Computer-Based Systems and Organizational Control Structures: A Case Study Development

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Abstract
The increasing adoption of computer technology within service sector organizations has generated many studies of how effective use may be made of such systems. In this paper an analysis is made of one such implementation and an appraisal is made of the way in which the interaction between the total quality management 'philosophy' and computer based systems may evolve new forms of managerial structures and controls.

1 Introduction
The focus of this paper is the implementation of a computer-based system (CBS) within a service sector organization, namely a retail bank which, for reasons of anonymity, will be referred to as 'Zenbank.'

The study concentrates upon the interface between the operational design of staff activities and the computer systems to be found within the case study organization. Initially the approach views the development of the case study managerial structure from the cybernetic perspective. These principles are used to illustrate the cybernetic basis and the contradictions inherent in the use of total quality management (TQM) principles to support CBS implementation and usage. In summary the case highlights the way in which an information system can be regarded as part of social and political processes which are intertwined with organizational problem solving, decision making and learning. These perceptions point to dilemmas in connection with developing CBS applications for variably skilled front-line personnel in large organizations.

2 The Viability of Organizations
A developing theme observable in the move away from 'hard' to 'soft' systems thinking is the emphasis placed by CBS designers on their assertion that their strategy is not the replacement of human beings with machines (the 'strong' AI model), but the development of sociocybernetic systems (Geyer and Van de Zouwen 1986) within which a man-machine socio-technical 'partnership' is enabled.

Among the many metaphors being developed to support this approach is the perception of organizations as if they were brains (Morgan 1986: p.79). The resulting designs attempt to create forms of organization that disperse brain-like capacities throughout an enterprise, rather than just confine them to special units or parts. This model of the human brain, or more precisely, the central nervous system as an analogy (or design model) for the effective organization of managerial systems has resulted in organizational forms based upon the development of cybernetics (Ashby 1964; Beer 1959; Wiener 1948). A central concept in this model is the notion of 'viability'. In order to become or remain viable, an organization has to achieve 'requisite variety' (Ashby 1964) with the complex environment it faces. It must be able to respond appropriately to the various threats and opportunities presented by the environment. According to Ashby's (1964) Law of Requisite Variety, in order to control a complex system (the environment) the controlling system (the organization) must be able to generate at least as much variety as the system being controlled, thus 'only variety can destroy variety' (p.207). The actual mechanism of control may consist of establishing and maintaining the controlled system in states dictated by the controller, or, more specifically, adjusting the values of designated variables of the controlled system to those desired by the controller, and maintaining those values. Thus it can be anticipated that the regulator will need to use one or both of the variety management methods - situational variety reduction (attenuation) or control variety amplification.

2.1 Variety Attenuation
The key to variety attenuation in the cybernetic model is filtration of information so as to discriminate between significant and insignificant
data. Control in this form is thus accomplished through a function of the reduction of perceived situational variety.

With regard to variety attenuation one of the main themes of the cybernetic theory of organizations is the intelligent use of the computer to provide this function. Beer (1975) argues that a computer is wasted if deployed merely for more and more data production and data storage. He describes the function of the computer as follows:

'The idea is to create a capability in the computer to recognize what is important, and to present only that very little information.' (Beer 1975: p.431).

Thus the computer should be used for information reduction and analysis, or, in Beer’s terms, it ought to be used for the purpose of variety attenuation rather than for increasing the existing variety of data (Beer 1975).

2.2 Variety Amplification

From the cybernetic perspective variety amplification illustrates the move towards an open systems view of the organization. The implication is that the successful organization not only interacts strongly with its environment, but also exercises some measure of control over it. From the standpoint of Ashby’s Law, the need to deal effectively with a complex environment dramatically changes the problem of variety management. It seems unlikely that situational variety attenuation, as reflected within a CBS, can cope with the complexity of the interactive (social) environment. A more powerful form of variety is needed if the organization is to exercise control over its environment. Thus in interpreting the cybernetic model, the alternative mode of control in complex systems is variety amplification.

