A Strategic Information System for Hospital Management

by

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A thesis submitted in conformity with the requirements

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Abstract
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Although hospital management teams receive voluminous data from a wide variety of

sources, they are unable to distill this data into the essential information they require to

make strategic decisions. The objective of this work has been to:

- investigate a methodology, based on the Balanced Scorecard, which helps

  managers define and use important management information;

- develop an information system that makes this information accessible and

  which provides a context for integrated decision making;

- investigate the impacts of the prototype system on the healthcare organization.

In this work, we hypothesize that the Balanced Scorecard methodology provides an

effective tool for healthcare business units both to formulate their strategic information

needs and to manage strategy implementation

Over a period of four years, we have defined and implemented management systems in

five business units in a large academic health science centre. The methodology

incorporates a multistep prototyping method for developing and implementing a decision support information system based on the Balanced Scorecard framework. We evaluated the system by triangulating the results of user surveys with themes from a focus group and with illustrative evidence.

Results of our evaluation indicate that the Balanced Scorecard provides an effective tool for healthcare managers to formulate their strategic information needs and is one tool in the manager's arsenal which helps with strategy implementation. The project has demonstrated the value of focusing on a limited number of important indicators. Managers have been satisfied with the information system ease of use and data formats, but want more timely information. The Balanced Scorecard has enhanced organizational learning by promoting systems thinking within the management groups, accountability for specific indicators and focused further data analysis as performance trends suggested deeper lines of inquiry.

As a result of this work, senior executives have decided to transform the research Balanced Scorecards into production systems for the organization. We conclude that our strategic hospital management system has significant direct benefit. It also has pervasive indirect positive value by catalyzing the development of organizational capabilities for linking strategy formulation, strategy implementation, process improvement and performance feedback.

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List of Abbreviations

Abbreviation	Description
CABG	Coronary Artery Bypass Graft Surgery
PSU	Patient Service Unit
CVPSU	Cardiovascular Patient Service Unit
LOS	Length of Stay
CMG	Case Mix Group
OLAP	Online Analytical Processing
PTCA	Percutaneous Transthoracic Coronary Angioplasty

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      My colleagues in Information Services at Sunnybrook

      My university supervisors and colleagues

      Innumerable professional colleagues who have helped me grow these ideas

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1. Introduction

After almost a decade of year over year increases to their costs and operating budgets (Altman, Goldberger, & Crane, 1990), Canadian hospitals now face substantial annual funding reductions with an expectation of further cutbacks and potential restructuring of the entire Ontario healthcare system by the provincial government (Mactavish & Norton, 1995b). This environment of fiscal restraint has forced healthcare organizations to consider all possible means for delivering services more effectively and efficiently. One such means has been the reorganization of hospitals along program management lines. Hospital resources and personnel are organized around patients rather than around a multitude of specialized departments. Unit managers assume greater strategic decentralized responsibility for their business units. They must manage and coordinate the activities of multiple professionals and multiskilled staff all acting in concert to achieve the goals of the work unit. In general these local business unit leaders have far greater strategic, managerial responsibilities than they had under traditional centralized structures.

Management of strategy can be modeled as a set of tasks for strategy formulation and implementation. When formulating strategy, the manager must decide what he or she is trying fundamentally to do, a vision and a culture, and concrete positions. These tasks relate to the role of conceiving their frame. Strategy implementation relates to the roles of controlling, communicating, leading, linking and doing. All strategy management activities are not necessarily sequential nor linear. They are iterative and ongoing.

In order to manage strategically, management teams must be able to formulate specific positions regarding the products, markets and structures, implement strategies effectively, evaluate the success of intended strategies as well as recognize emergent strategies. Their strategic information needs are great. Ironically, organizations suffer from an excess of data. In such a world, the scarce resource is not data, but data processing capability to effectively produce relevant information. What managers need is a methodology for outlining their

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strategic information needs, a tool for gleaning the required information from the plethora of data and a technique for focusing organizational attention on the correct issues.

Rockart (1986) has outlined four methodologies that are used to determine management information needs: the byproduct technique; the null approach; the key indicator system; the total study process. He has proposed a fifth method called critical success factors. We also utilize a sixth methodology, the Balanced Scorecard. The first four methods supply an abundance of data, but do not provide a methodology for relating strategy to information. The critical success factor methodology does relate strategy to information, but the framework for doing this does not have ongoing applicability to the strategy management tasks. The Balanced Scorecard method provides a framework both for formulating strategic information needs and for the ongoing management of strategy. The framework consists of four quadrants: customer, internal, financial and learning. The process of selecting and agreeing on measures in each quadrant forces a management team to define what is strategically important to its organization. Limiting the number of allowable measures in each perspective obliges managers to focus their strategic vision and identify the handful of most critical indicators. By graphically displaying information trends in time from four different perspectives, the balanced scorecard provides insight into dynamically complex situations and allows managers to assess whether improvements in one area may have been achieved at the expense of another. This balanced set of measures both reveals the tradeoffs that managers have already made among performance measures and encourages them to achieve their goals in the future without compromising key success factors.

Information Technology for delivering information to managers has advanced significantly in recent years. The decision support system label covers a wide variety of information systems. Some are based on individual decision processes. Some provide analytical models that replace decision making. Some aim to support simple managerial tasks such as convenient data retrieval or selection of a single variable. Often these systems are applied to the delivery of data. However, in order to be strategically effective, these technologies must be linked with a methodology that managers use to express their information needs.

The context for this research is the Canadian healthcare system. The objective of the work has been to:

- investigate a methodology, based on the Balanced Scorecard, which helps hospital managers define and use important management information;
- develop an information system that makes this information accessible and which provides a context for integrated decision making;
- investigate the impacts of the prototype system on the healthcare organization.

In this work, we hypothesize that the Balanced Scorecard methodology provides an effective tool for healthcare business units both to formulate their strategic information needs and to manage strategy implementation

During this project, we have developed a multistep prototyping method for developing Balanced Scorecard based information systems and a software model for implementing the system. We developed software and implemented prototypes in five business units in a large academic health centre which had adopted a program organizational structure.

There are two fundamentally different research paradigms that can be applied to the Balanced Scorecard evaluation: logical positivism and phenomenological inquiry.

In the positivistic ideal of research, researchers postulate hypotheses and use quantitative and experimental methods to examine the effects of one or more variables on another in a more or less controlled environment. The advantage of a quantitative approach is that it is possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparisons and statistical aggregation of the data. One of the main techniques of quantitative research is to randomly select and test a statistically representative sample. The purpose is to prove or disprove the hypotheses and generalize a set of succinctly presented findings from the sample to the larger population it represents.

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By contrast, phenomenological inquiry seeks to inductively understand human experience in context specific settings using qualitative approaches. Qualitative research consists of systematic and detailed study of individuals in natural settings, instead of settings contrived by the researcher (Kaplan & Maxwell, 1995). In stark contrast to the succinct results derived from a random representative sample that is the hallmark of quantitative research, qualitative methods typically produce a wealth of detailed information about a much smaller number of purposefully selected cases. The intent of purposeful sampling to select information rich cases whose study will illuminate the questions under study. The increased understanding of the cases and situations leads to theories and richer explanations of how and why processes and outcomes occur which may be applied to other similar cases.

Based on the viewpoint that methodology is driven by situational needs (Patton, 1990), the research team chose a set of evaluation tools from both the positivistic and phenomenological arsenals. This methodological pragmatism is a prevailing trend in information systems evaluation research (Aydin, 1995). We evaluated the Balanced Scorecard systems with a combination of user surveys, a focus group and illustrative evidence. We surveyed two management teams selected as a purposeful, information rich, sample of the balanced scorecard user population. The survey uses well established implementation attitudes and end user computing satisfaction tools with responses on a five point Likert scale. A focus group of Sunnybrook managers was audiotaped, transcribed verbatim, reviewed and coded by two investigators. We triangulated the survey results with the themes developed in the focus group analysis and with the illustrative evidence.

Results indicate that the process of developing a Balanced Scorecard indicator system helps management teams to define meaningful strategic objectives and to gain a shared understanding of the unit's goals. They are satisfied with the information system ease of use and data formats, but want more timely and more relevant information.

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We have generalized these results from our test set of PSUs to other PSUs and to other organizational units. We surmise that any healthcare unit charged with developing and implementing strategic objectives would be capable of developing a BSC project, no matter which jurisdiction it lies in or type of facility it is. Factors that affect success include management commitment, organizational capability for business analysis, technical information delivery and organizational structure.

The project has demonstrated the value of focusing on a limited number of important indicators. The Balanced Scorecard has filtered and developed the critical information from the mass of data that constantly bombards managers. The Balanced Scorecard has enhanced organizational learning by promoting systems thinking, the building of shared models and fostering dialogue within a management group.

Areas for future research and evaluation include the advancement of the Balanced Scorecard methodology as a management framework and the development of the information delivery architecture.

We conclude that the Balanced Scorecard concept and methodology have significant benefit for healthcare organizations. The Balanced Scorecard also has pervasive indirect positive value by catalyzing the development of the organizational capability for linking strategy formulation, strategy implementation, process improvement and information delivery.

2. Background

2.1 Health care reform

After almost a decade of year over year increases to their costs and operating budgets (Altman et al., 1990), Canadian hospitals now face substantial annual funding reductions with an expectation of further cutbacks and potential restructuring of the entire Ontario healthcare system by the provincial government. (Mactavish & Norton, 1995b). This environment of fiscal restraint, common across North America, has forced healthcare organizations to consider all possible means for delivering services more effectively and efficiently. There have been previously inconceivable changes in service delivery models away from lengthy inpatient stays to very much shorter lengths of stay and more emphasis on outpatient procedures. Hospitals have radically decreased their budgets, some have shared services, others have merged and yet others have closed their doors. In addition, hospitals have rethought every aspect of their traditional methods of service delivery and organization. Many organizations have experimented with different organizational structures and concepts to support their drive towards increased consumer satisfaction and efficiency. Two related ideas are the patient focused care concept and the program management organizational structure.

2.2 The drive towards the patient focused hospital and program management

The traditional hospital organizational structure has emphasized differentiation by function with each medical, surgical or professional specialty represented by a different department. The hospital organization of its nursing units mirrors the medical division by specialty (Charns & Smith, 1993). The reasons for this fragmentation have been partly historical and partly driven by the professional needs to sub specialize and compartmentalize activities. Lathrop has concluded that the extent of compartmentalization and overspecialization is the primary cause of poor service and high costs. (Lathrop, Seufert, Macdonald, & Martin, 1991). From a patient perspective, it has resulted in many unwieldy and inefficient

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arrangements as patients travel from point to point to receive services. Major difficulties have arisen in coordinating activities and in sharing resources. This organization structured by service provider specialty has not been conducive to consumer satisfaction nor to organizational efficiency. From the management perspective, the hospital has been viewed as a single entity. The managerial role has been limited to a homogeneous group of professionals providing a centralized service to the entire hospital. Senior corporate officers have provided strategic direction for the entire hospital and attempted to coordinate strategy across multiple specialty and functional areas. Corporate services, such as Human Resources, Finance and Information Services have provided a generic service to all functional areas.

The patient focused hospital concept arose in direct response to over specialization. The central tenet of patient focused care is that hospital resources and personnel should be organized to serve the needs of the patients rather than around a multitude of specialized departments and service providers (Murphy & Ruflin, 1993). Patients with similar diagnoses, clinical care and ancillary resource needs are grouped into homogeneous units (Sidky, Barrable, & Stewart, 1994), (Jirsch, 1993). These needs are met by bringing many care giving functions to the patient in the form of multiskilled practitioners and redeployed equipment. Conventional clinical departments which were separate and independent may be amalgamated into multifunctional areas called programs. Each program is optimized for the needs of a particular patient group. It contains its own decentralized professional staff, nursing staff, resources and budgets. In essence, the single hospital entity is turned into a portfolio of relatively independent mini hospitals joined together by a cluster of central policies (Leatt, Murray & Lemieux-Charles, 1993; Ellis & Glaskin, 1988).

Galbraith has conceptualized organizations as information processing systems. His model considers the transmission of information as the central function of organizational structure (Galbraith, 1973). The amount of information needed to perform a task is a function of inputs, outputs and difficulty. The greater the diversity of the outputs, the number of input resources and the level of difficulty and the tasks, the greater the number of factors and

interactions that must be considered simultaneously when making decisions and therefore the greater the information required. Program structures decrease the diversity of the outputs by grouping like patients together. The organizational design captures interconnections within the boundaries of a single work group (Charns & Smith, 1993) and decreases the amount of coordination that is required between different work units and the degree to which tasks performed by different work units are interdependent. On the other hand, many more input resources must be coordinated across tasks with a high level of difficulty and complexity. Thus the information processing required by the institution as a whole is decreased, but within each program unit, complexity is increased and the management function is more complex.

2.3 Management of a program oriented unit

Program management and the patient focused hospital require a very different type of management. Old functionally arranged organizational support mechanisms are mis-aligned with ways that the organization now conducts itself. Senior hospital officers now provide overall direction, but it is up to each semi autonomous business unit to interpret that direction and adopt a strategy for their areas. Central groups provide common infrastructure for the entire organization of business units and services for which there are economies of scale. Examples include technology infrastructure, physical plant, human resource management and bulk purchasing. However, the centralized groups divest their services to the business units where feasible and must support disparate requirements of these groups. In particular, they must support the strategy and management requirements of each group.

Unit managers assume greater strategic decentralized responsibility for their business units. They must manage and coordinate the activities of multiple professionals and multiskilled staff all acting in concert to achieve the goals of the work unit. PSU managers have budget and line authority for all services provided to the unit's patients (Mactavish & Norton, 1995a). They are accountable for setting strategic direction that is consistent with the direction of the hospital as a whole, they are responsible for resource allocation within the

business unit and they are held accountable for the performance of the unit. In general these local line leaders have far greater strategic and managerial responsibilities than they had under the previous centralized structures (Acorn & Crawford, 1996) .

