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## Building and Using Corporate Data Models: A Case Study of Four Australian Banks

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### Executive Summary

Although there are strong arguments in favour of corporate data models and their role in data management, empirical studies have shown that many organisations have experienced great difficulty in building and effectively using a corporate data model. This study extends these previous studies and uses a process-oriented, interpretive case study approach which focuses on the relationships between the actions of stakeholders in the strategic data planning process and the organisational context in which it takes place

The case study involves four large Australian organisations and identifies a number of key issues including difficulty in understanding the corporate data model, difficulty in sustaining management support, appropriate methodologies and tools for building, representing and using corporate data models and understanding the complex organisation issues involved in the corporate data modelling process. These issues are analysed and explained using concepts from structuration theory. Results of this study will assist practitioners when considering building and using corporate data models and suggest that further research is required in methodologies for building and representing corporate data models.

### 1. Introduction

Many organisations are greatly concerned about the availability of reliable information for operating their business activities and to support decision makers. The provision of accurate and timely information depends largely on the quality of the design of the organisation's databases and the quality of the data contained within them. The corporate data model is an important input to the design of well structured databases and to increasing the quality of data in the databases. It is an abstract model of information requirements independent of functional boundaries within an organisation and implementation technology (Brancheau and Wetherbe 1986).

There are strong arguments which support the importance of corporate data models from information technology vendors, consultants and methodologists (Finkelstein and Martin 1981, IBM 1981, Martin 1982, Texas Instruments 1989, Zachman 1987). The application of data management techniques and the development and use of corporate data models in practice, however, has been problematic. Despite this lack of success, data management and developing a corporate data model have remained key issues in surveys of senior information systems managers on different continents throughout the nineties (Galliers *et al.* 1994, Niederman *et al.* 1991, Pervan 1993).

Empirical studies have shown that many organisations have experienced great difficulty in building and effectively using a corporate data model (Beynon-Davies 1994, Davenport 1994, Earl 1993, Goodhue, Quillard and Rockart 1988, Goodhue *et al.* 1992, Hoffer, Michaele and Carrol 1989, Kahn 1983, Lederer and Sethi 1989:1991). This study extends these previous studies. It uses a process-oriented, interpretive case study approach which focuses on the relationships between the actions of stakeholders in the strategic data planning process and the organisational context in which it takes place. Results of this study will assist practitioners when considering building and using corporate data models and indicate areas for further research.

The paper is structured as follows. The next section of the paper provides definitions of important concepts in data management and corporate data modelling and synthesises four key factors from an analysis of previous research. Section three describes the research approach used and the following section presents a description of four case studies of building and using corporate data models. In

section five of the paper the case study data is analysed using concepts from structuration theory and the four factors synthesised from previous research are discussed. The paper concludes with a summary of the results and some important implications for practitioners.

## 2. Data Management and the Corporate Data Model

We begin this section of the paper with two important definitions. *Data management* (also known as information resource management (Trauth 1989) and data administration (Kahn 1983)) is the practice of managing data as a corporate resource in much the same way as more tangible assets such as equipment and personnel are managed (Trauth 1989). Poorly managed data presents real problems for the management of large organisations. Information from several functional areas within an organisation is frequently required for strategic decisions. This inability to respond to cross-functional questions reduces an organisation's potential to respond to business problems and take advantage of opportunities (Gartner Group 1990).

A *corporate data model* (also known as a data architecture) is a high level model of information requirements within an organisation (Brancheau and Wetherbe 1986). The model should be personnel, organisation and technology independent and is usually represented using a conceptual data modelling notation such as the entity-relationship model (Periasamy 1994). A corporate data model usually spans several functional areas within an organisation. When the model spans the entire organisation it is known as an enterprise data model.

There have been a number of empirical studies which relate to corporate data modelling. These may be classified into three broad categories, those with an information systems planning focus; those with an information architecture focus, and those with a data management focus. These studies are summarised below in Table 1 and provide strong evidence of the problems with building and using corporate data models in practice.

Many of these previous studies identified particular factors rather than provide detailed descriptions of the process by which organisations build and use corporate data models. The research question addressed in this paper, then, is:

"Why is using a corporate data model so difficult in practice?"