The premise upon which variety amplification rests is that epitomised by the rise of the human and later neo-behavioural movement which attempted to avoid the worst excesses of Taylorism with softer supervision, employee ‘empowerment’ (Juran 1988) and job enlargement (Friedmann 1977). For many managers and theorists, the work of Argyris (1957) and other behavioral scientists stimulated interest in determining whether the economically productive organization could also be an attractive place to work. Managers and researchers sought ways to implant the goals of the organization in the worker (Argyris 1962). Important in this task was the idea of ‘motivation.’ Researchers tried to develop understanding of the factors, particularly non-economic factors, that influenced human behaviour in the workplace. A number of theories of motivation (Maslow 1954; Argyris 1957; McGregor 1960; Likert 1961; Hertzberg 1966) appeared. One element of motivation, the idea of ‘participation’ formalised into the ‘socio-technical’ methodologies of systems analysis and design (Trist et al. 1963) seems to have been a significant precursor to the effective managerial use of variety amplification. This shift may also be seen to be expressed in the growing support given to recruitment, selection and appraisal techniques which aspire to provide effective ‘attitudinal restructuring’ and behavioural control through the manipulation of normative orientations which facilitate the development of cultural identities appropriate to senior management-determined corporate goals and policies. Thus a new emphasis was placed upon the use of psychological techniques to motivate employees and to develop more sophisticated, culturally based control processes geared to effective socialization and personal development (Storey 1989).

The interest in attitudinal restructuring has resulted in the various managerial philosophies embraced within the TQM paradigm. These centre upon the potential and importance for management to delegate implementation of process improvement down the organizational hierarchy and allow lower echelon staff ‘to make judgements, allocate resources and call for appropriate action when necessary’ (Dimancescu 1992: p.199). This derives partly at least from a belief that development of CBS intensive bureaucratic forms of organization may relieve employees of responsibility for the consequences of their actions through supporting a so-called mechanistic organizational structure (Morgan 1986) whereby systems designers and senior members of the hierarchy are ultimately accountable for decisions and, more importantly, their effect on productive performance. In order to prevent dysfunctional employee behaviour resulting from an overreliance upon computers, TQM has stimulated a process of making line staff individually responsible for maintaining managerially defined levels of service. Thus the total quality vision is one of workers as self-empowered with a set of (computer-based) tools with which they can anticipate, comprehend, correct and improve a complete operational process as opposed to its isolated parts.
3 The Case Study

3.1 Methodology

The field research for the case study was carried out during a six month period and the research involved a historical reconstruction of the changes that have taken place during a period in which new management and information systems have been implemented. The primary method of data collection was through open ended interviews over a period of time with the more candid and articulate individuals amongst managers and staff. Verbatim notes were taken during interviews, and where possible certain interviews were tape-recorded. A total of 30 staff took part in the research, 16 of whom were employed in management grades.

3.2 Zenbank

Zenbank is a UK-wide retail financial services organization whose activities include traditional banking activities expanded under new financial legislation to include mortgages, life assurance, pensions and investment management.

In response to the commercial and legislative changes which took place within the U.K. financial sector in the mid-1980s, a management consultancy was commissioned to report upon Zenbank's possible opportunities in the new business environment. This in turn led to the identification of two main difficulties which the company faced in maintaining and expanding its operations. First, there was an acute lack of relevant management information that would provide an effective instrument for corporate coordination. Second, it was considered that there was also a shortage of clerical and administrative expertise within the branch network. This led to changes in the management structure and the development of a customer care programme promoted by senior management. Zenbank's interest in customer care and quality service delivery included the development of highly advanced computer systems and major branch refits.

The overall result had been a concentration on the development of what are considered better quality products, defined in the company's literature as 'fit for our customers needs'. Further, the programme of change placed a demand on the organization for planning information about staff numbers, productivity levels and costs, consistent with Zenbank's business plans. This was intended to facilitate greater monitoring, costing and control of the branch workforce, the branch network, and its central support and line staff throughout the company. Information of this depth or type had not previously existed, and its requirement necessitated the development of extensive computer-based systems to enable branch costs to be determined more closely.