2.4 Management roles

While it is clear that business unit managers have more significant responsibilities, it is less clear how to define specifically what those responsibilities are. In fact, as Jacques (1989) has pointed out, even the term manager is poorly defined. Management theorists have tried to describe managers according to their position in the organizational hierarchy or by listing the tasks they perform. Mintzberg (1994b) models the management function as a system of interconnected roles shown in Figure 1:
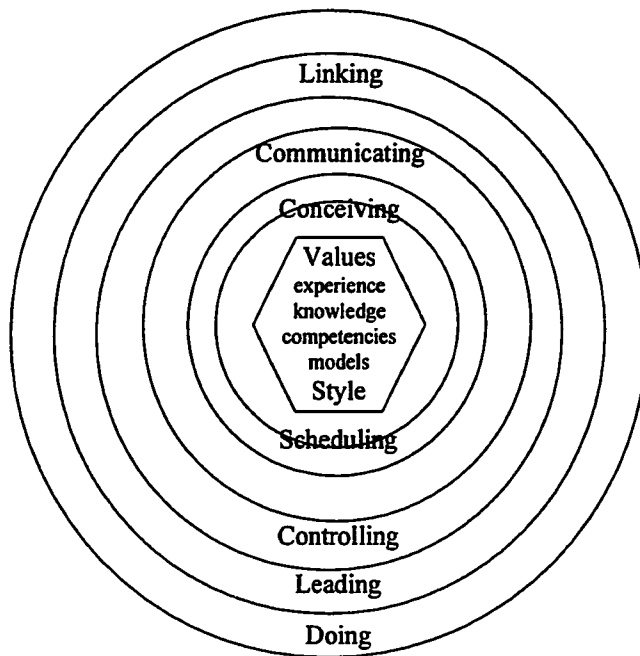
Figure 1: Interconnected Management Roles

(after Mintzberg, 1994)

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At the core is the person in the job. The individual comes to the job with a set of values, a body of experience, a set of skills and competencies and a base of knowledge. That knowledge defines a set of mental models, keys by which managers interpret the world around them. Together all of these characteristics determine how the manager approaches the given job, his or her style of managing.

The job has a frame of reference which gives rise to the conceiving role of the manager, namely thinking through the purpose, perspective and positions of a particular unit to be managed over a particular period of time. 'Clarity of vision' and 'strategic thinking' are both terms used to denote a sharper frame.

A person in a particular managerial job with a particular frame sets an agenda of specific activities. The associated role of scheduling has both a general aspect and a more specific aspect. First the frame becomes manifested as a set of current issues of central concern. The sharper the frame, the more integrated the issues. Second, the frame and issues get manifested in a tangible schedule, the specific allocation of managerial time. Implicitly included here is the setting of priorities among the issues.

The person in the job with a frame manifested by an agenda represents the core of the job. The next circle models the roles associated with the milieu in which the job is done.

Communication refers to the collection and dissemination of information with the people around them. Mintzberg contends that formal information, that is, information capable of being processed by a computer, does not play a particularly dominant role here. Rockart disputes this (Rockart & Crescenzi, 1984). The controlling role describes the manager's efforts not just to gain and share information, but also to use it in a directive way inside their units; to provoke action by those who report to them. They do this in three broad ways: they develop systems, they design structures and they impose directives. Informational control through the exercise of formal authority is the most direct way for the manager to operationalize his or her agenda, by using budgets to impose priorities or delegation to assign

responsibilities. This is typically what people have in mind when they think of the managerial role. Clearly, it is a limited view. Delegating means mostly diagnosing and identifying issues, while authorizing means mostly deciding. There is a middle step, that of designing possible solutions. This step usually resides with the person being managed (Simon, 1960).

There is a vast domain of literature that deals with the leading role. Early work focused on identifying intellectual, emotional, physical and other personal traits of effective leaders (Stogdill, 1974) while more recent work concentrates on explicit approaches to leadership, divorced from personal style (Farkas & Wetlaufer, 1996). Situational leadership theories suggest that the effectiveness of the leading role depend on the fit between personality, task, power, attitudes and perceptions (Fleishman, 1973) (Gibson, Ivancevich, & Donnelly, 1979). Schein (1990) contends that the major function of the leader is to create and manage organizational culture - the behavioral assumptions and basic beliefs of the organization. In pursuing the management roles, leaders develop this organizational culture. Performance measures that the leader systematically attends to are a powerful mechanism for reinforcing culture (Jacques, 1989). Leading is done at three levels: At an individual level, leaders encourage and motivate people; at a group level, they build and manage teams; and at a unit level, they create and maintain culture. In leading, the manager unites his or her people, galvanizing them into action to accomplish the unit's mission and adapt it in a changing world.

In the linking role, the manager is both an advocate of the unit to its environment and a conduit for influences from the environment back into the unit. Managers also become directly involved in action. This is the doing role in which the manager gets fully and deeply involved in key activities or projects.

All of these roles together make up the integrated practice of managerial work. Managers conceive of their frame; they have a scheduling role by deciding on and prioritizing the central issues and allocating time and resources to them; they communicate and share information, they control their units by developing systems, designing structures and

imposing directives; they lead their people; they link with the environment; and they have a role in doing things, solving problems and negotiating with external parties. The managerial job requires all of these roles to be performed in a blended, balanced way.

From this description, it is clear that integrated management is an information intensive activity, requiring knowledge of the business unit being managed, the business processes of the unit and its goals and priorities.

All of these roles point to the right information needed by managers.

2.5 Strategic management

Strategy is usually associated with planning, the design of effective ways of bringing about a desired future (Ackoff, 1970). Strategy, as a planning activity, is done to coordinate the activities of the organization, to ensure that the future is taken into account and to design control mechanisms. These formal plans are typically proposed by senior management and can be designated as intended strategy. Intended strategies which are carried out become realized strategies as shown in Figure 2.

The real world inevitably involves not only thinking ahead, but also adaptation as unexpected events and unpredictable situations occur. In contrast to intended plans, strategies may arise as a result of actions, taken one by one, which converge in time in some sort of consistent pattern of activities. Emergent strategies can emanate from all levels of the organization as individuals search for and create opportunities. Intended strategies are often superseded. Formation and implementation occur together and throughout the organization. Strategies which are defined by formal plans and strategies which are defined by a pattern of activities are not necessarily mutually exclusive. Organizations often pursue umbrella strategies, planning the broad outlines in advance while letting the details emerge within them.
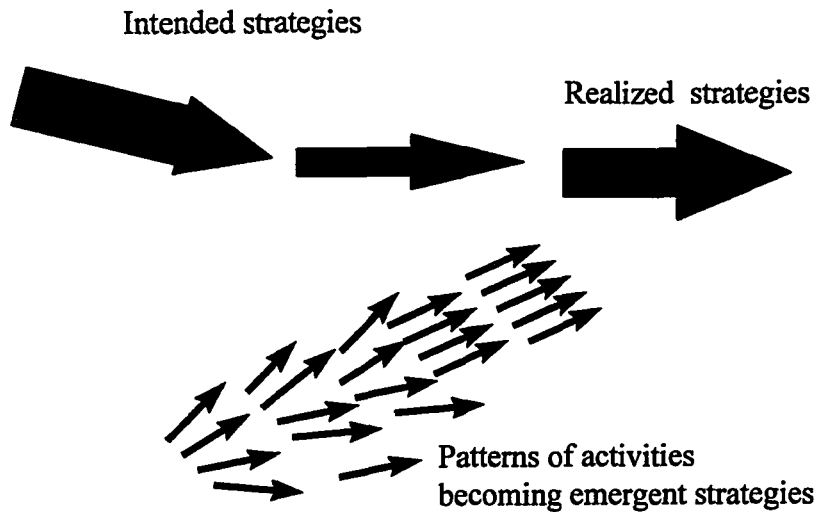
Figure 2: Intended and emergent strategies

(after Mintzberg, 1994a)

The nature of decentralized autonomous programs requires managers to take a more strategic view of the business unit. This implies that managers must have the ability both to formulate and implement intended strategies as well as to recognize emergent patterns.

Strategic Management involves not only strategy formulation but also strategy implementation. A formal reductionist approach decomposes the process of managing intended strategies into five tasks (Thompson & Strickland, 1989):

1. Developing the concept of the organization and forming a vision of where the organization needs to be headed.
2. Translating the mission into specific long range and short range performance objectives
3. Crafting plans that fit the organization situation and that should produce the targeted performance

4. Implementing and executing the chosen strategy efficiently and effectively
5. Evaluating performance, reviewing the situation and initiating corrective adjustments in mission, objectives, strategy or implementation in the light of actual experience, changing conditions, new ideas and new opportunities.

The first three steps relate to the managerial role of conceiving the frame. The manager must decide what he or she is trying fundamentally to do. The manager must define a vision, culture and strategy. The last two step relate mainly to the roles of controlling, communicating, leading, linking and doing.

This reductionist model must be refined to take into account organizational barriers to strategy formulation and implementation. The management tasks are not necessarily sequential nor linear. They are iterative and ongoing. Changing circumstances will always make corrective adjustments desirable. Long term direction may need altering. Performance objectives may emanate from the top and cascade down the hierarchy or they may flow up in a cumulative fashion. They may need to be raised or lowered in the light of experience and changing environmental influences. Objectives should stimulate the development of strategies which should give rise to a second cascade through the organization. Strategy may need to be modified. Strategies should give rise to resource allocation decisions. Often budget decisions are initiated at lower levels and flow up the hierarchy for approval. Strategy implementation is always a trial and error process. In addition, these strategy management tasks are not cleanly divided or sequenced. There is constant interplay between the elements. Moreover the tasks involved in managing strategy have to be done in the midst of a fragmented managerial schedule that is packed with special assignments, duties, meetings, deadlines, unexpected crises and people issues. Thus while particular strategies sometimes evoke specific resource allocation decisions and while objectives do help to form strategies and decide budgets, it is not reasonable to model these as a conveniently nested set of processes.

In order to manage strategically, management teams must be able to formulate concrete positions regarding the products, markets and structures, implement strategies effectively, evaluate the success of intended strategies as well as recognize emergent strategies. Their strategic information needs are great. Ironically, organizations suffer from an excess of data which overload rather that enlighten managers. The scarce resource is not data, it is organizational attention - the allocation of information processing capability to convert data into information relevant to a defined issue or agenda. (Simon, 1995). Organizational attention is the fundamental constraint in achieving objectives (Cyert & March, 1963). There is always more opportunity space than there is information processing capability. What managers need is the right strategic information that can focus organizational attention on agendas linked to strategies.

2.6 Providing managers with the right information

So far we have established from the literature that managers have multiple integrated roles and that strategic management is information intensive. The development of strategy requires ongoing understanding of the interplay between corporate, business unit and functional objectives, strategies and budgets. We also recognize that organizational attention rather than data is the fundamental constraint to achieving objectives.

We now turn our attention to an investigation of information delivery in organizations in order to understand how they support their managerial information needs. Rockart (1986) outlined four historical methodologies for meeting management information needs: the byproduct technique; the null approach; the key indicator system; and the total study process. He then proposed the critical success factor methodology. We utilize a sixth methodology, the Balanced Scorecard.

In the **Byproduct technique,** the organization concentrates on implementing information systems which are primarily designed to perform routine paperwork processing. Attention is focused on systems that process payroll, accounts payable, inventory and so on. The data

byproducts of these transaction processing systems are made available to interested executives as heavily aggregated reports. Little attention is paid to the real information needs of these managers. Alternatively there may be ongoing, periodically forthcoming results of a previous one time request. This is, as Rockart put it, "the paper processing tail wagging the information dog". This does not necessarily provide useful management information.

In the **Null approach**, it is assumed that top executive needs are so dynamic and unpredictable that they cannot be met with computer generated, structured information. These executives are dependent on future oriented, rapidly assembled, often subjective and informal information. Moreover the analytical inputs they do receive seem to be of relatively little importance (Mintzberg, 1976). Proponents of this approach point to the uselessness of the reports developed under the Byproduct approach as evidence of this position and conclude that all computer based approaches are useless. This viewpoint overlooks the management control role of executives which can be at least partially served by means of routine, often computer based reporting.

The **Key Indicator approach** is based on three concepts. The first concept is the selection of a key set of indicators of the health of the business. Information is collected on each of these indicators. The second concept is exception reporting - the ability to make available to the manager only those indicators where performance is significantly different from expected results (assuming that significance levels can and have been predefined). The third concept is the expanding availability of better, cheaper and more flexible visual display techniques. In most key indicator systems the emphasis has been on financial data (Rockart, 1979). While the data may be variable, the orientation has been towards financial, balance sheet data. In its cafeteria approach to providing an extensive information base, the key indicator approach does not provide a methodology for helping managers think through their objectives and thus it fails to provide assistance to executives in ascertaining their real needs.

The fourth approach, the **Total Study process** is a top down detailed analysis of the information needs of the organization. The objectives of the process are to develop an

overall understanding of the business, the information necessary to understand the business and the existing information systems. It involves extensive interviews of multiple managers in the organization to determine their environment, objectives, key decisions and information needs. The total study process is comprehensive and can pinpoint missing systems. However, the all inclusive scope generates huge amounts of data and it is expensive to perform. The results do not necessarily focus on providing managers with better information, but may be biased towards the paper processing gaps identified by the study. Typically this results in the development of management information systems being deferred until the missing operational systems have been developed. A more serious flaw is that the total systems view fails to properly represent the information needs of managers. Strategic or management control activities do not necessarily need information that is merely the aggregated byproduct of an operational system (Becker, 1962). In addition, there is the difficulty of constructing an enterprise reporting system that meets individual manager's needs.

2.6.1 Critical Success Factors

Critical Success Factors (CSFs) were introduced as a methodology for helping managers to determine precisely what information they need (Rockart, 1986). CSFs are defined as the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department or organization. The technique helps managers make explicit and focus their limited attention on the few truly important areas in which favorable results are absolutely necessary. Critical success factors are not limited to accounting information and they are tailored to the particular management need.

The methodology of developing CSFs is to understand industry CSFs, economic and political environmental factors and the temporal circumstances. These provide input into the corporate CSFs for the organization. In turn, corporate CSFs become inputs into a similar CSF determination process for each subsystem of the organization. This top down influence pattern can be continued down through the organizational hierarchy to the individual

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manager level (Rockart, 1986). The CSF approach does not attempt to deal with strategic planning. It centers on information needs for management control where the data needed to monitor and improve existing areas can be more readily defined.

The CSF method results in a useful set of reports to monitor ongoing operations at the executive level. The method can also be used to prioritize the development of information systems, based on the gaps identified during the CSF development process. In addition the hierarchical nature of the method provides a means of communicating the critical success factors for the organization. There is no focus on the interaction between factors, nor on possible tradeoffs that must be made between CSFs

2.6.2 The Balanced Scorecard

The balanced scorecard was first proposed as a framework for translating strategic objectives into a limited, coherent set of performance measures (Kaplan & Norton, 1992; Kaplan & Norton, 1993; Kaplan & Norton, 1996). The scorecard presents managers with four different perspectives from which to choose measures arranged in quadrants as shown in figure 3:

- measures of customer satisfaction;
- financial measures;
- internal process metrics and;
- organizational innovation and improvement measures.