**Table 1 Summary of Recent Research in Corporate Data Modelling**

Study	Category	Problems
Ledeser and Sethi (1988: 1991)	Info. Sys. Planning	Obtaining management support; finding people with the right skills
Earl (1993)	Info. Sys. Planning	Corporate data model too complex and too expensive to develop
Periasamy (1994)	Info. Architecture	Corporate data model considered irrelevant by management; but useful for IS Departments
Kim and Everest (1994)	Info. Architecture	Corporate data models often large and unusable; should be kept at a high level and focus on short-term results
Brancheau and Wetherbe (1986)	Data Management	Keep corporate data models at a high level and focus on short-term results
Goodhue, Quillard and Rockart(1988)	Data Management	Should use corporate data model for provision of management information within functional areas; strategic data planning rarely successful
Goodhue <i>et al.</i> (1992)	Data Management	Strategic data planning is problematic and may not be the best way to produce a corporate data model
McGrath (1993)	Data Management	Political resistance is a major obstacle to implementing corporate data models; must be anticipated and addressed
Beynon-Davies (1994)	Data Management	Participation by all stakeholders is critical; understanding social, political and economic context important

From the studies discussed above we may initially synthesise four factors:

- The corporate data model is difficult to understand
- Management support is difficult to sustain
- Appropriate methodologies and tools for building and representing corporate data model must be used
- Using the corporate data model involves understanding complex organisation issues

In this study we adopt a process-oriented perspective which offers a basis for a deeper understanding of the overall problem together with insights into the four factors.

### 3. Research Approach

We designed a research programme consisting of four, in-depth, interpretive case studies in order to better understand the issues, problems and relationships which arise when using a corporate data model in its organisational context. Yin (1989) argues that case study research is particularly useful when answering "how" or "why" questions over which the researcher has little control and further argues that multiple case studies should be considered as multiple experiments rather than multiple subjects in an experiment or multiple respondents in a survey. Benbasat *et al.* (1987, p373) provide support for the use of multiple case studies: "multiple case designs are desirable when the intent of research is description, theory building. Multiple case designs allow for cross-case analysis and the extension of theory. Of course, multiple cases yield more general research results".

We have undertaken case studies in each of the major four Australian banks. The four banks were selected on the basis that banks are critically dependent on their information systems and each of the four major banks has expertise and experience in the use of corporate data models. Initial interviews took place in late 1993 and subsequent data collection occurred until mid 1995. The cases are described using a framework (see Figure 1 below) which we adapted from Orlikowski's (1993) framework for the process of organisational change when adopting CASE tools.

The framework shows the interaction of strategic conduct and institutional context over time. Strategic conduct consists of three broad, sequential activities which describe the longitudinal process of adopting and using strategic data planning. Institutional context is structured into environmental, organisational and information systems contexts. The interaction between the institutional context and strategic conduct represents how the context can influence and constrain the actions of stakeholders and how the actions of stakeholders can also reinforce and change the institutional context. The framework should be understood as a dynamic model in which there is continuous change within the institutional context, and actions within the strategic conduct are constantly being revised. The unit of analysis for the case study is the data administration group (usually specialist data modellers) and its relations with information systems project teams (usually non-specialist data modellers) in using the corporate data model.