3.3 The Computer Based Information Systems

Following from the management consultancy review the company undertook a major project in the late 1980s to design and develop an integrated voice and data network system which was to provide the organization with what was described by a Zenbank analyst as a 'nervous system' that would link the nationwide system of branches with the network of area offices and the head office so as to render all three more effective. The strategy also included taking out of the branch the administrative functions that do not affect customer service. The aim was to reduce the large variety of data that the line staff previously had to handle. This was described by the head of computer systems and services as 'a phase of empowerment', providing more systems support and allowing branch staff to perform new roles in promoting and selling financial products. In this the system assumes an important role as a tool for intelligent filtration, testing, aggregation, and presentation of data to the area and head offices. The resulting management information system (described as Zen-net) was designed to automate many of the reporting functions which take place between the branch, area and head offices. The implementation also included an organization-wide electronic mail network based upon the linking together of local area networks. The new information system was thus viewed by its implementors as not only providing line staff with the capability to handle the perceived new customer needs but also to provide management with an enhanced surveillance capability of the whole organization.

Coupled with the establishment of an integrated corporate-wide information system, Zenbank's information technology strategy provided for the development of applications which were aimed to support market analysis and assist in the deployment of new financial products. These systems were commissioned as a part of the drive to maintain Zenbank's competitive edge in preparation for the likely effects of financial deregulation following from the financial services legislation. This development reflects the increasing competition for customers within the financial
services sector together with the desire to match specific customer profiles with the development of products and services. The managerial objective was to use the new system to improve customer service and hence maintain or increase market share. Customer evaluation was identified as being a key factor in maintaining a competitive edge and became an important area for the use of decision-support systems within the organization. It was hoped that the resulting Account Profiling System (APS) would provide consistency (variety attenuation) in terms of the evaluations and decisions made by geographically dispersed branch personnel who sell and deliver complex services. Prior to the implementation of such applications, there were many areas of business which could only be undertaken by specialist personnel at the area or head office. APS was introduced to try to reduce the number of situations in which confirmations and authorizations had to be sought from the area or head offices and to try to provide specialist sales staff with the necessary information as they worked out of the branch locations.

3.4 Total Quality Management at Zenbank

The management consultancy report brought to light the difficulty faced by Zenbank in its staffing policy. The company had traditionally recruited school leavers for all junior grade clerical jobs; however there was a shortage of these due to demographic changes. In response, middle management in the Personnel Division devised a stop-gap scheme to recruit female 'returners' locally. Coupled with this was a change resulting from the use of computer systems within the transaction processing functions. Tools and techniques transferred from the manufacturing environment (Gosling, Rowe and Dale 1992) had reduced the need for a large number of staff to be engaged in purely administrative functions. This resulted in a shift in personnel deployment away from what may be described as back office transaction-based functions to front line activities involving direct customer contact and the selling of services. The bank's desire to take a more aggressive approach to the marketing of financial products encouraged the organization to embark on a 'customer care' (variety amplification) scheme for staff who may have spent many years in a back office or clerical role who now found themselves redeployed to the customer interface and required to develop the new set of skills that such employment entails. Coupled with the programme was the effort made by senior management to effect significant cultural change. The key word in the new style was 'participation', and a variety of approaches and actions were initiated, designed to foster and develop a participative culture.

3.5 The Skill Structure of the Staff/Customer Interface

A major problem faced by the system developers of APS was the realisation that customer evaluation is a problem having multiple and unpredictable solutions. Prior to the installation of APS and Zen-net, customer evaluation consisted of a series of decisions about whether the society should enter into a financial relationship with a customer. Much emphasis was placed upon the tacit knowledge of the branch manager and certain key sales staff in terms of loan authorisation and customer relationships. This perception of the importance of what may be perceived as tacit skills resulted in concern at the branch level with regard to the possibility that staff could rely upon a formalised series of rules to support them within this operational area.

The use of APS was meant to enable branch-office personnel to do their own profitability analyses and at the same time what were called 'quality forums' were developed with the aim of discussing user problems and developing the skills necessary to interpret the output from the computer-based system. Consisting of brainstorming sessions in which groups discussed ideas drawn up by the Management Committee, the forums were meant to operate at branch, area and head office levels and participating staff were encouraged to use electronic mail conference facilities over Zen-net. Thus the new assumption was that all employees through contributing to the discourse would now become engaged in debating the means of improving the service to the ultimate consumer and therefore providing an addition to the so-called value chain (Oakland 1989).