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Customer	Internal
How well are we doing from our customer's perspective ?	At what do we have to excel?
Innovation	**Financial**
How well do we adapt to change and continuous improvement?	How wisely do we use our resources?

Figure 3: The four perspectives of the Balanced Scorecard

(after Kaplan and Norton, 1993)

The Balanced Scorecard methodology can be mapped to the interconnected managerial roles described in Figure 1. The technique helps the conceiving role by helping managers sharpen their frame; it aids the communicating role by a shared understanding of the frame; the methodology identifies the central elements of the scheduling role; it helps managers in their linking role by providing a model to communicate with; the measures form the major part of the controlling system; developing a BSC is part of the manager's doing role.

The process of selecting and agreeing on measures in each quadrant forces a management team to define what is strategically important to its organization. Limiting the number of allowable measures in each perspective obliges managers to focus their strategic vision and identify the handful of most critical indicators. By graphically displaying information trends in time from four different perspectives, the balanced scorecard provides insight into dynamically complex situations and allows managers to assess whether improvements in one area may have been achieved at the expense of another. This balanced set of measures both reveals the tradeoffs that managers have already made among performance measures and encourages them to achieve their goals in the future without compromising key success factors. Understanding trends and the interrelationships between variables is particularly important when an action has one set of consequences locally and a very different set of

consequences in another part of the system or when obvious interventions produce non obvious outcomes (Senge, 1990). In this way, the Balanced Scorecard helps managers develop their mental models. The healthcare industry has started to adopt a similar concept referred to as an instrument panel (Nelson, Bataldan, Plume, Mihevc, & Swartz, 1995; Nugent, Schultz, Plume, Bataldan, & Nelson, 1994). Another variation in healthcare is the report card - a comparative reporting system that allows healthcare purchasers and consumers to rank institutions. (Corrigan & Nielson, 1993). The Balanced Scorecard has also been suggested as a framework for evaluating the performance of an integrated health delivery system (Leggat & Leatt, 1997). Balanced Scorecards have been tried in a number of different healthcare settings - a community hospital (Nelson and Krywonis 1997) and a regional healthcare system (Nelson 1997). No evidence has been presented in the literature evaluating these projects.

2.7 Technology solutions to supplying managers with the right information

We have reviewed several methodologies for defining managerial information needs. We now investigate Information Technologies for supplying managers with that information. Information systems can help executives in two ways (Rockart & Crescenzi, 1984): It gives managers an opportunity to improve the delivery of their organizational products and services; and it potentially increases their personal effectiveness and productivity in managing the business.

Information Technology related to supplying managers with information has advanced significantly, typically under the label of executive information systems or decision support systems. The term decision support systems was introduced by Gorry and Scott Morton in 1971. (Gorry & Scott Morton, 1971). They proposed a framework for looking at decision making in the context of managerial activities shown in figure 4.

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Purpose of management activity

———————————————————————→

	Operational control	Management control	Strategic control
Structured			
Semi -structured	Decision Support systems		
Unstructured			

Type of
decision making
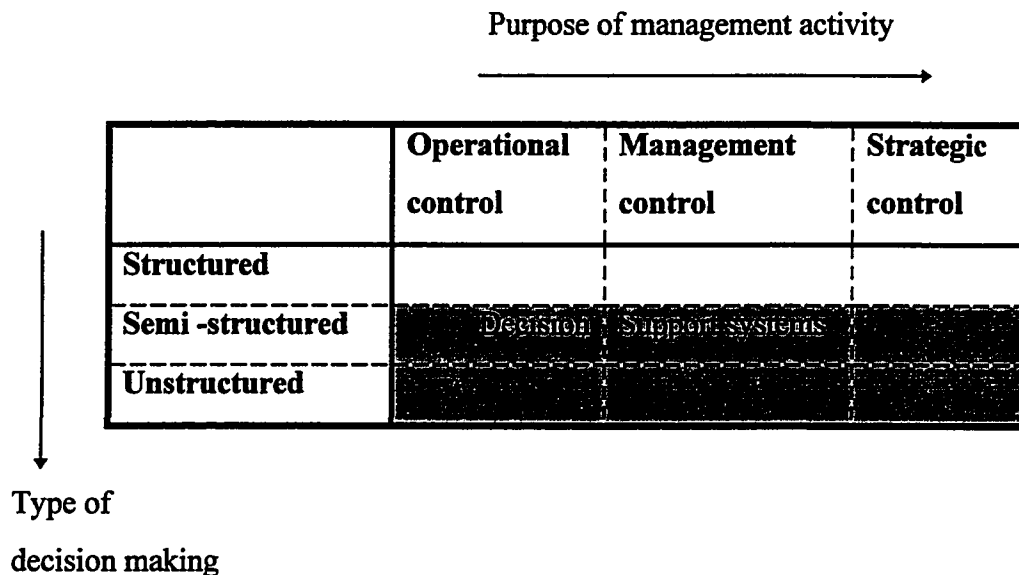
Figure 4: A framework for defining decision support systems

(after Gorry & Scott Morton, 1971)

The horizontal axis of the framework is modeled after Anthony's classification of managerial activities into operational, management and strategic tasks. The vertical axis uses Simon's spectrum of structured to unstructured decisionmaking. A fully structured decision is one in which all phases of the decisionmaking process - identifying the problem, designing possible alternative solutions and selecting one - can be structured and defined. Conversely an unstructured problem is one in which none of the decision making phases is precisely determined. Semistructured decisions are those where one or two of the intelligence, design or choice phases are undefined. Gorry and Scott Morton proposed that decision support systems were the information systems used to support managers making Semistructured and unstructured decisions.

Information systems designed for structured decision making assume that there are generally accepted models of the decision process. The system designer typically interacts with operational experts rather than managers. The system may replace rather than aid decision

making. This is not the case with systems designed to help management teams with unstructured problems where human judgment and communication is essential to problem solving (Tan, 1996). The system is based on descriptive paradigms of decision making rather than prescriptive perspectives of rationalistic models. Strategic models are often vague, ill defined and unverbalized by managers in the organization. The act of supporting a manager implies a meshing of analytic tools into his or her existing problem solving, communication and analytic activities (Keen & Hackathom, 1986). Gorry and Scott Morton pointed out the significant differences in the methodology for developing these systems, notably the lack of a comprehensive database of appropriate and useful data, the requirement to develop models in conjunction with the managers, and the skillset required by the analyst to communicate with the managers. A key difference between replacement and support is that the former aims at solving a problem or getting an answer while the latter focuses on helping a person. This requires a detailed understanding of the manager's habits needs and concepts.

A drawback of the Gorry Scott Morton model is its cognitive bias being based on Simon's theory of individual decision making. Systems which support individual tasks with no interdependencies should rightfully be known as personal support systems. Group support systems are for tasks with pooled dependencies which thus require substantial face to face discussion and communication. Organizational support systems are for tasks with sequential interdependencies. The latter are by far the most common sort of decision support system and require a different theoretical basis than the prevailing cognitive theory.

We conclude that the decision support system label covers a wide variety of information systems. Some are based on the individual decision process. Some provide analytical models that replace decision making. Some aim to support simple managerial tasks such as convenient data retrieval or selection of a single variable.

3. Objectives and hypothesis

In summary, the program management organizational structure requires managers to be much more responsible and accountable than they have traditionally been in the past. Managers perform many roles which require the right information. They have a great strategic involvement in the unit. Management information is produced as a byproduct of the operational processes. There are techniques for defining management information needs. Technology has advanced faster than our capability for understanding how to apply it well.

The context for this research is the Canadian healthcare system. The objective of the work has been to:

- investigate a methodology, based on the Balanced Scorecard, which helps hospital managers define and use important management information;
- develop an information system that makes this information accessible and which provides a context for integrated decision making;
- investigate the impacts of the prototype system on the healthcare organization.

In this work, we hypothesize that the Balanced Scorecard methodology provides an effective tool for healthcare business units both to formulate their strategic information needs and to manage strategy implementation

4. Research milieu - Sunnybrook Health Science Centre

Sunnybrook Health Science Centre (Sunnybrook) is an academic teaching centre with over 1300 acute care and long term care beds. It is affiliated with the University of Toronto. The hospital employs over 4300 people, including almost 1200 full-time and part-time nurses. In addition to nurses and doctors, Sunnybrook has some 1100 professional and technical staff. It is a multifacility institution with a geriatric day hospital, physician offices, a regional cancer centre as well as a variety of outpatient clinics all located on the same campus. The hospital has over 17000 admissions and 250 000 outpatient visits annually.

For many years, Sunnybrook was organized conventionally as a series of functional 'smoke stacks" which segregate different functions into fairly strict hierarchies. In the late 1980s, Sunnybrook restructured according to patient focused care and program management principles. Sunnybrook's Statement of Philosophy reflecting its commitment to patient focused care is shown in Figure 5

Our Patients, residents and their families are the focus for all we do. We are committed to understanding and exceeding their expectations

We will strive to ensure:

That care is provided in a atmosphere of respect and consideration which reflects the diversity, perceptions expectations and responses of each patient and resident.

That our communication with patients, residents and their families is easily understood, sensitive and confidential in accordance with the patient wishes and needs.

That the quality of care is extended through a continuum provided by an inter professional team, other local agencies and volunteers.

That we are accountable and responsible for what we do, and we will strive to use resources in an effective manner.

That as an academic hospital, we pursue our role in teaching and research while being sensitive to our patient's needs for privacy.

That we respect our staff and provide an environment where their physical, emotional, and educational requirements are supported.

That we encourage curiosity and innovation and we require evaluation and continuous improvement of all our activities.

That patients, residents and their families see their experience at Sunnybrook as a meaningful and positive one.

Figure 5: Sunnybrook Vision and Mission Statement

Six major programs, shown in Figure 6 are responsible for a set of services for specific types of patients. Where service groups could not be decentralized, they perform functions on behalf of the whole hospital. Programs have clinical, research and academic responsibilities. One or more clinical working units called Patient Service Units (PSUs) have been established within each program. Each PSU operates as a semi autonomous strategic business unit grouping like patients together. Budget and resources are decentralized to the PSU. One PSU does not have substantial interaction with another PSU. They do however have a dependence on centralized and corporate services, somewhat limiting their autonomy. The PSUs have a coleadership model. A Medical Director and Operations Director share joint responsibility for each PSU. Following the principle of shared governance, each pair of co-directors has established a management team comprising members of the PSU. Typically, the management teams have included unit managers called patient care managers and usually other staff representation. PSUs must develop strategies that are consistent with Sunnybrook's key concepts: patient focused care; quality management; and shared governance. They must take into account the Sunnybrook corporate objectives and the external forces on the organization.

4.1 Applying the hypothesis to the research milieu

Over a period of three years, we developed prototype decision support systems based on the Balanced Scorecard methodology in five different patient service units (PSUs) at Sunnybrook Health Science Centre. The methodology for doing so is described below.

SHSC Patient Services Organization Chart

May 7, 1997

SHSC

AGING PROGRAM | MENTAL HEALTH PROGRAM | CANCER PROGRAM | COMMUNITY PROGRAM | HEART & CIRCULATION PROGRAM | TRAUMA PROGRAM & CLINICAL SERVICES

AGING PROGRAM
- Physical Support PSU
  - K1E Rehab/assess/LTC/IAP PCU
  - K1C Physical Support PCU
  - K2E Long Term Care PCU
  - K2W Long Term Care PCU
  - LGSE Reactivation PCU
  - LGSW Palliative LTC PCU
  - LFSE Physical Support PCU
  - LFSW Physical Support PCU
  - LTSW Physical Support PCU
- Cognitive Support PSU
  - K3C Long Term Care PCU
  - K3E Long Term Care PCU
  - K3W Long Term Care PCU
  - LSS Cognitive Support PCU

MENTAL HEALTH PROGRAM
- Mental Health PSU
  - F1F2/FG Psychiatry PCU
  - K1W Psychogeriatrics PCU
  - LTSE Social Support PCU

CANCER PROGRAM
- Medical/Radiation Oncology PSU & Systemic Radiation Programs
  - C3 Med.-Rad. Onc. PCU
- Surgical Oncology & Related Services PSU & Surgical Oncology Program
  - C2 Urology Otolaryngol. Ophthalmol. Gynaecology Oncology PCU
  - C8 General Surgery Gastroenter. Gynaecology PCU

COMMUNITY PROGRAM
- General Medicine PSU
  - C4 Gen. Medicine PCU
  - D2 Neph/Gen. Medicine/Infectious Diseases PCU
  - D4 Respirology/AGU/Gen. Med./ALC PCU

HEART & CIRCULATION PROGRAM
- Cardiovascular PSU
  - B3 Cardiac Surgery Vascular Surgery PCU
  - D3 Cardiology/Cardiac Surgery PCU
  - CCU B3 Coronary Care Unit PCU
  - CVICU D7 PCU

TRAUMA PROGRAM & CLINICAL SERVICES
- Trauma & Related Services PSU
  - C5 Trauma/Neurotrauma/Plastics PCU
  - D5 Orthopaedics/Trauma PCU
  - NICU B5 PCU
  - ASCIU Spinal Cord Program
- Critical Care PSU
  - B7 Critical Care Unit PCU
  - D7 SPCU
- OR & Related Services PSU
  - PACU
  - Operating Room
  - Pain Program

Solid line box indicates Inpatient Services

Dotted line box indicates inpatient support services without allocated beds

J.holden.bacore.