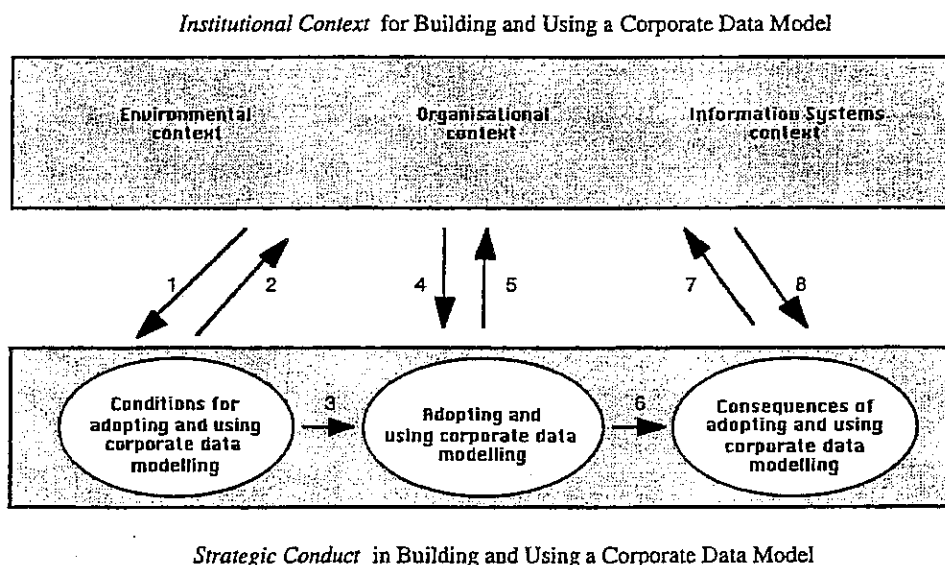


Figure 1 Adopting and Using Corporate Data Models within Organisations (adapted from Orlikowski (1993))

An interpretive analysis of the case study data was undertaken using concepts from structuration theory (Giddens 1976). We selected structuration theory for the analysis as it offers a sound basis for a focus on the dynamics of the interaction between action and structure and is thus well suited to a processual case description. Structuration theory is concerned with how and in what ways the actions of individuals are related to the structural features of the societies of which they are part (Giddens 1976). Three dimensions of structure are accounted for in structuration theory: signification, domination and legitimation. These are seen as interacting with three dimensions of human interaction: communication, power and sanctions. Giddens identifies the three modalities of *interpretive schemes*, *facilities* and *norms* which link the realms of structure and interaction. A summary of the dimensions and interactions of structuration theory is shown in Figure 2.

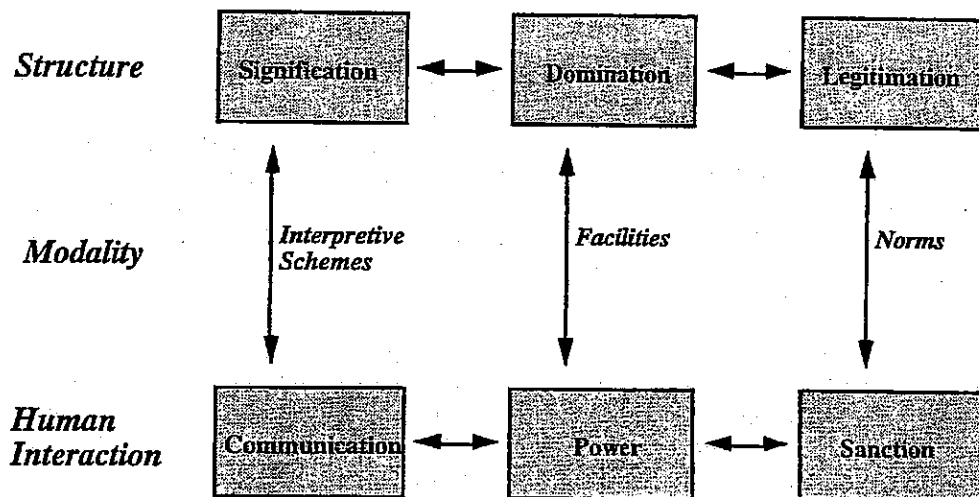


Figure 2 Analytical Dimensions in Structuration Theory

The three modalities mediate the linkage between social structure and human interaction. *Interpretive schemes* are shared stocks of knowledge which humans draw upon to interpret actions and behaviour, thus achieving meaningful interaction and communication. In this way structures of signification (meaning) are produced and reproduced (reinforced). *Facilities* are the means through which intentions are realised, goals are accomplished and power is exercised. It includes the ability to mobilise and allocate material and human resources. The use of resources produces and reproduces structures of domination. *Norms* are rules and conventions of appropriate conduct which define legitimate interaction within the moral order of a setting. Human actions are sanctioned by drawing on norms of behaviour and morality. Thus, structures of legitimation are produced and reproduced.

Structuration theory was well suited to analysing data represented using the framework described above and provided considerable insight into the complex organisational processes which occurred during the building and using of corporate data models within the four banks. For a more detailed discussion of structuration theory and how it can be used within information systems research see Shanks, Hodgson and Darke (1996).

#### 4. Description of the Four Cases

This section of the paper provides a brief description of the process of building and using a corporate data model within each of the four banks studied. Descriptions of each case have been published individually - Bank 1 (Shanks and Swatman 1996a); Bank 2 (Shanks 1997); Bank 3 (Shanks and Swatman 1996b); Bank 4 (Shanks and Swatman 1996c) - and the interested reader is referred to those publications for an in-depth treatment of the studies on an individual basis.