In terms of the system development at Zenbank the problems of capturing the forms of tacit knowledge could be identified in terms of the systems evolution. Initial system development concentrated upon the single elements (rules) of an evaluation (e.g. credit reference, period of time spent living at one address, etc.). However, it was realised in some of the initial studies of the way in which loan and account applications were being processed by different branches that staff were not always structuring the operation in essentially the same way. In this action the importance of the relationship between the branch staff and the
customers could not be easily expressed in systems analytical terms. The importance and relevance of these relationships varied across circumstances. The rules themselves may specify what to do, but do not themselves specify how and when they should be applied. As Collins (1986) points out, even though rules may be codified, they remain problematic when put into action due to the possibility of interpretation. Elaboration of the existing paradigm (more rules) does not solve this essential problem. The decision as to when a relationship or a rule should be applied was accepted as a judgemental problem that could only be achieved by staff with a sensitivity to the environmental characteristics.

Also in conflict with the desire to rationalize the customer evaluation process, was the desire of the senior management that branch staff should not define evaluations of customers as recurring, well-structured computer-based decisions involving the calculation of utility and sensitivity analysis for the purpose of classification and prediction. This desire was linked to a concern that a customer relationship based upon narrowly predictive information (variety attenuation) may not be very useful if the goal is to proactively create the possibility for further client development in a fast changing business environment. An emphasis was presented in staff training to try to avoid creating an atmosphere of uniformity in dealing with individual customers (variety amplification).

4 Computer Based Systems and Total Quality Management: Towards the Total Control Solution?

Viewed from the perspective of a cybernetic system the Zenbank case can be considered as reflecting some of the inherent difficulties which exist in the concept of decentralised decision making. These in turn highlight the central problems of the terms and definitions of the meaning of decision-making within organizations (Wilson 1993). The development of the management information system and the new management structure illuminates the managerial desire to create and encourage independent decision making at the level of the line staff where the use of a decision support system (such as APS) must be effectively tempered with human judgement if the system is to remain viable. If this could be established effectively at the line staff level then the whole organization, if viewed as a series of recursions of the line staff activity system, should also be viewed as being viable (Beer 1985). A prime characteristic of viability in Zenbank's business system is the presence of massive flows of information within the system and between the system and its environment, and the necessity of its staff to make a correct interpretation of this information. Thus at each level of the organization, managerially allowed freedom of action and access to corporate information must be optimised in order to control staff activity. Only if an individual is unable to control the situation (e.g. a complex loan agreement unable to be supported with APS), should an exception report go to the next organizational level (the branch manager) who would then intervene in the situation. The problem remains in training staff to know what the appropriate response should be.

In achieving this, Zenbank's managerial aim may be perceived to be one of development of commitment and consent through the various TQM and attitudinal modification programmes which are expected to transform workplace cultures so as to result in employees becoming actively concerned in their work. The problem faced within the system design was to overcome staff tendency to measure the putative importance of data (a staff/customer relationship) through the means of computer-based statistical significance or algorithmic action. The managerial response to the danger of overreliance upon APS could be observed in its effort to promote the means of 'variety amplification' within the staff through the use of TQM. Thus in Zenbank's case, empowerment is concerned with increasing employee decision-making participation in relation to the output from APS and correct usage of Zen-net. The concept of empowerment through TQM suggests that on the one hand, much more responsibility and autonomy in branch operations was made possible by the new technology and systems, particularly with respect to providing direct customer service with less reference to head office. On the other hand, senior management were now able to use Zen-net's network databases to access local branch management information. The performance of branches could be monitored directly by senior management much more closely than had previously been the case resulting in a tightening of managerial control of the work at the branches. Therefore while tactical responsibility is delegated, strategic control is simultaneously centralised. The approach adopted in Zenbank is both made possible and enhanced by the operation of two complementary disciplinary forces. The first of these is the discipline which derives from the practice and philosophy of TQM. The second and key disciplinary force is that which derives from the use of APS and Zen-net which has the
capability of providing extensive organizational surveillance.