Figure 6: Sunnybrook Organizational structure (May 1997)

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5. Balanced Scorecard system development methodology

The first objective of this work has been to investigate a methodology, based on the Balanced Scorecard, which helps hospital managers define and use important management information. Each Balanced Scorecard system was developed using a methodology shown in Figure 7.
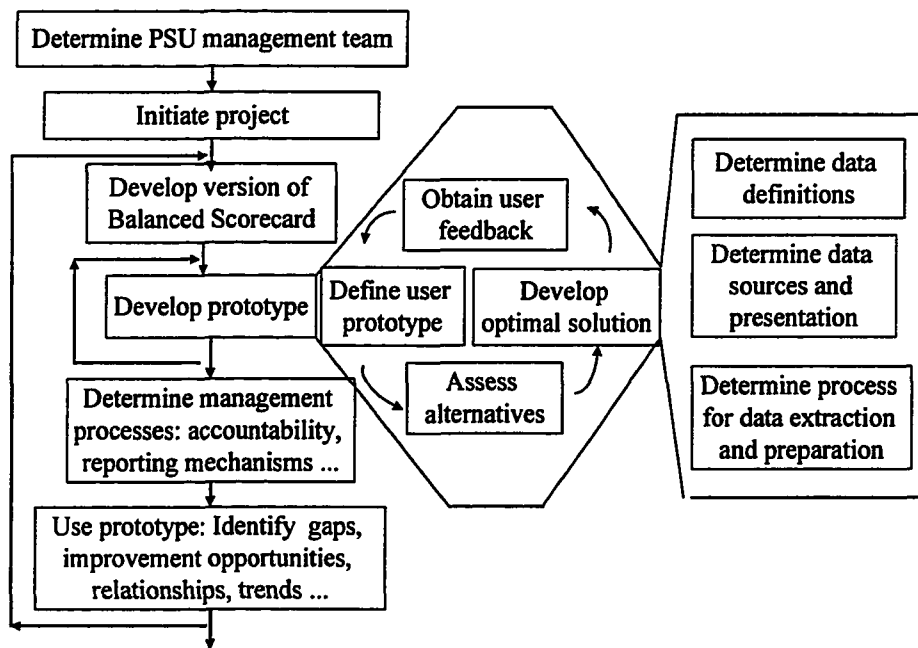
Figure 7: Balanced Scorecard Development Methodology

5.1 Step 1: Select PSU

At the start of the Balanced Scorecard project in 1993, program management had just been instituted at Sunnybrook. Programs and PSUs were in their formative stages. Not all PSUs were either ready or able to implement a Balanced Scorecard project. Criteria for selecting the first PSU development site were:

- a functioning management team with the authority to make PSU wide decisions.

- a consensus, participative style of management;

- an appreciation of data driven management decision making;

- a desire to use enabling technology for management purposes.

- senior corporate and IS leadership approval

Figure 8 below shows the composition of the leadership teams. We selected the Cardiovascular PSU (CVPSU) as the first site for developing a Balanced Scorecard at Sunnybrook since it met all the criteria described above. The PSU treats medical and surgical patients with cardiovascular diseases. The unit performs coronary artery bypass grafts, angiography, pacemaker insertions, valve replacements and has a large outpatient diagnostic practice. Cardiovascular medicine is very quantitative. The PSU has many data sources. Cardiovascular managers are comfortable with the idea of management with information.

Cardiovascular PSU	Cognitive Support PSU	Trauma	Emergency
Medical Director *	Medical Director	Medical Director	Medical Director
Operations Director	Operations Director *	Operations Director	Operations Director
2 patient care managers *	3 patient care managers	3 patient care managers	Patient care manager
Clinical nurse specialist *	Clinical educator *	Clinical educator *	Clinical educator
Clinical educator	Staff nurse	Staff nurse	Staff nurse
Staff nurse			

Figure 8: Leadership team composition

* indicates that incumbents in these positions changed during the course of this work

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Our second site was the Cognitive Support PSU. Cognitive Support is a long term care area in the Aging Program. It deals principally with long term care residents with Alzheimer's disease. The majority of its residents are World War Two veterans. Long term care is very much less quantitative and less technology focused than the acute care setting. By contrast the Emergency PSU is totally outpatient and sees patients for very short duration. The Critical Care PSU is an intensive care area. The Trauma PSU covers a wide range of surgical specialties and situations. We specifically chose these contrasting areas in order to demonstrate the applicability of the Balanced Scorecard technique across a spectrum of care settings.

5.2 Initiate the project in the PSU

Initiating a project in a PSU consisted of three steps:

1. Meeting the PSU leadership and establishing the Balanced Scorecard development team,

2. Learning about the PSU, sensitizing the management team to the Balanced Scorecard framework and concepts and;

3. Gaining approval to proceed.

5.2.1 Meeting the PSU leadership and establishing the Balanced Scorecard development team

Gaining the approval of the PSU senior leadership was a critical step. If either the Medical or Operations Director of the PSU did not agree to support the project, the analyst would not have received resources or support from within the PSU. In all cases, the Medical and Operations Directors found the framework intuitively appealing and were comfortable with the project proceeding. Establishing the Balanced Scorecard development team was not trivial. The Cardiovascular PSU had two management teams: a Design team which dealt with PSU management concepts; and an Operations team which managed the ongoing operations of the PSU. We chose to define the CVPSU Balanced Scorecard with the Design team. In hindsight, this approach was flawed. It meant that the developers of the Balanced Scorecard

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were not the ultimate end users. We did not transfer the Balanced Scorecard system to the Operations team effectively.

The Cognitive Support PSU had only one management team with several subcommittees and taskgroups. The management team decided that all its members should be involved in developing the indicators. Specific detail tasks, such as the detailed data definitions could be done at the subcommittee or taskgroup level.

5.2.2   Learning about the PSU

The objective of this step was for the analyst to learn about the PSU and its management team dynamics. Each PSU 'mini hospital' is fundamentally different. For example, the cardiovascular PSU is a high profile organization, whose success is measured by the volume of cases that go through it. Many procedures and lengths of patient stay are predictable. Conversely, the Cognitive Support PSU cares for patients until they die. Length of stay and volume of cases has no meaning in this context.

The analyst found information about the PSU in their strategic plans; other documents; one on one meetings with team members; attending various team meetings; and by investigating PSU databases, reports and other data sources. A recurring theme throughout this project was to determine whether currently supplied corporate data sources met the PSU needs. It soon became clear that each PSU was, in fact, a 'mini hospital' with varying goals, and strategies. This translates into different measures and information requirements. Corporate data which were standardized for all PSUs did not meet managers requirements. A byproduct of this step was that the information analyst became integrated into the PSU management team and gained their trust.

5.2.3 Presentation to the management team

The final step in project initiation was for the analyst to make a formal presentation the PSU management team. The presentation brought together a summary of findings, a list of potential data sources, some thoughts on potential indicators and a review of PSU objectives. The outcome of the presentation was for the team to agree to develop an initial Balanced Scorecard.

5.3 Develop version of Balanced Scorecard

The team then developed a first version of the balanced scorecard. The objective of this step was for the team to try and describe their strategically important goals using a limited number of measures. Two important pitfalls to avoid at this stage of the project were the inclination to define each indicator in detail and the tendency of teams to limit their definition of needs based on current information sources only.

Depending on the team makeup, a number of group dynamic issues arose:

- Underlying rivalries between team members or disciplines surfaced based on the indicator descriptions. This is described in more detail in section 5.4.1
- Team members who were not comfortable with management by measurement objected to the use of indicators as unrepresentative of actual goals. A similar attitude manifested itself again later in the project when proxy indicators were used.
- Team members in some PSUs feared that the indicators would be misinterpreted and used against them and were unwilling to discuss indicators openly or to divulge data. It was necessary to discuss team mechanisms for interpreting and using the data on an ongoing basis. This was a confidence building exercise for the entire team.

Different management teams used various processes and degrees of formality to get consensus on the indicators for their prospective scorecards. Since we intended to develop the prototype system iteratively over time we did not require the management teams to commit

to a final Balanced Scorecard at this point. Figure 9 shows a sample Balanced Scorecard for the Cardiovascular patient service unit.

<u>Customer</u>	**<u>Internal</u>**
patient satisfaction	Average length of stay
average waiting time	Turnaround time
cancellations	Complication rate
	Time to treatment
<u>Innovation</u>	**<u>Financial</u>**
Patients in clinical studies	Average cost per case
Day of admission procedures	Productivity
Patient focused care objectives:	Profit per case

Figure 9: Cardiovascular PSU balanced scorecard

5.4 Develop prototypes using the spiral development cycle

Each prototype has been developed using a methodology based on an evolutionary prototyping spiral development cycle (Boehm, 1988). Iterative prototyping is commonly used to develop decision support applications (Watson, Rainer, & Koh, 1991). Each loop through a development spiral moves through four phases:

1. Plan prototype
2. Assess alternatives
3. Develop optimal solution
4. Get customer feedback.

With each iteration of the spiral progressively more complete versions of the system are built.

5.4.1 Phase 1: Plan prototype

Planning consisted of determining objectives, alternatives and constraints. Initially this consists of requirements gathering and project planning. It was important to understand underlying group issues around data. When the group proposed an indicator, it forced the members to agree on a strategic direction and PSU priorities. The process revealed underlying assumptions about the relative importance of different programs, disciplines or staff and areas of team discord and rivalries. In a few cases, a Balanced Scorecard indicator became the focal point for discussions about the importance of one discipline versus another in the new program structure. The cost conscious environment combined with the move to multiskilled staff made all disciplines insecure about their futures. Any attempts to define an indicator that implicitly recognized one discipline as being more important than any other was met with resistance. Conversely, defining a discipline specific indicator was construed as control because of poor performance. Managing the group dynamics with sensitivity during this exercise was a key analyst function. The outcome of this step was a detailed set of indicators that could potentially be developed at this point.

5.4.2 Phase 2: Assess alternatives

This step analyzed alternative development possibilities and allowed the management team to balance the potential value of an indicator with the development difficulties of that indicator. This analysis included economic factors, technical or data acquisition feasibility, data definition difficulty, data ownership and data sensitivity issues. It was important during this stage to determine approximately where the data would come from and how much effort it would take to implement the indicator. For example choosing an indicator that required a great deal of extra data entry work for staff with little information value was more perilous than choosing an indicator that required little staff work, but had high value. By and large, indicators that used well defined corporate data sources and established data definitions were lower risk than local data stores. The outcome of the assessment was a scope statement that

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identified what would be engineered in this prototype. Appendix A shows sample scope statements for two PSUs.

5.4.3 Phase 3: Engineer and Develop indicators

The engineering phase consisted not only of developing definitions and data sources for each indicator, but also of developing software to extract and display each indicator. It was very important to clearly articulate operational definitions of indicators (Deming, 1982). The methodology for doing this is similar to that proposed by (Donabedian, 1969). Identifying the correct measures was a crucial part of the development process (Crockett, 1993). Different ideas about the measures often stemmed from differing concepts of the key success factors and which were most important. In addition, we developed the generic software that would cross PSUs. The software framework and development toolset for all Balanced Scorecard prototypes is discussed in Appendix C. Figure 10 shows a sample indicator definition,

Indicator Statement: Average LOS for acute myocardial infarction

Definition of terms

Average Length of Stay (ALOS) is the arithmetic 'average' length of stay of all patients who were discharged during that period (i.e.: Total days stay/total discharges);

acute myocardial infarction refers to patients in case mix group (CMG) 195 - acute myocardial infarction with cardiovascular complications. Patients with no cardiovascular complications (CMG 194) are excluded

Rationale

Average LOS is an indicator of the efficiency of care.

Description of indicator population

Numerator - Total days stayed ;

Denominator - total discharges

Indicator data collection logic

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Average LOS for CMG 195 by period - from patient costing system study set for this CMG. The study set must be regenerated each period to get current data

Display

Average Length of Stay by financial period
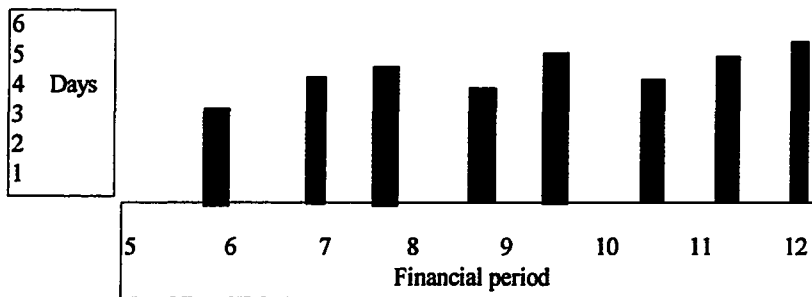
Figure 10: Sample Indicator: Cardiovascular PSU Average Length of Stay

Table 1 shows a selection of indicators, their definitions, data sources and update method. Appendix B details all indicators and their definitions

Indicator	Definition	Data source	Extract	Comment
Average wait time - cardiac surgery	Time from acceptance for surgery to date of procedure for all patients accepted at Sunnybrook for coronary bypass surgery segmented by urgency rating	Provincial cardiac care tracking	Monthly Query of Oracle database	Data ownership issues
Average wait time - pacemaker insertion	Time from acceptance for surgery to date or procedure for all patients accepted at Sunnybrook for pacemaker insertion	Departmental booking	Monthly query Dbase 3 database	Dependence on database owner for monthly updates
Average length of stay - acute myocardial infarct	Total days stay/total discharges for patients with acute myocardial infarction with cardiovascular complications	Patient abstracting	File extract, monthly	Data ownership issues
Complication rate - cardiac surgery	Severe and moderate intra-hospital and 3 month post discharge complication rate for coronary artery bypass graft and valve surgery	Departmental patient tracking	SQL query, Dbase 3, monthly	
Average cost per case - coronary bypass surgery	Direct, fixed and variable costs for coronary bypass cases with no catheterization	Hospital patient costing	Monthly Extract from mainframe	Data is not current enough
Productivity - cardiac surgery	Total nursing dollars divided by number of weighted cases.	Patient abstracting and workload	File extracts from both	Data must be reconciled across

		measurement	systems, monthly	two different system
Day of admission surgery rate	Day of admission urgent and elective surgery rate, including cardiac, vascular and pacemaker surgeries excluding outpatient heart catheterizations and Percutaneous Transthoracic Coronary Angioplasties	Hospital utilization report	File extract, monthly	system

Table 1: Indicator definitions and data sources

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5.4.4 Phase 4: Get feedback

Feedback on the prototype from the management team guided the planning for subsequent stages of development. Iterative prototyping with frequent, ongoing contact with the PSU team and feedback ensured that the final system met the strategic needs of the PSU management team. Case Study 1 illustrates the indicator development methodology

Case Study 1: Use of Chemical Restraints in the Cognitive Support PSU

A key objective of the Cognitive Support PSU is to maximize the quality of life of institutionalized veterans with cognitive disabilities. One quality of care issue involves the extent to which these residents have been restrained using chemical or physical restraints. In the "Develop scorecard" step, the PSU management group decided to measure Chemical restraint use. They further refined the definition to include only psychotropic drug use. In the "Assess alternatives' step, we identified two sources for data, the hospital pharmacy system and the hospital patient costing system. Since the patient costing system contained audited data, we decided that the risks of not being able to obtain data were relatively low. However, since the data definition had not been established, the risks of not succeeding in the data definition were high. During the engineering phase, we extracted data from the patient costing system, but found that the data had been collected from the point of view of cost. Unit doses were collected, since the cost of the drug is associated with the labour of producing it rather than the raw materials. Individual drugs were not identified. Since different psychotropic drugs have different restraining effects, we needed a method of identifying different types of drugs and of comparing them. So we could not use this data. An interesting side note is that since we were extracting the dollar value of the drug as a proxy for amount, the management team discussed placing the indicator in the financial quadrant. However, they decided to keep the indicator in the internal quadrant, since the objective in collecting it was to improve quality of care rather than to control cost.