##### 3.2.1 Bank One

###### *Institutional Context*

Bank 1 was structured into a number of business units and a centralised information systems department. Major decisions concerning information technology were made centrally and the information systems department was designated a profit centre and effectively acted as a service bureau for the other business units in the bank. A standard systems development methodology was in place and was mandated for all information systems project teams within the bank.

### *Strategic Conduct*

A data administration group was established to encourage data modelling within project teams and to design the data model for the redevelopment of a major retail and institutional banking system. That data model became the basis for the corporate data model. Data administration staff were available to provide assistance to project teams in data modelling. Despite providing valuable assistance to the retail and institutional banking project and building a high quality corporate data model the data administration group was perceived by many project teams as a group that slowed down development and should be bypassed. Project team members found the corporate data model difficult to understand. It was only found to be useful for large-scale cross-functional application systems. After the data modelling for the retail and institutional banking project was completed the group was closed down and absorbed into a smaller architectures group.

### **3.2.2 Bank Two**

#### *Institutional Context*

Bank 2 had a strongly divisionalised structure with separate business units each responsible for its own information systems planning and infrastructure. Information systems decision making was strongly divisionalised in the 1980s though this approach was moderated by the introduction of a centralised technology group in the late 1980s established to focus on organisation-wide planning and architectures. A standard systems development methodology was in use but the level of use was at the discretion of project teams.

#### *Strategic Conduct*

The recognition of major problems with duplicated and redundant data and lack of integration of application systems lead to the formation of a data administration group. The corporate data model was built using a strategic data planning approach. Use of the corporate data model was included as an addendum to the systems development methodology and a number of training seminars were conducted by the data administration group. However the corporate data model was not widely used by project teams and considered more of a hindrance to systems development than a help. Project teams members found the corporate data model difficult to understand. The potential benefits were oversold to management and the failure to realise expectations lead to a loss of management support. The data administration group was closed down, however the corporate data model was used later in the design of a data warehouse.

### **3.2.3 Bank Three**

#### *Institutional Context*

Bank 3 had a highly centralised structure with centralised architecture and strategy groups. Decisions concerning information technology were made centrally and the bank had a long history of centralised business and information systems planning. A mature systems development methodology had been developed in-house and was widely used by project teams.

#### *Strategic Conduct*

A particular problem was recognised which concerned the lack of consolidated data to support decision making about customers and accounts. The corporate data model was initially built to support the development of an integrated customer and account information system. The scope of the corporate data model has been extended as further application systems were developed and their data models merged into the corporate data model. The customer and account information system was perceived as a major ongoing success by management within the bank and the data administration group enjoys continued managerial support. Use of the corporate data model was readily incorporated into the systems development methodology and reuse from the corporate data model has been included as an objective in all project appraisals.

### **3.2.4 Bank Four**

#### *Institutional Context*

The structure of bank 4 combined centralised infrastructure groups with decentralised business units. Previously, Bank 4 had been highly centralised with a technology-led information systems planning process in place. An ambitious attempt to redevelop the bank's core application systems had been cancelled in the early 1990s and a policy of decentralised information systems development has been implemented. The bank uses a mature systems development methodology which was designed in-house.

### *Strategic Conduct*

A corporate data model was developed in the 1980s as part of the attempt to redevelop the bank's core application systems. A small data administration group maintains the corporate data model and provides data modelling consultancy services to project teams. Project teams had difficulty understanding some of the concepts in the corporate data model and viewed using the corporate data model as something which slowed systems development down rather than provided short term benefits. The data administration group were focusing their efforts on management information systems which spanned functional boundaries within the bank and on the development of a data warehouse.

## **5. Discussion and Implications**

In this section of the paper the four factors synthesised from the literature are analysed and presented using concepts from structuration theory. The analysis is based upon a cross case analysis of issues from each of the four banks.

### **5.1 The Corporate Data Model is Difficult to Understand**

Mutual understanding among stakeholders is important to the successful implementation of information systems (Myers 1995). Communication breakdown between stakeholders is a major contributor to information system failures (Klein and Hirschheim 1991). According to structuration theory, shared understanding depends on shared structures of signification. The corporate data model represents knowledge about the global, shared view of data definitions for the organisation and contains abstract, generic concepts which apply across application boundaries. It is clear from the case studies that only experienced data modellers from the data administration groups were readily able to understand the corporate data models. Both business users and information systems professionals in the project teams had difficulty understanding the models.