Zenbank’s emphasis upon both the development of a new management information system and the TQM programme can thus be regarded as a two-component strategy to refocus the staff perspective in the accomplishment of the organization’s goals. In the new role, the staff member’s immense, diverse, inherent human variety must be focused to support those goals, which are traditionally set by management. This has been attempted in two very different ways. The individual’s organizational perspective has been focused to purpose through controls to induce prescribed behaviour (variety reduction as affected through APS and to a more ambiguous extent through Zen-net), while at the same time the individual has been asked to pursue, on their own initiative, the societal goals of the organization (variety amplification as affected through programmes of staff ‘empowerment’).

In Zenbank’s case the variety amplification function seems to have taken the traditional form which can generally be described as following the so-called close to the customer model as expressed by the Drucker, Ouchi, Peters and Waterman genre and evidenced in the various total quality and customer care contrivances being introduced into the organization. Ideally this will take place in near real time aided by the information exchange capabilities of Zen-net. In this model, customer needs cannot be predetermined but the final form of service provision must be tailored as the organization/customer interaction takes place. The staff are thus encouraged to participate. Management still has a problem with human variety, but now an entirely different one; now management must try to focus and use the employee’s variety; it does not desire to suppress it. For the success of Zenbank’s business participation is now not only desired, but apparently essential.

Zenbank’s information and management structure may now be seen to be attempting to follow the pattern of organizational development described by contemporary writers as ‘excellent’. In Zenbank’s situation this was observed in the various ‘mission-statements’ and customer care campaigns which attempt to place an emphasis on the provision of customer-defined value. Furthermore the access that all members of staff now have to corporate databases and the electronic mail communication provided by Zen-net are promoted as a heuristic tool which empowers the staff with the potential for discovering important data which will amplify their capability to respond to their environment.

Under the structure of TQM variety amplification, the line staff function now becomes one of devising the means that lead to the (participatively) designated results to be achieved in Zenbank’s markets. The line staff now needs the inherent variety provided through Zen-net, the staff training and consultation programmes to find the means that lead toward the desired ends. However, the surveillance capability of Zen-net coupled with the use of TQM is such that discipline is established in a most efficient manner and the exercise of control is possible with a minimum number of supervisors. The desired effect of harnessing these dual forces is to minimise negative divergences from expected behaviour and management desired norms whilst identifying positive divergences and maximising their creative potential.

5 Conclusions

The philosophy of the devolution of decision-making among the Zenbank staff hierarchy implies a degree of delegation of responsibility. However as Clegg (1988) has demonstrated, the process of devolution reveals a contradiction in the nature of organizational control. Delegation is a double-edged sword, being able to both increase the power of the delegating agency, so long as it can retain authority, and undermine it if the obedience of the delegated agency cannot be assured. In principle, delegation could simultaneously increase the control of the delegator and empower the delegated. Notwithstanding the self-disciplinary activities of the different work groups, the increased opportunity for a disaffected member of staff to undermine Zenbank’s operations increases the need to ensure obedience.

In conclusion it may be perceived that in order to maintain strategic control over empowered and devolved work groups, management have erected a superstructure of electronic panoptical surveillance and control which enhances visibility and facilitates the direct and immediate scrutiny of both individual staff and branch action (Foucault 1977; Dandecker 1990). Zen-net provides the means by which management can achieve the benefits that derive from the delegation of decision-making responsibility proposed by the TQM philosophy whilst retaining authority and disciplinary control through the ownership of the superstructure of surveillance and the information it collects, retains and disseminates. TQM seeks to mobilize staff support for the reorganization of the business while the use of information systems design serves to supply the project with scientific legitimation. In this respect, cybernetic systems design performs the
essential technocratic task. It translates the political agenda into a technical language of science. However its merging within the philosophies of TQM and participative design methodologies attempts to overcome the problems of systems development taking place in a language cast in a specialized idiom accessible only to those trained in the intricacies of systems design. Thus the process of subjectification takes place which consists of "transforming compliance into cooperation, consent into commitment, discipline into self-discipline, the goals of the organization into the goals of the employee" (Holloway 1991: p.94). At the methodological level the use of TQM philosophy may be seen to be the continued attempt to extend organizational and system planning to control further the behaviour of staff members. It is in large part an effort to rationalize the network of personal interactions that constitutes the supposedly informal relationships and tacit skill elements of the organization. In reconsidering the central theorem in cybernetics which states that the system regulator must be a model of the regulated system, it may be seen to fail to engage with a crucial aspect of models of and in social systems: namely that they are functions of human agency. Models and their predictions about a system behaviour inevitably constitute important power and meta-power resources for this agency. Power considerations, in addition to other factors that constrain the quality of models, may intervene and lead to models that are acceptable to those in power, but possibly ill adapted to the maintenance of a social system.