We then extracted data from the pharmacy system and tried to aggregate it. There were many difficulties. The pharmacy system contains data about prescribed drugs, not administered drugs. Many orders are optional, given under the discretion of the nurse. While we now had drug names and dose sizes, we needed to find a mechanism for comparing the restraining effects of these different drugs. In addition, we needed to define whether 'average drug use' meant the average of those residents who were taking psychotropic drugs or the average of all residents in the unit. We also considered whether it was possible or fair to compare chemical restraint use across various units which had different types of residents or residents with more or less severe disease. We finally agreed on the indicator format which shows, for each chosen clinical unit, the average dose of Haldol equivalent drug per resident per month and the total number of residents on psychotropic drugs. During the course of developing this indicator, we had numerous consultations with the management team. The effect of these discussions was to ensure that the indicator was a reasonable proxy for measuring the PSUs objectives. It also kept the issue of chemical restraints on the PSU management agenda, a positive effect of the development process, given that a strategic objective of the PSU was to reduce chemical restraint use. The PSU gained the ability to compare restraint use in two different units with ostensibly similar patients as shown in Figure 11 which engendered discussion about differing management styles and practice patterns. After introducing this indicator, the PSU tried a number of different interventions to reduce chemical restraint use including education posters and new medication administration rules.
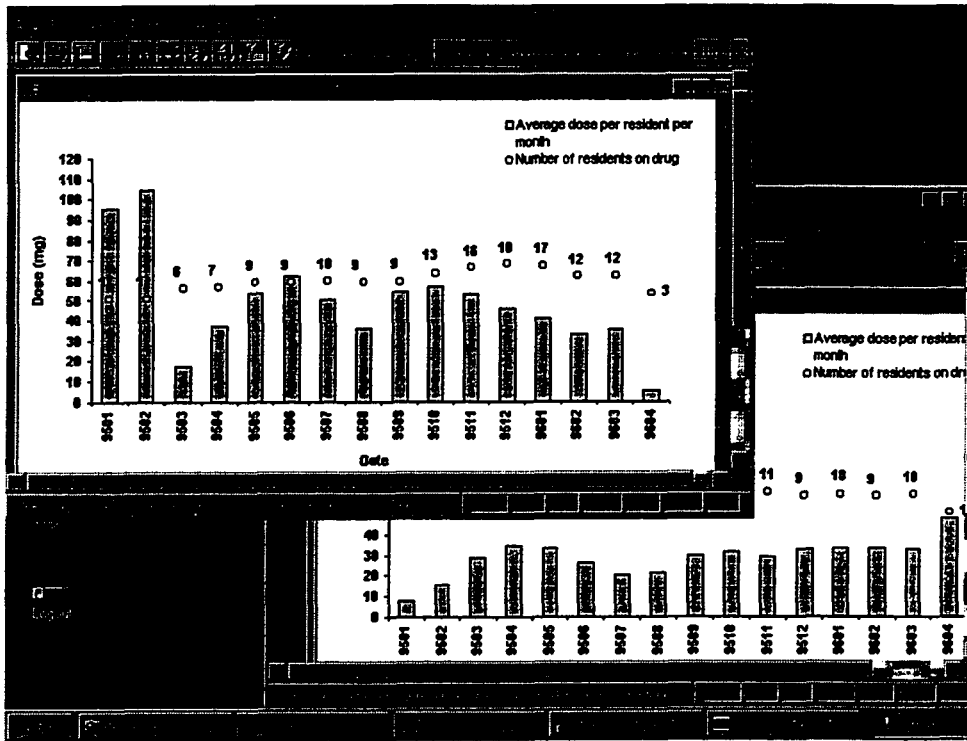
Figure 11: Use of Chemical Restraints in the Cognitive Support PSU

5.5 Determine management accountability

As with any new software tool, the new decision support system had to be integrated into PSU management processes. Once the Balanced Scorecard reached a critical mass of data, the analyst helped the PSU management team to design organizational mechanisms to complement their decision support processes. For example, we experimented with an "Adopt an indicator" approach in which management teams were encouraged to assign individual members to be accountable for specific indicators. We also tried to put in place a regular reporting mechanism so that PSUs would regularly revisit their Balanced Scorecards.

5.6 Use prototypes

We arranged to provide all members of the management team with access to the software prototype. This was an intricate, user specific administrative process, involving computer

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hardware upgrades, software upgrades, network access, workstation customization and various types of training.

We kept discussion going at the team level about indicators, for example catalyzing discussion about performance targets and indicator trends. We also worked with individual team members who had been assigned to work on specific indicators as discussed in Case Study 2

Case Study 2: Surgery on Day of Admission

Many patients were being admitted to the Cardiovascular PSU several days prior to surgery. This practice resulted in expensive inpatient levels of care being applied to patients who did not require it. A corporate objective of the hospital was to try and perform surgeries on the day of admission. The Cardiovascular PSU management team decided that increasing the Surgery on Day of admission rate was a key indicator for them. Then they decided that it was a measure of innovation, rather than an internal measure since it was a new skill the PSU needed to learn. This was one of the first indicators the PSU developed. We sourced the data and started measuring the trend. The management team also set a target rate which was not being achieved. In 1993, only 25% of patients in the Cardiovascular PSU had their surgery on day of admission. The management team assigned this indicator to a patient care manager for analysis. She analyzed the underlying data and decided that the first patient group the PSU should be concerned with was elective cardiac surgery patients. This group represents a large group over whom the management team could have some control. Further detailed analysis demonstrated that the commonly held perception that out of town patients were the primary cause on non same day admission was incorrect. Neither was patient age a factor. However, the time of surgery did affect the day of admission. Patients on the first surgery shift, starting at 7.00 am could not be admitted on the morning of the procedure because there was insufficient preparation time. Also, cardiac surgeons secretary's were the

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key staff telling patients when to arrive at the hospital. Thus the management group
realized that cardiac surgeons and their secretaries required education to ensure that
all second and third shift elective patients would be admitted on the day of their
surgery. In addition, the group put in place a project to work with the surgeons to
find a medically safe, but shorter procedure for getting the first shift patients
prepared for surgery. They also identified several problems with the preadmission
processes that were addressed. As a result of these improvements, overall same day
of admission surgery rate for the entire PSU improved consistently during 1995 and
1996 as shown in Figure 12.
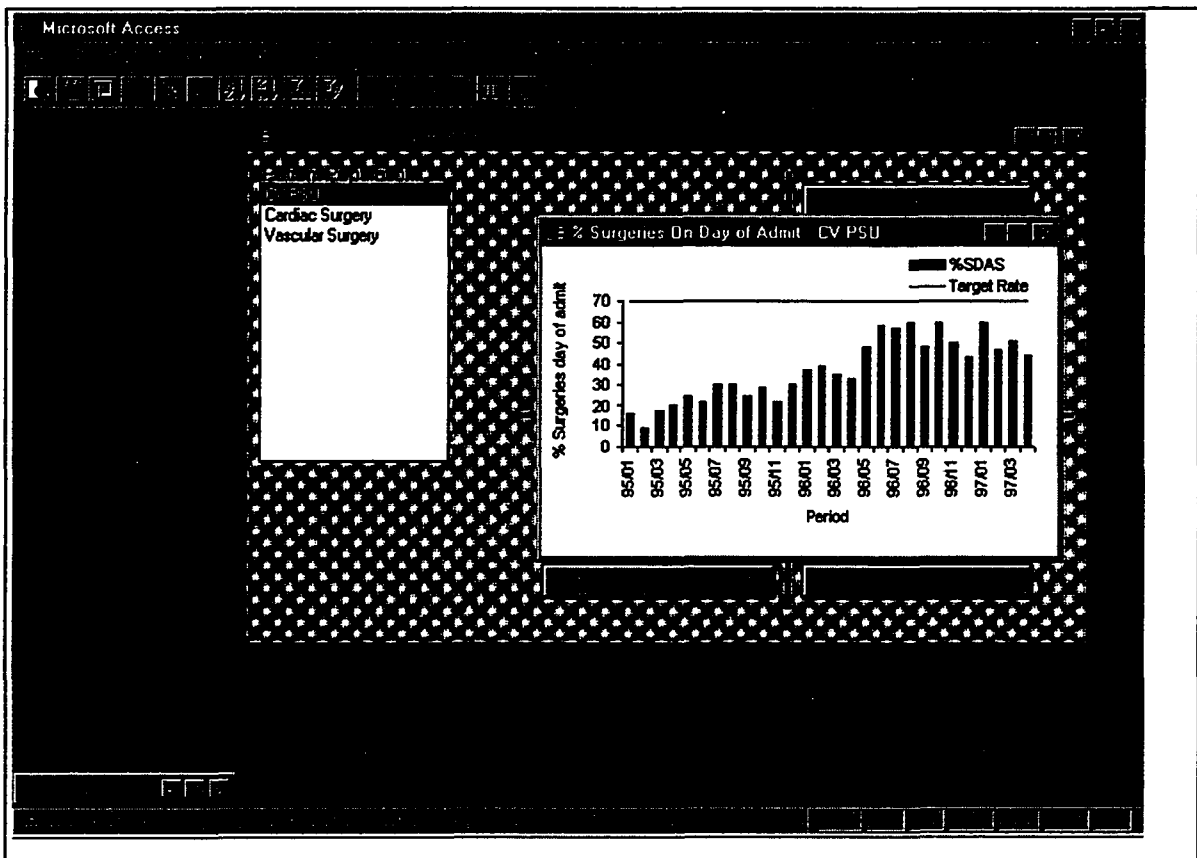
Figure 12: Surgery of Day of Admission in the Cardiovascular PSU

5.7 Software development for the Balanced Scorecard project

The second objective of this work has been to develop an information system that makes Balanced Scorecard information accessible and which provides a context for integrated decision making. We define the information system broadly to include data manipulation and display software, indicator data and simple data acquisition tools. We limited the scope of functionality to the presentation of aggregate data for a meaningful set of populations for each indicator. The scope of this research prototype did not include the implementation of robust production routines for regular monthly data updates. Since there are no designs for Balanced Scorecards reported in the literature, we developed a model for implementing the Balanced Scorecards in software. The prototype Balanced Scorecard software consisted of a relational database for each scorecard, a data acquisition subsystem and data display functions. The data acquisition subsystem had various degrees of automation ranging from direct SQL queries of source systems, to imports of user generated ASCII files and floppy disk extracts from non networked systems.

Each Balanced scorecard was a matrix of **indicators** and **patient populations.** Each indicator could be displayed for a variety of patient populations. Conversely, each patient population had a variety of indicators associated with it. Functionally, users selected an indicator which brought up a context sensitive list of user populations to choose from. Users then selected an appropriate patient population using the interface shown in Figure 13. Users viewed the indicator data as a trend comparing current and historical data or as a table. Multiple indicators could be displayed simultaneously, facilitating an understanding of data patterns and interrelationships. In order to promote online usage, we did not provide functionality for printing reports, graphs or data. In hindsight, this was an error, since indicator information is often required when the computer system is not available.
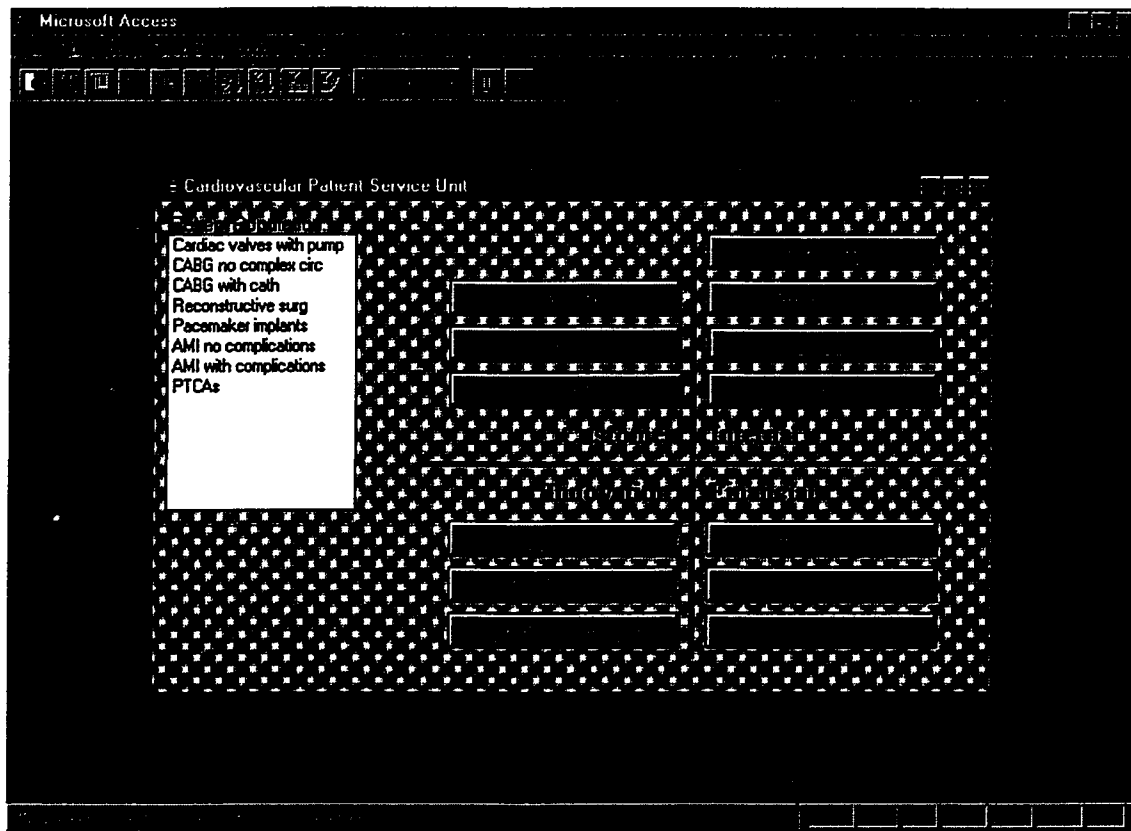
Figure 13: Balanced Scorecard System User Interface

We chose a microcomputer database product as our prototyping environment because it was simple to use, flexible and allowed for rapid prototyping. A major design principle was to develop generic software that could be customized for multiple PSUs. Additional details are given in the Appendix C.

5.8 Progress in Balanced Scorecard prototype development

As of June 1996, the project was in its fourth year of development. There were five PSU Balanced Scorecards at various levels of sophistication and completeness as shown in Table 2. They utilized over a dozen different data sources including provincial databases,

Sunnybrook corporate mainframe systems and small departmental databases as shown in Figure 14.

Indicators shown in italics in Table 2 were requested by the management teams, but had not been implemented as of June 1996. Included among these were patient satisfaction measures. All PSUs wanted to explicitly measure patient satisfaction. In Fall 1994, Sunnybrook began to perform an annual patient satisfaction survey - a 41 item questionnaire that measures hospital quality as judged by patients. As of June 1996, Sunnybrook had only completed and received two waves of patient satisfaction results. Sunnybrook also developed and administered a resident and family satisfaction survey. As of June 1996, two waves had been done. The PSU management teams felt that two data points was still insufficient data to show as a trend. Moreover, most PSU management teams did not feel that annual data would be meaningful on a Balanced Scorecard that displayed monthly or quarterly data. Some PSUs did implement various types of patient satisfaction surveys, but these were usually adhoc, non rigorous surveys providing a snapshot of data. Several PSUs measured proxies for patient satisfaction, such as waiting times or cancellations. However, the lack of a mechanism for collecting and evaluating ongoing patient satisfaction data was a serious deficiency when trying to understand the balance in management objectives.

Indicator perspective	Cardiovascular PSU	Cognitive Support PSU	Emergency PSU	Trauma PSU	Critical care PSU
Customer satisfaction	• *patient satisfaction* • average waiting time • cancellations	• average waiting time • *resident satisfaction*	• length of stay	• *inpatient satisfaction* • *ambulatory patient satisfaction*	• *patient satisfaction* • *waiting time*
Internal excellence	• length of stay • complication rate • time to treatment	• *wandering events* • falls • chemical restraint use	• redirect consideration • critical care bypass • lab result waiting time	• length of stay • *attendance / absenteeism*	• *length of stay* • *absenteeism* • *patient focused indicators*
Innovation and learning	• same day surgeries • *clinical studies*	• activity participation	• geriatric program referrals • *social work referrals*	• same day surgeries • *outpatient surgeries*	• *bereavement program impact* • *program studies*
Financial viability	• cost per case • productivity	• *absenteeism* • *compensation claims*	• *cost per case*	• cost per case	• *cost per case*
Population types	• case mix groups • services	• units • staff groups	• encounter type • severity level	• case mix groups • staff groups	• severity adjusted diagnostic groups • staff groups

Table 2: Balanced Scorecards for five PSUs

(Indicators in italics were requested by the management teams, but had not been implemented as of June 1996)

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Feeder Systems

1. Callbacks Database
2. Cardiac Surgery Database
3. Cardiology Database
4. Pacemaker Inplant Database
5. Cardiac Care Network
6. Angioplasty Database
7. TSI System
8. Utilization Database
9. Pharmacy System
10. HR/Payroll System
11. Med 20/20 System
12. General Ledger System
13. Patient Care System
14. Metro Toronto Ambulance

14 Feeder Systems

Scorecards

Cardiovascular Scorecard

Cognitive Support Scorecard

Critical Care Scorecard

Trauma Scorecard

Emergency Scorecard

27 lines of data flow

5 scorecards

Managers Desktop

Figure 14: Balanced Scorecards and their feeder systems

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6. Evaluation of the Balanced Scorecard Project

6.1 Introduction

The third objective of this work has been to investigate the impacts of the prototype Balanced Scorecard systems on the healthcare organization. There are many ways of evaluating the success of the Balanced Scorecard project ranging from asking if the system works technically as designed to exploring whether the system produced the desired results. Selecting appropriate evaluation questions depends both on the explicit purpose of the evaluation and on the implicit assumptions derived from the researcher's model of change.

In the past, information systems research has been characterized by a positivistic methodology of formulating hypotheses that are tested through controlled experiment or statistical analyses. This methodology suits simple models of change in which (1) computer systems are viewed as an external force that brings about change or (2) organizational members have control over the technology and the consequences of its implementation (Anderson, Aydin, & Jay, 1995). In either case the nature of the information technology and the character of the users is considered static over the course of the study. (Lytinen, 1987). This is not true in general and particularly in the case of the Balanced Scorecard project which was developed using an iterative spiral development process. There is a third more advanced theoretical information systems evaluation perspective: complex social interactions within an organization determine the use and impact of the information system (Anderson et al., 1995). The prediction of organizational change outcomes that result from information systems requires an understanding of the dynamic social and political processes that occur within the organization as well as the characteristics of managers and the information system. Evaluating the impact of the Balanced Scorecard project in this context requires an innovative methodological approach

The primary purpose of the evaluation was to establish the value of the Balanced Scorecard project to the PSU management groups as a

- a management concept
- a methodology and process for implementing the use of this concept
- a software application

In addition, the evaluation results were to be used by the implementation team and corporate groups. The latter wanted to use the results to decide on the future viability of the Balanced Scorecards at Sunnybrook. The former wanted to use the evaluation results formatively to identify problems with the project and improvement opportunities as the current and future PSUs moved through their spiral development cycle (Kaplan & Maxwell, 1995). The implementation team also hoped to gain insight into the implementation process and to develop a theory of Balanced Scorecard project implementation success factors.

6.2 Evaluation methodology

Balanced Scorecard projects are aimed at management groups rather than individual managers. The PSU management team was the most appropriate unit of analysis for the Balanced Scorecard project evaluation. The focus of the evaluation was on common themes that unite the test PSU management in their adoption of the Balanced Scorecard project as well as variations between PSU management groups rather than on individual differences within a PSU management group.

The tools comprised:
- an user survey
- a focus group
- a set of illustrative vignettes

We combined the results of all three tools to provide a detailed view of the Balanced Scorecard concept, methodology and software. From this data, we have developed a generalized theory related to Balanced Scorecard projects.

6.3 User survey

The Balanced Scorecard survey was intended to establish how satisfied Balanced Scorecard users have been with the Balanced Scorecard project. The evaluation team, comprising the authors, Sunnybrook Information Services representatives and PSU representatives assembled the user survey tool. The survey instrument, shown in Appendix D, is composed of four parts.

The first part consists of the implementation attitudes measurement tool developed by Schultz and Slevin (1975). It comprises a set of 47 questions. The five point Likert scaled answers measure overall attitudes towards the implementation of the Balanced Scorecard implementation as well as the specific factors shown in Table 3.

Factor	Description	Number of Questions
1	Effects of the project on manager's job performance	11
2	Effect of the project on manager's ability to understand PSU goals	9
3	Relationship between the developers and the management team	3
4	Support the project has from senior leaders	12
5	Importance of the project to the PSU management team	12

Table 3: Factors for measuring satisfaction with the Balanced scorecard project

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In order to preserve its psychometric properties, the tool was minimally customized by referring to the Balanced Scorecard project and Sunnybrook PSUs. In addition, questions and factors which Schultz and Slevin showed did not correlate were discarded.

The second part of the questionnaire includes five dependent variables which measure the respondents likelihood of using the system and their evaluation of its worth (Schultz & Slevin, 1975).

The third part of the instrument measures end user satisfaction with the Balanced scorecard software. This instrument was developed by Doll and Torkzadeh (1988) and has well established reliability and validity. Responses to questions on a five point Likert scale tested user satisfaction with the factors shown in Table 4

Factor	Description	Number of questions
1	Content	4
2	Accuracy	2
3	Format	2
4	Ease of Use	2
5	Timeliness	2

Table 4: Factors for measuring end user satisfaction with the Balanced scorecard software

The fourth part of the survey was developed by the authors. It includes open ended questions that assess changes caused by the Balanced Scorecard system and elicit suggestions for improving the system. These questions were intended to serve two purposes. The first was to ensure that important items were addressed. The second was to elicit information about impacts for which measures are difficult to develop. Placing these questions at the end of the

survey ensured that the psychometric properties of the previous sections were changed as little as possible.

The surveys were anonymous and categorized the respondent only as a manager or non manager. The questionnaire was initially administered to a test individual and refined to eliminate inconsistent, ambiguous or unclear questions. The study was approved by the Sunnybrook Ethics in Research Committee and by the University of Toronto Human Subjects in Research committee.

6.3.1 Survey Participants

Five potential PSUs could have responded to the user survey. Purposeful sampling identified two management teams who had been involved in the BSC project for at least twelve months. This group was not a statistically representative sample of all PSU managers and therefore did not allow the evaluation team to generalize on a statistical basis. However, the group did include the senior PSU managers as well as the most active front-line managers and represented the most significant users of the Balanced Scorecard. It thus constitutes a purposeful, information rich, adequate sample (Aydin, 1995).

The evaluation team distributed 22 surveys to the Cardiovascular PSU and Cognitive Support PSU management groups, including a few ex-managers who had been involved in the project. Each survey was accompanied by an explanatory letter. An evaluation team member explained the study during monthly management meetings when the questionnaires were distributed. The groups were given three weeks to return the survey.

Sixteen people returned the study. Participants included 10 directors or PSU managers and 6 PSU members. All participants had been exposed to the Scorecard for between 10 months and three years. All participants had received training in Windows and in the use of the Scorecard. The team received unsolicited verbal feedback from PSU members who chose not to complete their surveys. They were typically people who were new to the PSU

management team, or had not been involved in the development or use of the Balanced Scorecard.

6.3.2 Scoring the evaluation survey

The five point Likert scale was converted to a numerical scale as shown in Table 5 below

Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
-2	-1	0	+1	+2

Table 5: Likert Scale Conversion

Each section was scored separately

In section 1, the Likert factor score is computed by summing the scores for each questionnaire item which Schultz and Slevin found weighted significantly on that factor. For example 12 items (questions 1, 2,6,10,12,18,22,23,24,35,40,43) contribute significantly to Factor I - Effects on performance and so forth. Appendix D details each question and the factor on which it loads. Each individual respondent then had a Likert factor score for each of the seven factors computed in this way. In addition, the team calculated a global Likert score for each individual by summing across all questions. This global score is an overall measure of the respondent's attitude towards the Balanced Scorecard project. Figure 15 shows these individual factor scores. Each Likert factor score has been normalized between -2 and +2 by dividing the total Likert factor score by the number of questions loading on that factor.
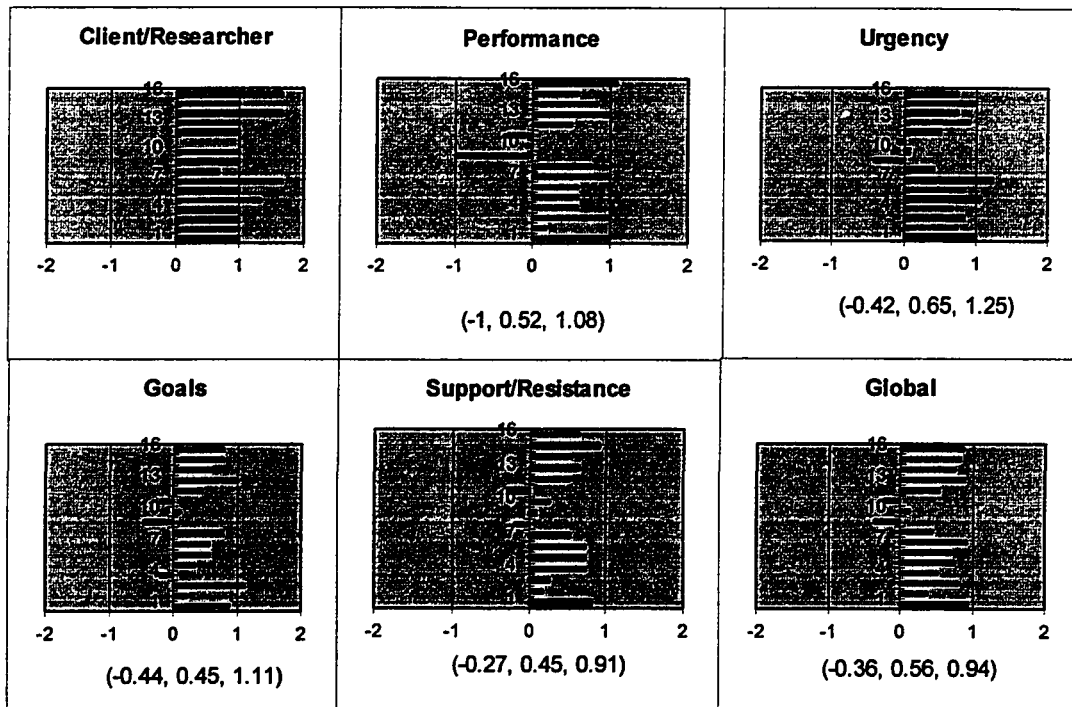
Figure 15: Individual factor scores to section 1 for all respondents to the User survey:

Figure 15 show each individual respondent's answer to factors tested in section 1. Table 6 shows the mean score on each factor for each group along with the minimum and maximum values. In addition the percentage of respondents who were positive for a factor (factor score > 0) has been calculated as well as a 90% confidence interval. The confidence interval represents the minimum percentage of the management team who would have answered positively, had the entire management team returned their surveys. For example: 16 out of 22 respondents returned their surveys: In one case 13 out of 16 or 81% were positive; Had all respondents returned their surveys, we could say, with 90% confidence that at least 69% or 15 out of 22 would have been positive.

	Client/ Researcher	Goals	Performance	Support/ Resistance	Urgency	Global
Mean	1.06	0.45	0.52	0.45	0.54	0.56
- range	0	-0.44	-1	-0.27	-0.42	-0.36
+ range	1.67	1.11	1.08	0.91	1.25	0.94
S.D.	0.41	0.46	0.57	0.35	0.45	0.40
+ ve replies	16/16	13/16	13/16	14/16	15/16	14/16
+ ve replies %	100%	81%	81%	88%	94%	88%
90% CI	100%	69%	69%	77%	86%	77%

Table 6: Aggregate results for section 1 of the User survey

Section 2 of the survey consisted of probability scales or rating scales between 1 and 10. These results are reported directly. Section 3 consisted of the end user satisfaction factors. These were analyzed using the same methodology described for Section 1. Section 4 consisted of a set of open ended questions. The narrative responses to these questions were collated and summarized. Complete details of this analysis are shown in Appendix E. A summary of results is discussed below.

6.4 Focus group analysis methodology

The second part of the evaluation consisted of a focus group. The intent of the focus group was to explore themes that became evident from the survey and from detailed observations of teams using the scorecards.