In Banks 2 and 4, enterprise-wide corporate data models were developed which were poorly understood and not used by project teams. In particular, the entity types in the corporate data model of Bank 4 were named using four character abbreviations which were very difficult to understand. The generic concepts in the corporate data model were viewed as highly abstract, "theoretical" ideas with little immediate relevance to project teams. However, corporate data models were found to be useful by these banks for the design of data warehouses where a global perspective of data is important. For this type of application there is a strong motivation to understand the corporate data model.

In Banks 1 and 3 the corporate data models were designed to support the development of specific, large, cross-functional information systems. In Bank 3 a customer information system project was viewed as strategically important by management and its staged development ensured that short-term, visible success was achieved. The terminology in the corporate data model was of immediate relevance to stakeholders in the system. In Bank 1 the corporate data model also provided useful input to the design of the retail and institutional banking system project. However for other projects in Bank 1, the corporate data model was perceived by project teams as highly abstract and difficult to understand.

One solution proposed to the problem of difficulty in understanding corporate data models is to concentrate on a few key concepts only. For example Bank 1 suggested Customer, Product, Organisational Unit and Location and Bank 4 suggested Customer and Product. They argued that it is then feasible for project teams to develop a shared understanding of these concepts and thus some of the proposed benefits for corporate data models can be realised. This agrees with the empirical study of Kim and Everest (1994) which recommended that a corporate data model should focus on a few key concepts.

Although previous empirical studies have found that business management did not understand corporate data models (Periasamy 1994), it has generally been assumed within the literature that entity relationship models are intuitive and easily understood and used by information systems practitioners (Hitchman 1995). This study, however, has found that information systems practitioners also find corporate data models difficult to understand. This finding is consistent with the empirical studies of Earl (1993) and Kim and Everest (1994) who found that corporate data models were considered too complex, conceptual and inflexible and also the extensive survey of information systems practitioners by Hitchman (1995) who found evidence of poor understanding of some abstractions in entity relationship models.

It is clear that stakeholder understanding and communication about the corporate data model is critical to its successful use within organisations. New ways of building and representing corporate data models which facilitate improved understanding are urgently required. One useful means to improve understanding of corporate data models is through explanation using scenarios and design rationale (Shanks 1996).

### **5.2 Management Support is Difficult to Sustain**

Management support is widely recognised as an important factor in the implementation of information systems (Myers 1994). Most studies of information systems implementation view management support as a factor which impacts the success of implementation, however in this study a processual perspective has been adopted in order to understand how management support varies throughout the duration of the study. In all four banks initial management support was obtained through clear statements of existing problems and strong arguments describing potential benefits. Lederer and Sethi (1991) note that although management support is essential to the development and effective use of a corporate data model it is often short lived. During the period of the study the level of management support varied within each of the banks. We have identified some of the factors which gave rise to the variation and describe these below.

Raising expectations too high was a serious problem in retaining management support in Bank 2. A common customer identifier provided clear benefits and, thus, a strong reason to obtain initial management support. The actual costs of realisation in practice, however, were far too high and could not be achieved in the short term. In structural terms, the unexpected consequence of raising the expectation too high was reduced management support. Goodhue *et al.* (1992, p28) note in relation to management support for strategic data planning, "data sharing must be critical to top management's view of the future organisation, or involvement will evaporate when the true costs become apparent".

Retaining management support for the corporate data model requires the clear demonstration of short term benefits (Kim and Everest 1994). However the benefits which derive from using a corporate data model are typically long term or indirect in that they result in, for example, better quality information systems or reduced maintenance costs. Very few metrics are available to measure benefits which may be assigned to use of the corporate data model and in the case studies only Bank 3 measured the amount of reuse in project reviews. One problem identified in the banks was that project teams are rewarded for completion of projects on time and within budget rather than for compliance with the corporate data model. In structural terms this can be understood as sanctioned behaviour which is encouraged and becomes routinised and increases resistance to using the corporate data model.