From this perspective systems theory may now be perceived to be attempting to address the basic political task of securing consensus and legitimation. It does this by supplying the political agenda with what would appear to be a higher form of legitimation, the scientific legitimation accorded to a natural process. In as much as natural processes possess a dimension of inevitability, the effective course of action becomes the one that facilitates the centralized restructuring of subunits or parts. Thus cybernetic systems theory may legitimate 'one-dimensional', 'rational-technical' interests that maintain domination by an elite (Marcuse 1964).

In practice, 'one-dimensional' policies often have dialectical consequences and unintentionally produce the very conditions they were designed to reduce or eliminate. In expressing their opinions of the concept of devolved responsibility many of the Zenbank staff said that they felt that the decentralization and empowerment concepts promoted by senior management were unauthentic, with area or head-office personnel still possessing executive control in evaluating or authorising their actions. Comments received from staff suggested that they perceived that dominance of the senior management group was being reproduced on a continuing basis by its central role in all important decision-making. In addition, various managerial levels could draw upon control facilities which were created through the development of Zen-net, such as direct access to databases on branch performance, which enabled direct monitoring of branch activities. This was felt to curtail further the decision-making responsibilities of the area and branch management. Worries were expressed that rather than bringing the improved ability to communicate within the organization, Zen-net provided a surveillance system with the ability to expose an individual as a source of failure within a much shorter time than under the old administrative system. Staff indicated that they now felt that their basic work activity could be subject to constant scrutiny by senior management. This in turn created a climate where self-management was developed in lower level staff through the discipline of the technology. Although the flatter hierarchy of Zenbank's new organizational structure suggests that the decision-making and controlling function of middle management has completely disappeared, it may be argued that, rather than being dispensed with, the attempt has been made to incorporate it into the consciousness of the lower level staff themselves.

6 Summary

The contradictions revealed between the controlling tendency inherent within organizational computer systems and the rhetoric of supposed worker empowerment resonant within the TQM philosophy suggest that there are many unresolved difficulties existing within the use of quality management methodologies to support the organizational development of computer systems. Some of the inherent tensions may derive largely from the limited systems designers' conceptions of decision-making and social and organizational relations together with the designs of those who advocate total quality management. They may also be a reflection of the implicit, yet contradictory, assumptions about human behaviour that underlie computer systems' development. For though the employee is seen to be passive and compliant in responding to the control (variety attenuation) functions of the computer system, in terms of concepts of empowerment and the creative usage of the system, the demand is for an actively engaged subject (variety amplification). As an attempt to escape Weber's 'iron cage of bureaucracy' the control mechanism of variety amplification may
seem to complement computer-based situational variety reduction in management practice. However, it may also provide an insight into some of the contradictions in cybernetic attempts to develop organizational effectiveness. The modern thesis of 'excellence through people,' via the formalisation of strategies to encourage innovation, spontaneity, trust and openness, with constraining restrictions on thought temporarily suspended, seems to rest on the mechanism of control variety amplification in compliance with Ashby's Law. The Zenbanx case study illustrates that considerable organizational resources are now being devoted to this ideal and the information systems thought necessary to support it. However in observing this system model, caution is required in distinguishing between the activities of variety amplification and variety attenuation. If managers lose or confuse the true meaning of these dimensions, as they engage solely in instrumental action through the medium of computer-based systems, it is likely to lead to distorted understandings and ultimately to a distortion of actions within the organization. It remains the task of the critical observer to identify the many instances of organizational action which are proposed by managerial theorists and practitioners to be acts of variety amplification and to subject these acts to such an analysis that will reveal whether or not they are indeed only variations on the theme of variety attenuation.

References:


