two or three elements comprise customer value as well as what defines the organisations competitive advantage. If an organisations competitive advantage lies in performing customer service as fast as possible then the relevant processes should be reengineered. At a US electronics equipment manufacturer, seven possible job titles in three different functions were involved in the nine steps required to provide hardware. In the redesign these steps were combined by eliminating five job titles and thus the speed of the process increased and the service improved dramatically. This enabled the organisation to gain competitive advantage[Hall *et al,*1993].

Davenport [1990] found the second method of identifying processes to be sufficient as most organisations do not have the resources to redesign all processes. At most, businesses were able to support only 10 to 15 major processes per year.

Whichever approach is used organisations need to classify each redesigned process in terms of beginning and end points, interfaces, and organisational units which are involved in the process and particularly the customers involvement. If processes are considered in these terms it can broaden the scope of the process and therefore increase the impact of the BPR project. This is important as most processes in an organisation are interconnected which makes it difficult for managers to isolate particular processes. Classification enables mangers to clearly identify processes and thus enables mangers to reengineer complicated processes [Davenport, 1994].

Davenport [1990] developed a framework for classifying processes in order to determine the level of management attention required, the role of IT and the business consequence of each process. To effectively leverage IT in candidate processes, certain characteristics of a business process need to be altered by IT to achieve a dramatic improvement. Thus classifying processes allows a role for IT to be identified more clearly and it allows a role for management to be defined.

7.4 Identifying IT Levers

Most BPR approaches have not, until recently, considered IT capabilities until after a process had been designed. The conventional wisdom in IT usage has always been to first determine the business requirements of a function, process, or other business entity, and then to develop a system [Davenport, 1990]. Rather the role of IT in a process should be considered in the early stages of its redesign.[Henderson and Venkatraman, 1989] An awareness of IT capabilities can and should influence process design [Davenport, 1990].

Venkatraman developed a model which depicts five levels of IT enabled business transformation which can be used in BPR. The first level, namely Localized Exploitation, involves leveraging IT functionality within a business. It is basically the level at which IT is used to automate existing processes within a business function. Typically managers initiate and deploy these systems to respond to operational problems or challenges. Vekatraman concludes that simply automating existing processes under leverages IT's potential capabilities and fails to provide organisations with as many possible advantages if the organisation had attempted to change the business processes to leverage the technical functionality. The main weakness is that competitors can easily imitate standard technical applications with minimal changes to their underlying business processes to neutralize sources of strategic advantage.

The second level, Internal Integration, reflects a more systematic attempt to leverage IT capabilities throughout the entire business. This level involves two types of integration, namely, technical interconnectivity and business process interdependence. (dealing with the interdependence of organisational roles and responsibilities across distinct functional) Venkatraman concludes that neither type alone is sufficient and that most firms achieve technical interconnectivity, however few firms address the challenge of business process interdependence.

The third level is business process redesign. This level reflects a strong view that the benefits from IT functionality are not fully realized if superimposed on the current business process, however integrated they may be [Venkatraman,1994]. The reason for this is that current business processes subscribe to a set of organizational principles that responded to the industrial revolution. Organizational concepts such as centralization versus decentralization, span of control, line versus staff, functional specialization, authority-responsibility balance, and administrative mechanisms for coordination and control are all derived from these general principles. Venkatraman argues that although these concepts are still valid, IT functionality can significantly alter some of these "first principles" of business process redesign. The fourth level, Business Scope Redefinition, represents the redesign of the nature of exchange among multiple participants in a business network through effective deployment of IT capabilities. Level five, Business Scope Redefinition, addresses the question, "What role, if any, does IT play in influencing business scope and the logic of business relationships within the extended business network?".Here Venkatraman believes that IT is able to redefine the scope of a business, opening up new markets for the business. Otis Elevator has leveraged IT enabled features like remote elevator monitoring (REM) as an additional source of revenue [Inbound/Outbound].In looking at Venkatraman's model we can see that a business which has only reached level two in the framework has only levered IT in so far as improving efficiency. However in order for a business to achieve a competitive advantage it must reach level three, BPR. BPR is the platform which is necessary in order for a business to create strategic capabilities for future competition. Venkatraman concludes that IT is not simply a utility like power or telephone but a fundamental source of business scope reconfiguration to redefine the "rules of the game", through restructured business networks (level 4) as well as redesigned business processes (level3). IT is important in BPR as it has the potential to provide and support new forms of relationships and new ways of working in the organisation. However in order for IT to play a successful role in BPR an awareness of its potential needs to be realized at an early stage. Only considering IT once the processes have been redesigned means that IT can only be used as a tool to automate those processes and thus not affording the business a competitive advantage. Research from MIT Management in the 1990's strongly indicated that IT functionality should not be simply overlaid on existing business processes but should be used as a lever for designing the new organisation and associated business processes [Venkatraman, 1994].

7.5 Designing and building prototypes of the processes

The final step in the BPR process is to design the process. This is usually done by the same team that performed the previous steps. This would involve obtaining inputs from the users involved and through brainstorming workshops [Davenport, 1990]. Prototyping allows the designers to perform successive iterations as needed. The nature of prototyping has the advantage of allowing problems with the process design to be identified and corrected at an earlier stage than with using the conventional development life cycle method.

The benefits of using prototyping in the development of IT applications has already gained widespread acceptance [Davenport, 1990]. Dorothy Leonard-Barton believes that building prototypes of business process changes and organisational redesign initiatives can yield similar benefits. The implications of this extension are that process designs, after agreement by owners and stakeholders, would be implemented on a pilot basis in parallel with existing processes. The processes would be examined regularly for problems and objective achievement and modified when necessary. As the process approached final acceptance it would be phased into full implementation.

IT plays an important role in this step by acting as a design tool. CASE tools facilitate in the process of process design by proving capabilities to draw process models. This ability to draw models rapidly and make changes suggested by process owners speeds redesign and facilitates owner buy-in [Davenport, 1990]. Some CASE tools go a step further and can actually generate computer code for the IS application that will support the redesigned business process. By using such tools any later changes to the business process are easily and rapidly accommodated.

8.0 Conclusion

BPR is a highly complex process in which a multitude of factors need to be considered in order for it to have any chance of success. BPR critical success factors have been established and frameworks have been developed to guide organisations attempting BPR so that their projects may meet with success. However most of these BPR projects are still being perceived as failures.

Our survey indicated that most managers perceived IT as the least critical of the identified critical success factors, however it also showed that most BPR projects had not been a success. This could be attributed to the fact that not enough emphasis is being placed on the role of IT in the BPR process, which is also supported by Martinez [1995].

We suggested that IT should be levered throughout the BPR process. Although the technical aspect of IT is crucial in the redesigning of business processes, it is critical that the IS team, involved in the BPR project, have the necessary people and management skills to compliment their technical skills.

IT alone will not produce a successful BPR project however if the project has top managements support and the support of the users directly involved then the correct use of IT, as shown in our framework, can lead to a successful BPR process.

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ON TOTAL SYSTEMS INTERVENTION AS A SYSTEMIC FRAMEWORK FOR THE ORGANISATION OF THE MODEL BASE OF A DECISION SUPPORT SYSTEMS GENERATOR

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ABSTRACT

Decision Support Systems(DSS) have been dealing so far predominantly with semistructured problems for which existed well established Operations Research techniques. Most of them were originally oriented towards supporting a single decision maker. The situation is changing in the past decade. These changes have been observed in three directions. The concept of Group Decision Support Systems (GDSS) oriented towards supporting the process of decision making emerged in the United States in the late 1980s. Another trend is represented by the facilitator driven systems according to C.Eden that initially did not use computers as the centerpiece but now most are computerised. Among them are Soft Systems Methodology (SSM), Strategic Choice, Metagame Analysis, Decision Conferencing and Strategic Options Development and Analysis (SODA). A third trend has been the extension of MCDM decision aids into the group decision making situation.

A convergence of the three trends is observed in the extended research agenda in the field of DSS as presented by Khoong recently. The new developments in the field of DSS require also new and better ways for their design and specification, especially of their model base, which should be capable to handle the complexity of the new tasks. Computer hardware and software have made considerable progress in recent years aiming in providing the background for the design of better decision support systems. On the other hand there has been no considerable progress for the past ten years in the development of design methodologies for DSS.

It has been established by Keen, Sprague and others that the classic systems development life-cycle(SDLC) approach is insufficient as a prescriptive guide for building DSS. As a result of the fact that SDLC does not provide a means for bridging the gap between analysis, design and implementation, its usage frequently leads to the development of systems that do not meet user or organizational needs.