The economic recession affected Banks 2 and 4 severely and led to a change in direction by management to an emphasis on core activities and a strong customer focus. Infrastructure groups where there existed no clear evidence of direct benefit, such as the data administration group, are often the first to go in any cost cutting exercise. Thus despite high quality corporate data models and potential long term benefits, the data administration group may find itself losing management support due to the environmental context of the organisation.

Management support is also retained by successful use of the corporate data model in practice. Myers (1994) points out, however, that success is a relative concept; what one group in an organisation may perceive as success is perceived elsewhere as irrelevant or even failure. The data administration groups in the four banks focused on the quality of their corporate data models, their profile within the banks, the quality of their staff and development of repositories for reuse as indicators of success. Management however was far more concerned with clear, short term benefits. In order to sustain management support, data administration groups need to be more aware of managements interpretation of the meaning of success. An important implication of this is that data management initiatives should be linked to tangible business benefits which can be realised in the short term in order to sustain management support.

### **5.3 Appropriate Methodologies and Tools for Building, Representing and Using Corporate Data Models must be Used**

A number of methodologies were used within the four banks to build the corporate data model with varying degrees of success. Each bank used different systems development methodologies, and



including the use of the corporate data model into the various methodologies was achieved with varying degrees of success.

Bank 2 attempted strategic data planning with little success. It was found that key people from the business units did not participate in the strategic data planning process. The corporate data model which was built was not subsequently used in systems development. Generic concepts in the corporate data model alienated many stakeholders. In Bank 4, a strategic data planning exercise in the 1980s had been considered largely unsuccessful although the corporate data model was ultimately used in data warehouse design. Alternative approaches to building a corporate data model should be considered. These include incremental development of the corporate data model using an evolutionary approach (Beynon-Davies 1994) and using an industry standard corporate data model (Allworth 1996, IBM 1993).

In Banks 1 and 3, the corporate data model was built using a different approach. In these banks, the model was limited in scope to specific, strategically important application system projects. This clearly defined its purpose and, in Bank 3, enabled the achievement of highly visible short-term results. As further important application system projects are undertaken, the corporate data model can be referenced and expanded by integrating the new data models with the existing corporate data model. This approach to building a corporate data model is known as the evolutionary approach (in contrast to the top-down strategic data planning approach). It is less expensive initially than top-down strategic data planning and provides the opportunity for extensive participation by various stakeholders in the data modelling process.

Beynon-Davies (1994) notes that user participation is very important and is difficult to achieve in a top-down strategic data planning exercise. Encouraging participation in the process of building and using a corporate data model is seen as a way of increasing understanding about the organisation's data and facilitating communication between business units.

Bank 2 had particular difficulty in including use of the corporate data model into its systems development methodology largely because the methodology was essentially process-oriented and use of the corporate data model became an appendix to the methodology. In the other banks use of the corporate data model was readily included in the systems development methodologies, however only in Bank 3 was that part of the methodology routinely used (and even then only by approximately half of all project teams). In the other banks, project teams regularly bypassed use of the corporate data model in the systems development methodology.

All banks considered use of a repository management tool which linked concepts in the corporate data model to physical databases and files to be important but not yet available.

#### **5.4 Understanding the Complex Organisation Issues Involved in the Corporate Data Modelling Process.**

The effective use of conceptual data modelling within information systems development is impacted by many social and organisational issues (Brancheau and Wetherbe 1986, Goodhue, Quillard and Rockart 1988, Goodhue *et al.* 1992). This is particularly the case with corporate data models as they can span across many business units and try to represent common definitions and semantics. Building and using a corporate data model represents a significant organisational change and should only take place when the political, social and economic context is understood (Beynon-Davies 1994). Although it is vitally important to have a sound technical knowledge of data modelling, the process of building and using a corporate data model is very much an organisational issue.

Data administration has a centralising tendency within organisations (Allen and Boynton 1991, Goodhue, Quillard and Rockart 1988). The introduction of a central data administration group to manage the use of the corporate data model may represent a significant organisational change. Walsham and Han (1991, p83) note that "structural contradiction refers to a disjunction between different principles of system organisation". In Banks 1 and 4 the trend was for management policy to move towards decentralisation and subsequently greater autonomy of project teams within business units. In structural terms the introduction of the centralised data administration group led to a structural contradiction and resistance from the project teams.