The evaluation team used extreme case sampling and selected a group of seven operations directors who ranged from seasoned Balanced Scorecard users to novices to managers who had never been exposed to a Balanced Scorecard project. Three of the Operations Directors represented the five Balanced Scorecards under development. The focus group was semi structured with a general interview guide outlining the set of issues to be explored (Morgan,

1992). Within these subject areas, the interviewer was free to explore, probe and ask questions. This kept the interaction focused, but allows individual perspectives and experiences to emerge. Since we did not envisage multiple interviewers conducting multiple focus groups, we did not require a standardized open ended interview in which the questions are written out in advance exactly as they are to be asked during the session. That approach would have minimized interviewer variation, but may have stifled creativity since interviewers are not permitted to pursue topics that were not anticipated when the interview was written. The guide, shown in Appendix G, was consistent with the factors addressed in the survey. The evaluation team designed sample questions to be open-ended, singular, non dichotomous and clear (Patton, 1990). The interviewers adapted both the wording and sequence of the questions to the context of the focus group.

Two interviewers conducted the focus group. The session was tape recorded and transcribed. The transcript was content analyzed and coded. An initial set of codes were developed as shown in Appendix H. This list was extended during the content analysis as additional content was discovered which had no code. Both evaluators identified and coded selected utterances independently. Inter coder reliability was assessed on an ongoing basis by coding small sections and then comparing the results of the two coders. At the beginning, inter code reliability was very poor. As the coding progressed, the two coders agreed to a common style and the reliability improved. Data analysis was based on the constant comparative technique (Mcracken, 1988). The evaluation team entered utterances and their codes into a database. The database was then queried for all fragments related to a particular code. Finally themes were developed from the coded utterances.

6.5 Case study methodology

Throughout the course of the Balanced Scorecard project, we kept notes of meetings and significant events. We collected artifacts related to the Balanced Scorecard project and participated in PSU management meetings, making detailed descriptions where appropriate. These formed the basis for the Case Studies described throughout this work.

6.6 Meta evaluation

A meta evaluation addresses the robustness and credibility of the evaluation methodology. Two key concepts here are validity and reliability. The validity of a test refers to what the test measures and how well it measures it. A valid test measures what is intended. Reliability measures assess the range of fluctuation occurring as a result of chance errors. A reliable test yields consistent findings over time (Ferris & Norton, 1993). In qualitatively oriented research, the evaluator is the test instrument for data collection. Validity and reliability address the necessarily subjective nature of data collection and analysis. The evaluator's biases, interests, perceptions, knowledge and critical faculties all affect the study. Because of the flexibility and individual judgment inherent in ongoing data collection and analysis, reliability is generally weaker than in quantitative studies. Human evaluators are not as consistently reliable as an objective test. But the researcher's close attention to meaning and context makes it less likely that they will ask the wrong question or overlook important data. So validity is stronger.

6.6.1 Sources of bias and their remedies

Appendix E lists the potential sources of bias in the evaluation and their remedies. Explicitly acknowledging and articulating the evaluator's biases, interests, perceptions and views allows readers and decision makers to take these effects into account when making decisions or judgments based on these data. Ultimately the test of validity in an evaluation study is whether the evaluation data credibly supports the investigators theories.

The biases are predominantly positive, implying that the survey and focus group are likely to produce a more positive picture than may be actually be the case. An underlying assumption of the qualitative method is that things make sense, at least to the participants. If the evaluation team has not discovered how to make sense of the situation, an adequate interpretation has not yet been achieved. A valid interpretation will take these discrepant data into account.

7. Evaluation results

The most notable survey results combined with focus group utterances and illustrative comments are shown in Table 7 below. Results show the percentage of respondents who were positive for each factor as well as a 90% confidence interval.

	Survey result	Sample focus group utterance
1	88% (at least 77%) overall positive about the scorecard project (all factors combined)	"The benefit of the scorecard is that it provides a framework for thinking about the many different parts of the work that we do"
2	81% (at least 69%) feel that the Balanced Scorecard has made their goals more clear, congruent and achievable	"I think that [the Balanced Scorecard framework] helps build that common vision... or common understanding of what you are doing"
3	81% (at least 69%) feel positive about the effect of the Balanced Scorecard on their job performance and on the visibility of that job performance.	
4	88% (at least 77%) report that the Balanced Scorecard project has adequate top management support, sufficient technical and organizational support and does not meet with undue resistance.	All five test PSUs have explicitly included the development of the Balanced Scorecard in their strategic objectives. Moreover, three out of five of the PSUs now formulate their strategic plans using the Balanced Scorecard framework. An example is shown in Appendix I.
5	81% (at least 69%) think they will use the scorecard	"We've spent a lot of time investing in this...We've done training, its part of our culture now."
6	Participants are satisfied with system ease of use (80%, at least 67%), and format (87%, at least 75%)	"One thing that makes the scorecard from a management perspective is the way it is presented and the ease of access... So it is data that everybody

		can access, no matter how in depth their technological skills are."
7	Participants are not satisfied with content and timeliness (both 47%, at least 30%)	"The data should be as least as timely as the [monthly] CUUR report."
8	100% of respondents report that developers of the Balanced scorecards understood their problems and worked well with them.	Balanced Scorecard developers attended every management meeting and became an integral part of the management team. They brought a set of analytical and information technology skills to the management group. They acted as a liaison for the PSU to Information Services and obtained resources and data for the management group. In addition, the developers had to understand the fundamental business of the PSU structure and problems in order to facilitate the development of each Balanced Scorecard.

Table 7: Survey results combined with focus group utterances

Table 8 shows additional themes that emerged from the focus group from which the research team built additional hypotheses.

	Theme	Sample focus group utterance
1	The scorecard is an integrating force	"The Balanced Scorecard summarizes a lot of innovations in management, no theories, but management direction, customer service... and quality."
2	Users like the ability to balance financial indicators with other objectives	"It gives you a nice framework for talking about ...the balance...in terms of finances and how they effect patient care"

3	Users like the ability to focus on important areas	"If you chose to develop some indicators for your work redesign, you can put them on the scorecard just to keep them front and center, to monitor what's going on"
4	The scorecard is used to communicate up and down	"I have also been using it with staff to make them understand some of the financial things as well as the patient focus and that we are trying to look at both sides."
5	The scorecard is applicable at multiple levels	"We need to comment on the fact that it can deal with different sizes of PSU's. There is flexibility. You can focus in at different levels in the balanced scorecard. I think that is a real plus."
6	There is support for a Sunnybrook corporate Balanced Scorecard	"In my mind, there is potential for developing a corporate Balanced Scorecard that translates the strategic direction of the hospital"
7	The Balanced Scorecard facilitator is a key role, to facilitate scorecard development, source data and to learn about clinical priorities	"The concepts aren't what's difficult, its the dynamics. I don't think that I would want to do without a facilitator" "[Non clinical people] often don't understand clinical priorities and you don't understand the clinical business. I think what you learned on your side from doing this work is incredibly valuable"

Table 8: Additional themes that emerged from the focus group analysis

These evaluation results establish that the Balanced Scorecard concept and methodology were positively received by the Cardiovascular PSU and the Cognitive Support PSU. As of June 1996, three additional PSUs were developing Balanced Scorecards at Sunnybrook. These five PSUs represented a broad spectrum of business units at Sunnybrook. We did not encounter a PSU that tried the methodology and failed or terminated the project. We surmise that the project would have succeeded in another PSU at Sunnybrook. The Balanced Scorecard approach has been used in many industries including: manufacturing, (Vokurka, 1995), finance (Vitale, Mavrinac, & Hauser, 1994), construction (Kaplan, 1994) soft drinks (Jensen, 1994) and high technology (Kaplan & Norton, 1993). Expanding beyond

Sunnybrook, we surmise that the methodology is generally applicable in healthcare and in fact, in any management system.

The data (survey results 1 and 2; themes 1 and 2) clearly demonstrate the first part of the hypothesis: The Balanced Scorecard provided the PSUs with an effective tool to formulate their strategic information needs. Data regarding the second part of the hypothesis - managing strategy implementation - was less clear. Returning to our definitions, managing strategy implementation includes the managerial roles of controlling, communicating, leading, linking and doing. The evidence (survey result 3, theme 4) shows that managers agreed that the scorecard helped them communicate their priorities. The Balanced Scorecard data helped managers in their controlling role. Building vision is part of the leading role. Communicating the strategic objectives outside the PSU is a linking role. Thus the second part of the hypothesis is true with qualifications. The Balanced Scorecard was one tool in the managerial arsenal which helped with strategy implementation.

7.1 Discrepancies between PSUs and within PSUs

There was a difference between the results for the Cardiovascular and Cognitive Support respondents. By and large the Cognitive Support users were more positive about the Balanced Scorecard project than the Cardiovascular Scorecard participants. Only 75% of the Cardiovascular PSU sample were positive in all factors (apart from client developers where 100% were positive) compared with 100% of Cognitive Support users.

Another way of viewing this difference is through the lens of data availability. We chose the Cognitive Support PSU to follow the Cardiovascular PSU in order to test whether the Balanced Scorecard methodology was applicable in an environment perceived to be poor in data. We hypothesized that the Cognitive Support PSU would be less satisfied with the project than the Cardiovascular management group. We found the opposite.
This difference may be due to the fact that the CVPSU scorecard had been under development for much longer than the Cognitive Support scorecard. At the time of the

survey, the Cardiovascular PSU scorecard had not been updated with fresh data for many months, whereas the Cognitive Support scorecard was in an active development phase. In addition, the Cardiovascular PSU management team changed significantly over the course of the project, including the replacement of the Medical Director of the PSU. The new Medical Director had not gone through the same development process as his predecessor, nor had he agreed to the data definitions or timeliness of the data. Consequently top management support for the scorecard content decreased. In addition, the Cardiovascular BSC was the first prototype and thus bore the brunt of the discovery and development process. It is feasible that this affected their eventual acceptance of the concept. In addition, we postulate that the Cognitive Support management expectation was less and they came further, from no data to some data, whereas the Cardiovascular management, being data literate with many data sources, had a higher expectation which was not satisfied.

7.2 Resolving the conundrum of high approval versus low use

We measured high levels of approval, but, in the focus group and anecdotally, users also reported dissatisfaction with the data and very little use of the software. The lack of use was understandable, given our inability to update the data regularly. This was particularly frustrating for the Cardiovascular PSU whose Scorecard was not updated for months at a time. In addition, the software provided only aggregate data and did not provide users with the ability to drill down into the data and do further analysis of the problem. Given these obvious limitations, we questioned why we measured high satisfaction. We surmise that we measured satisfaction with the entire project, especially with the Balanced Scorecard concept and the ongoing involvement with the PSU in developing strategy and measurable indicators rather than satisfaction with the data timeliness and level of detail.

7.3 Modeling a complex PSU using a limited number of indicators

A fundamental premise of the Balanced Scorecard framework is that a business unit's key strategic objectives can be modeled by a limited number of indicators. With the complexity of the unit, we wanted to investigate this assumption further.

Two quotations from the Focus Groups provided a perspective on this issue:

"[The limited number of indicators offered in a scorecard] is all you can really handle within a PSU. You can't handle endless limits. You don't have the facilities, the capability to keep measuring everything. You have to prioritize before you can do that."

"What will give you the most leverage? I get hundreds of pieces of data, all kinds of data. Most of it I can't deal with it, its too much. So let's look at the leverage...I don't think that ...that will give us the answer, but it does tell you to look if things are changing"

We conclude that it is both possible and desirable to model a complex business unit using a limited number of indicators. This focuses organizational attention on key objectives. In fact, the filtering and development of important information from the sea of available data is an important function of the project. What the Balanced Scorecard does from a management control perspective is help formulate the right questions in the right strategic areas. However, as Nelson has pointed out, "a limited number of indicators works as a place to start analysis, but not to stop" (quoted in Kennedy, 1996). Managers also require the ability to quickly and easily answer the string of questions that inevitably develop as they drill down further and further into the issue. This implies a need for advanced technology which make available a wide variety of granular data and the tools for manipulating them in a variety of ways.

The Balanced Scorecard development team presented the evaluation results to a senior Sunnybrook management group comprising the Chief Financial Officer, Chief Information Officer and Director of Decision Support. As a result of this presentation, this group authorized the transformation of the Balanced Scorecard project from a research activity into a production system at Sunnybrook Health Science Centre. They committed several hundred

thousand dollars to purchase sophisticated decision support system hardware, software and systems development services to implement Balanced Scorecards for all areas at Sunnybrook. A second senior group, including the Chief Executive Officer, Chief Financial Officer, Vice President of Professional Services and Director of Process Improvement, also participated in the preliminary development of a corporate Balanced Scorecard.

8. Discussion

The primary means for generalization of qualitative studies is not by statistical inference to some defined population in space or time, but through the development of a theory that has applicability beyond the setting studied (Yin, 1984). We have generalized from our experience at Sunnybrook Health Science Centre and our evaluation results and have developed a model of the Balanced Scorecard impact on the management process: we have developed a theory of project success factors; we have considered the influence of organizational structure on a Balanced Scorecard project; we have looked at the Balanced Scorecard in relation to other similar healthcare performance management techniques including the Serial 'V' methodology and the clinical value compass; we have reviewed management decision support; and we have related Balanced Scorecard theory to other management concepts such as core skills, capabilities, organizational learning, systems thinking and core competencies.

8.1 A model of the Balanced Scorecard impact on the management process

Figure 16 illustrates our model the development and use of Balanced Scorecard by a management group. The management group conceives a frame of reference by deciding purpose and objectives (3) of the system being managed (1). This consists of a large number of ill defined, interrelated subsystems. The Balanced Scorecard project firstly helps identify these subsystems and catalyze discussion about objectives, measures and targets. The project helps identify the correct 'listening channels', the process and outcome indicators that measure whether the system is achieving the desired objectives. The feedback system (2) integrates feedback from a variety of sources, the Balanced Scorecard being just one of those. Analysis of indicator data and trends leads the management group to identify gaps between expectations and targets and identify opportunities for improvement (4). This discussion leads the group to formulate decisions and plans for corrective actions (5). These plans must

be implemented either internally or external to the unit (6) and these lead to changes in the system (1).