This research proposes a framework for the organisation of the model base of a Decision Support Systems (DSS) generator, capable to handle complex messy problems based on a recent meta-methodology in systems thinking Total Systems Intervention. It presents a review of the existing methodologies for the development of DSS. The suggested approach is a synthesis of ideas from the field of Soft Operations Research or Problem Structuring Techniques, Systems Thinking and Decision Support Systems. It may be perceived as a way of linking TSI as a meta-methodology for systems thinking with the actual methods that may be applied for handling a given issue - in our case it is to build a DSS for a messy management problem.

The proposed framework is systemic at two levels. First it is based on Problem Structuring Techniques and existing approaches to the design of DSS that are systemic in their own attempt to cover all aspects of a certain side of the problems that a developer faces while building a DSS for complex problems. Secondly it uses the systemic framework of TSI that helps to manage the process of building DSS, indicating what should be included in the model base of the DSS and how one should approach the process of constructing the DSS. The proposed framework for building DSS is particularly suitable for organisational decision support systems, covering all essential areas of activities across an organisation. That is important for the transformation of the developers' focus from building ad-hoc DSS to handling organisation-wide tasks.

MODULAR NEURAL NETWORKS SUBROUTINES FOR KNOWLEDGE EXTRACTION

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Abstract

Current research in modular neural networks (MNNs) have essentially two aims; to model systematic methods for constructing neural networks of high complexity and secondly, to provide building blocks for hybrid symbolic- and connectionist knowledge based implementations. The principal benefit of MNNs is that it combines the desirable features of different neural network architectures while compensating for their individual weaknesses. This paper reviews several models of modular neural networks and describes a method for constructing modular neural network subroutines that facilitate easier knowledge extraction. We explore this feature and further consider the generalization abilities of network subroutines as compared with conventional neural network architectures.

LOW-COST MEDICAL RECORDS SYSTEM: A MODEL

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Abstract

A low-cost, microcomputer-based online system has been developed for the basic In-patient Medical Records functions of a GeneralHospital. Its basic functions are: to access patient data; register and admit a patient; enter drugs, treatment or operationdetails on a patient; discharge a patient; and produce thedischarge summary. The single-user system is entirely menu-driven, and has user-friendly retrieval facilities for the endusers. The information contents and concepts are based on the manual Medical Records system at Princess Marina Hospital, Gaborone. For example, each database patient master record embodies the form on the inner cover of the Case Note Folder and it is accessed by Patient Number or Patient Name. Unlike the popular network-oriented, general-purpose Hospital Information System, based on the MUMPS/FileMan technology of the US Department of Veteran Affairs (VA), this system is based on DBASE IV for the creation and manipulation of Medical Records Relational databases, interfaced with Visual Basic for the end-user operations. Our approach is to develop a single-user system, dependent on locally available computer resources and expertise, and be affordable to a variety of hospitals in this region. The system is operational with test cases and it is ready for pilot conversion on demand.

A METHODOLOGY FOR INTEGRATINGLEGACY SYSTEMS WITH THE CLIENT/SERVER ENVIRONMENT

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Abstract

The research is conducted in the area of software methodologies with the emphasis on the integration of legacy systems with client/server environments. The investigation starts with identifying the characteristics of legacy systems in order to determine the features and technical characteristics required of the generic integration methodology. A number of methodologies are evaluated with respect to their features and technical characteristics in order to derive a synthesis for a generic methodology. This revised spiral model (Bochm, 1986; Du Plessis & Van der Walt, 1992) is customised to arrive at a software process model which provides a framework for the integration of legacy systems with client/server environments.

INFORMATION SYSTEMS OUTSOURCING AND ORGANISATIONAL STRUCTURE

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Abstract

A decision of increasing importance to many organisations is whether to use internal or outside resources, assistance and expertise to address information technology and information systems requirements. This decision may be affected by many considerations, including cost corporate culture and business strategy. The structure of the organisation represents the embodiment of a number of components. These include size, industry group, culture, degree of centralisation and internal control, and structure of the information systems function. It might seem logical therefore, that the business environment of an organisation, as represented at a high level by its structure, should affect the decisions of those responsible for the control of information systems and technology.