Orlikowski and Robey (1991, p34) note that "systems developers work within the constraints of ... authority to build information systems". In all four banks, the data administration group leader was

lower in the organisational hierarchy than the project leaders of project teams. It was relatively easy for project teams to bypass use of the corporate data model during the systems development process. Trauth (1989) observed that a major problem with data administration groups is their "lack of authority or status to match their level of responsibility". To be effective the data administration group should be at a senior level within the organisation. However, authority can be achieved by means other than position in the organisation hierarchy. For example the highly visible success within Bank 3 of the corporate data model led to continued management support, a high profile for the data administration group and hence greater status.

Political problems concerning data ownership and sharing should be anticipated and planned for when using a corporate data model (McGrath 1993). Kim and Everest (1994) note that it is difficult to change accepted views of data ownership in functional departments. Where concepts of data ownership within business units and project team autonomy are routinised (Walsham and Han 1991) then the change involved is significant. This was particularly evident in Bank 2 with its highly decentralised culture and the autonomy of its business units.

In all four banks project leaders were rewarded for completing projects on time and within budget. As project leaders perceived that the corporate data model would only slow down systems development with few other tangible benefits, they did not use the corporate data model. Benefits such as improved quality of the project data model, common data definitions which would enable easier data consolidation in the long term and less data redundancy were not immediately relevant to project leaders. Goodhue, Quillard and Rockart (1988) note that a change in information systems culture is required and "incentive mechanisms must be changed to reward programmers for conforming to a corporate data model even it involved additional time and resources". Only in Bank 3 did formal project reviews include reuse from the corporate data model as a factor.

The purpose of a corporate data model is frequently expressed in broad terms. For example, the cataloguing of current data in application systems (Goodhue, Quillard and Rockart 1988, Simsion 1994), provision of a data architecture for information systems development (Kim and Everest 1994, Sager 1988), and education and communication (Goodhue *et al.* 1992). Each of these purposes is broad and unrelated to specific, pragmatic business goals. In Bank 3 the purpose of the corporate data model was to design a new integrated customer and account information system. This was a relatively specific, clear purpose and was related to a key management strategy to enable the bank to determine its total relationship with customers. Implementation of the system was incremental over a number of years with visible success along the way. This approach to using the corporate data model within a particular key project enabled the establishment of new interpretive schemes based on generic concepts in the data model (eg. Market Entity), new norms about using the corporate data model during systems development and power to the data administration group through reinforced management support. Use of the corporate data model subsequently spread to other project teams.

In contrast, Bank 2 attempted a broad strategic data planning exercise. This involved a large scale change to interpretive schemes, resources and norms in introducing the corporate data model for all projects, and resistance to the change from project teams. The inability to demonstrate an "island of success" (Brancheau, Schuster and March 1989) also led to a reduction in management support. More recently, Bank 2 has focused on a specific task, use of the corporate data model in the development of a data warehouse, with more success.

Clearly, organisational issues have a major impact on the success or otherwise of building and using a corporate data model. Experiences with building and using corporate data models within the four banks suggest that highly focused models with a clearly articulated purpose which can achieve tangible short-term results in a cross-functional application system project have the greatest chance of success.

## 6. Conclusion

A number of important propositions have been identified from the case studies described and analysed above. These are:

- Both business users and information systems practitioners find the corporate data model difficult to understand.

The corporate data model represents knowledge about the global, shared view of data definitions for the organisation and contains abstract, generic concepts which apply across application boundaries. It is clear from the case studies that only experienced data modellers from the data administration groups who built the corporate data models were able to readily understand them. The inclusion of design rationale and scenarios is suggested as a means to improve understanding of corporate data models.

- **Appropriate methodologies for building and using a corporate data model must be used**

Strategic data planning approaches are expensive to undertake and result in complex and poorly understood corporate data models. Evolutionary approaches which involving the consolidation of business unit data models are more appropriate in most circumstances. They facilitate stakeholder participation in the data modelling process and enable development of the corporate data model to be associated with successful application system projects, thereby sustaining management support.

- **Building and using a corporate data model involve complex organisational and social issues.**

Although management support for building and using a corporate data model can be obtained it is difficult to sustain due to long-term and abstract benefits. The centralising tendencies of data administration, the political complexities of data sharing and the strength of existing terminologies, reward structures and routine behaviours within organisational groups are complicating factors which are frequently overlooked. An understanding of the organisational context within which the development and use of a corporate data model takes place is critical to determining the most appropriate approach to use.

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