Are certain types of organisations more likely to use outsourcing to fulfil their information technology and systems needs? This paper first summarises some of the research into outsourcing, and outlines the characteristics and structures of various organisational types. It then describes a survey on these topics carried out on a sample of organisations from various industry sectors.

Certain relationships were found to exist between the practice of information systems outsourcing and both organisation structure and industry group. The paper discusses some of the main findings.

THE RELATIONAL ORGANISATION MODEL

A study into the usefulness of the theories of relational data modelling for the construction of organisational models.

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Abstract

It has become clear that today's complex society of specialised individuals has a need for problem solving techniques using an integrated and interdisciplinary approach. The popularity of business re-engineering beliefs is abundant. The actual successes of large scale business re-engineering projects are considerably less. Why, if everybody believes in it, is it not practised?

In this study I will attempt to bring convincing arguments that a way out of the organisational impasse can be found by using the principles of the relational database techniques for organisational modelling. I will highlight some of the reasons for the popularity of relational data structures in computer applications as opposed to hierarchical data structures. I will subsequently look for similar patterns in hierarchical organisational structures. I will then apply the principles of relational data modelling to organisational structures and discuss the benefits of the resulting organisational model. I will make recommendations to contribute to the solution of the problem of 'waste through organisational malfunctioning' by using this model.

THE PRACTICAL APPLICATION OF A NEW CLASS OF 2D NON-LINEAR SMOOTHERS FOR DIGITAL IMAGE PROCESSING

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Abstract

Modern applications in computer graphics and telecommunications command high performance filtering and smoothing corrections to be implemented in real-time. The recent development of a new class of non-linear smoothers for digital image processing is discussed with special emphasis on the practical implications for software and hardware development.

A TECHNOLOGY REFERENCE MODEL FOR CLIENT/SERVER SOFTWARE DEVEMOPMENT

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Abstract

In today's highly competitive global economy, well-structured information resources, representing enterprise-wide information, are essential to the survival of an organization. The user needs an integrated view of the information in the organization. Technological development plays a major role in the changing nature of Information systems. The capabilities of micro computers brought independent processing power to the desktop of every employee in the organization, leading to a growing sophistication of end-users and redistribution of computer users in the enterprise.

Client/server applications combines new hardware and software technologies for maximum productivity. The client/server model seems to be the answer to incorporate the performance of mainframe programming with the versatility and numerous desktop applications used on personal computers in an organization in a cost-effective way. Client/server application development can be seen as a modular design, in which tasks are divided among client and server computers, placing each task on the platform where it can be handled most effectively.

This study will focus on various aspects of client/server systems. The rationale for developing client/server applications, as well as various trends in the industry are discussed as drivers for client/server systems. The purpose of the research was to compile a technology model for the development of client/server software. A comprehensive overview of the individual components of the client/server system are given, different methodologies, tools and techniques that can be used are reviewed, as well as key aspects and client/server specific design issues. The research is intended to create a road map in the form of a Technology Reference Model for Client/Server Software Development.

THE FEASIBILITY PROBLEM IN THE SIMPLEX ALGORITHM

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Abstract

The simplex method is one way of solving a linear programming problem (LP-problem). The simplex method needs a basic feasible solution to start the solution process. This requires an available non-singular basis. Normally it is difficult to identify a non-singular basis from the problem data. Thus the simplex method introduces the concept of artificial variables that provides a non-singular basis. An artificial objective function is also introduced in such a way that the cost coefficients of the artificial variables are positive (negative), while the cost coefficients of the other variables are zero. By minimizing (maximizing) this new objective function, with the simplex algorithm, a feasible solution for the original problem is obtained. This is also known as the phase one problem of the simplex algorithm. Our paper will concentrate on the aspect of finding pivot selection heuristics for the phase one problem with the objective to improve the performance of the algorithm.

If no artificial variables are basic, it means that an optimum solution for phase one is found. In our approach we show how a feasible solution can be obtained by using an evaluation function. This evaluation function guides the pivot process of the simplex method in such a way that it will, as a first priority, try to pivot artificial variables out of the basis. We show how this evaluation function can be used in conjunction with other well-known column selection heuristics. We also show how this approach can be used with multiple pricing, a technique that strives to minimize data transformations at each step. The evaluation function is also employed to improve numerical stability in the solution process. Experimental work on some problems from the NETLIB test suite is presented. This empirical work also compares this approach to well-known column selection heuristics.

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