The management process
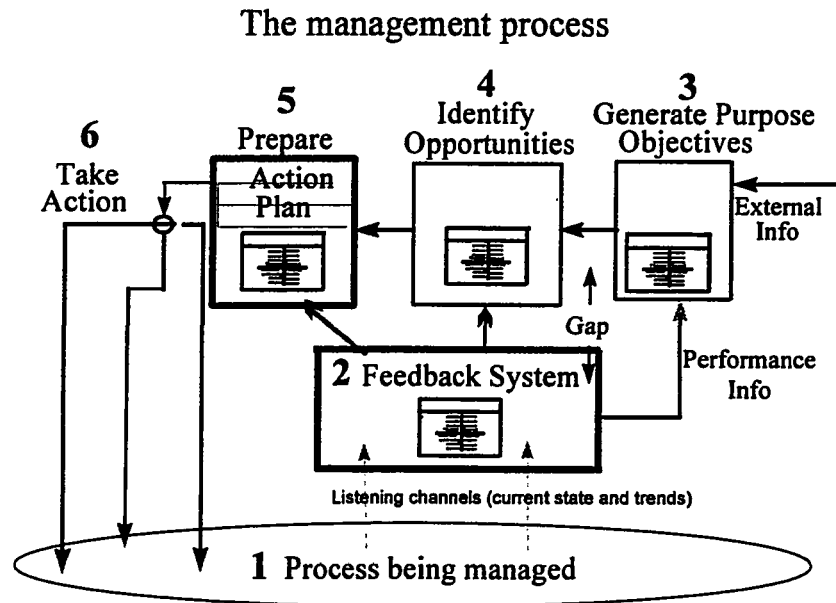
Figure 16: A model for Balanced Scorecard development and Use

The Balanced Scorecard proved itself to be a useful concept for enhancing Sunnybrook's strategic capabilities, including the processes of strategy formulation (3), strategy implementation (5), process improvement (6) and information delivery (2).

It is evident from this model that the Balanced Scorecard project has a pervasive effect on a management group far beyond the explicit development of indicators. This interpretation is consistent with an interactive control system described by Simon (1995). Traditional decision support systems are used as diagnostic control systems, to intermittently check indicators and to flag abnormal activities. By contrast, managers select one or a few systems as their own 'interactive control system'. They devote a great deal of attention to these systems and interpret the data they generate in face to face meetings of concerned line managers. The systems provide signals to the members of the organization about what should

be monitored and where ideas should be proposed and tested. They activate organizational learning through the debate and dialogue inherent in the interactive control process.

8.2 Success factors of a Balanced Scorecard project

The success of a Balanced Scorecard project is dependent on a number of factors including:

1. A business unit led by a management group that is responsible for the development of interrelated objectives and strategies and that is accountable for achievement of those objectives. In addition, the management group must be capable of actions that affect indicator outcomes

In this context, we question whether Sunnybrook's organizational structure and decentralized accountability were critical success factors of the Balanced Scorecard project. Program management captures work interconnections and complete processes within a work unit. Decentralized accountability forces managers at less senior levels to think and act strategically. The Sunnybrook PSU management teams had a real need for a strategic information system. By comparison. in a traditional functional structure, the management team does not have authority over as wide a range of resources nor over whole processes. They may also not be accountable for thinking strategically. But they will still need to measure their performance in each of the four perspectives. We conclude that the Balanced Scorecard methodology could be applied in a traditional functional structure. However its impact on overall organizational success may be limited, depending on the management group's strategic accountability and span of control. In addition, it may result in the functional area suboptimizing functionally, at the expense of the organization as a whole. A program structure where the management team has control over whole processes is a preferable organizational structure for implementing a Balanced Scorecard.

2. A recognition among the management group that the concept has value and a readiness among senior managers of the business unit to do such a project and commit the necessary resources to the development of a Balanced Scorecard. Defining the scorecard, the data definitions and verifying the indicator data requires significant managerial effort. Key decision makers must support the concept of the balanced scorecard. In all cases, the PSU directors strongly supported the balanced scorecard projects in their PSUs. This translated into time at meetings, and support for the time intensive data definitions and data gathering activities that took place. These local line leaders (Senge, 1990) sanctioned significant practical experiments and designed and implemented new learning processes. The Chief Information Officer also championed the PSU balanced scorecard project and provided resources and incentives for the PSUs to do the project. Without these forms of support, this project would have failed.

3. Ongoing value: One of the means for ensuring sustained support is for the project to provide incremental value to the management team. Value is measured in terms of the relevancy to their changing agenda. This is not a critical success factor at the start of the project, but becomes much more significant as the project progresses. In this regard, our inability to provide fresh data was reflected in end user dissatisfaction. This also relates to the development methodology, in particular the "assess alternatives" step. The business analyst uses this step to sensitize the PSU to the development options and to manage expectations. Once the development and user group has agreed on the indicators to engineer, they must produce the end result.

4. Organizational capabilities. Two models are important to consider: core skills (Irvin & Michaels, 1989) and core capabilities (Stalk, Evans, & Schulman, 1992). Core skills are those skills that offer a business unit the most leverage in achieving their objectives. If core skills are promoted enough in pursuit of a particular strategy, the skills themselves, even more than the strategies become the basis for continued success. A second related model is that of core capabilities. Key processes are identified, invested in heavily and viewed as a primary object of strategic value. These processes are woven together to

create a set of organizational capabilities. The longer and more complex the string of processes, the more difficult it is to transform them into a capability - but the greater the value of that capability once built. The Balanced Scorecard has helped the PSUs to understand what they must do exceptionally well in order to execute their strategies. The project has helped the PSU clarify their core skills and core capabilities as illustrated in Case Study 3.

Case Study 3: Telephone calls after Cardiac Surgery

The Cardiovascular PSU has a core capability for Coronary artery Bypass Graft Surgery. This includes the processes for preadmitting, admitting, surgery, anaesthesia, intensive care, ward care discharge and postdischarge. Some of the indicators of this core capability were, patient length of stay, cost per case, same day surgery rate, waiting time for surgery, readmission rate, callbacks, complications and staff productivity.

One core skill was patient discharge. An indicator that the PSU developed was the number of telephone calls received by the Surgery ward after discharge. An analysis of these calls revealed the areas in which patients were receiving insufficient education. This information was linked to readmission information, giving the management team a better understanding of the impact of poor discharge education. This process was totally reengineered as a result of this data. This indicator was interesting in that the PSU were unsure if their target was less calls, indicating better education or more calls, indicating that patients were making more use of the telephone advisory service. A second interesting aspect of this core skill was its application outside the PSU. As Sunnybrook PSUs shortened their lengths of stay so they became more dependent on external homecare agencies and nurses. A focus became the education of homecare nurses in the specialized care needs of post cardiac surgery patients. The patient discharge education material became the basis of this new project. Thinking through this issue, the mental model of the PSU

changed from a belief that patients required education prior to discharge to an understanding that patients required educational materials and educated resources post discharge. Thus an aspect of the discharge core skill became the provision of these resources.

At an organizational level, a Balanced Scorecard project helps a PSU understand how to link together the processes of strategy formulation, strategy implementation, continuous quality improvement and information delivery as a core capability. This capability can be more significant than the Balanced Scorecard itself. Core skills include Business analysis - Defining information needs using the Balanced Scorecard framework; Technical analysis - extracting information from multiple systems in a timely, reliable manner; Organizational development - designing management team accountability, communication strategies and training; Information architecture - developing the enabling technology architecture to meet business requirements; and Contents expertise - utilizing organizational expertise in Finance, Human Resources, Quality, Patient Satisfaction to solve strategic issues at the business unit level. The more these processes and skills are linked together, the more successful a Balanced Scorecard project will be. Conversely, the more a Balanced Scorecard project brings these processes and capabilities together, the greater the impact will be on the organization. Case Study 4 demonstrates an example of these capabilities.

Case Study 4: Time to treatment for patients with acute myocardial infarction (AMI)

A large part of the Cardiovascular PSU procedures is the treatment of heart attack victims - patients with acute myocardial infarction (AMI). Treatment is begun with an injection of one of two drugs - streptokinase or TPA. The Cardiovascular PSU decided that a key measure of quality was the 'door to needle time for treating AMI patients. Every minute of delay prior to treatment results in the loss of more heart muscle. At the start of the project, the time to treatment was in the region of 140 minutes. By comparison, the best practice at a local community hospital was around 29 minutes. On analysis of the process and data, we found that part of the reason for

long treatment times was the delay in getting the patient from the Emergency
department to the Coronary Care Unit, where treatment was initiated.
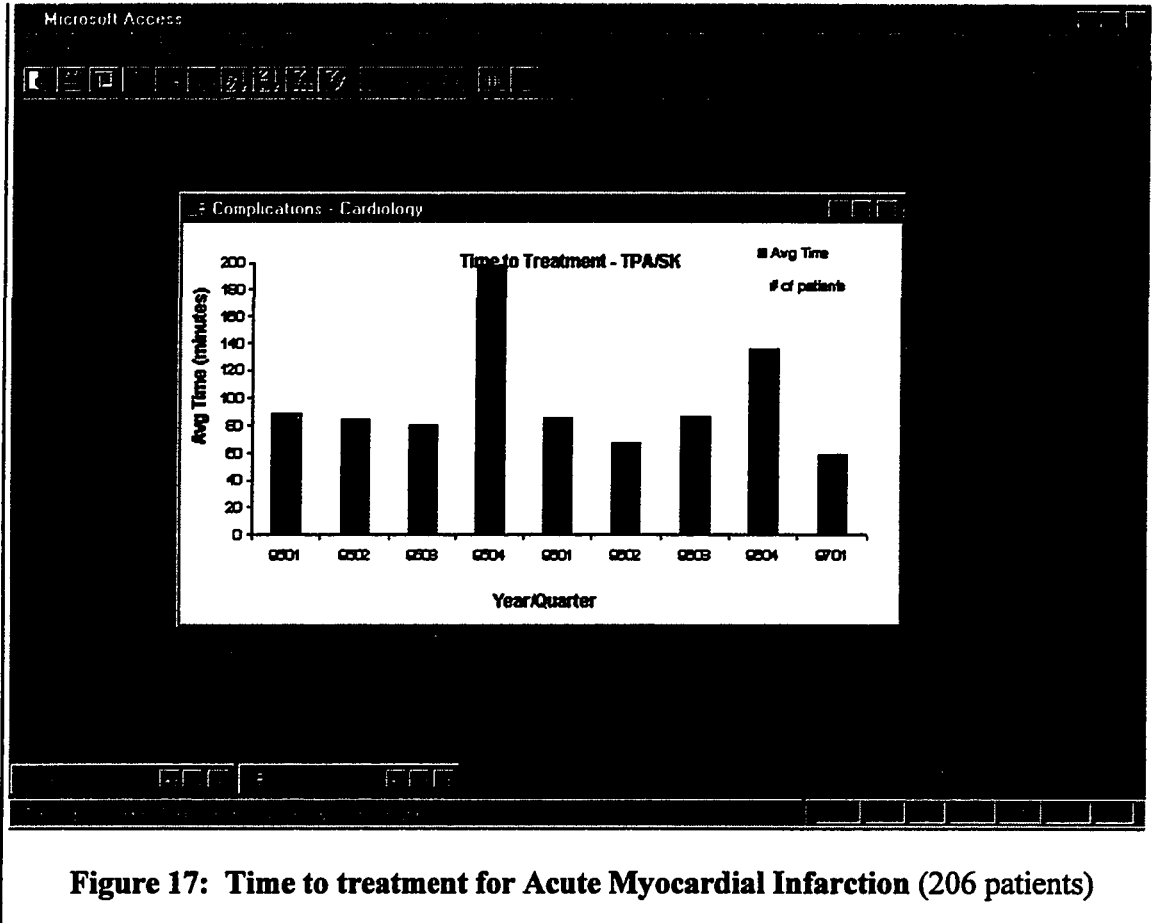
Figure 17: Time to treatment for Acute Myocardial Infarction (206 patients)

This comparison, along with other forces helped catalyze a PSU focus around
improvement in that area. At the same time, we started developing a Balanced Scorecard
in the Emergency PSU. They too identified time to treatment for AMI patients as one of
their internal indicators. We had already developed the ability to extract and analyze time
to treatment data. The two PSUs combined efforts and changed the treatment protocols
and processes to begin treatment in Emergency while ensuring that expertise was readily
available from the beginning of treatment. Since this change, time to treatment has
dropped to an average of 60 minutes in the first quarter of 1997 as shown in Figure 17.
(Note that the long average time in period 9504 was due to a single patient with a waiting

time in excess of 10 hours. This data point is not reliable). The improvement team have also identified two distinct classes of patient - simple patients whose time to treatment is around 35 minutes, comparable with best practice in a community hospital and within American Hospital Association guidelines (Mitchell et al., 1996), and very complex cases which require the resources of a tertiary care centre, whose time to treatment is around 100 minutes.

This example demonstrates how two different business units collaborated to optimize both their individual objectives and the objectives of Sunnybrook as a whole. It demonstrates the capabilities for combining strategy formulation with measurable indicators, strategy implementation, continuous quality improvement applied to the treatment process and information delivery and analysis. It also shows how, in an organization in which business units are not completely autonomous, systems thinking is required not only within the subsystems, but also across organizational boundaries.

In summary, the Balanced Scorecard concept, methodology and software is applicable to any management group. A Balanced Scorecard project will only be successful if senior managers recognize the value of the concept and are ready to do a project. The project must provide ongoing value to the management group and must have sufficient development resources applied to it. A Balanced Scorecard project both requires and catalyzes the development of a core capability for strategy formulation, implementation, continuous quality improvement and information delivery.

8.3 The Balanced Scorecard and organizational learning

Learning is defined as "increasing the ability to take effective action" (Kim, 1993). In the individual learning cycle, a person continually cycles through a process of having a concrete experience, making observations and reflections on that experience, forming abstract concepts and generalizations based on those reflections and testing those ideas in a new

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situation (Kolb, 1984). According to the experiential school, learning has both an operational and a conceptual facet. Operational learning represents learning at the procedural level, learning the routines required to complete a task. Conceptual learning relates to the frameworks used for decision making, answering the question why, challenging the nature of the existing procedures. Mental models are described as deeply held internal images of how the world works, including both explicit and implicit understandings. They provide a context in which to view and interpret new material and they determine what stored information is relevant to the current situation. Mental models not only help us make sense of the world, they also restrict our understanding to that which makes sense within the mental model. Conceptual learning or double loop learning (Argyris, 1993) leads to new frameworks in the mental model, which in turn can lead to discontinuous, radical improvement by reframing the problem in completely different ways.

Analogous to individual learning, organizational learning is defined as "increasing the organizational capacity to take effective action" (Kim, 1993). In the organizational context, the learning cycle implies collective experience, collective observation, shared conceptualization with a shared mental model and organizational testing activity. Organizational learning requires people to learn and improve their individual mental models and a process for making those mental models explicit and thus shareable by the organization.

The Balanced Scorecard is an effective tool for promoting organizational learning. The development and use methodology mirrors the organizational learning cycle. The group process for defining the indicators helps the management group create a shared mental model. The group discussion surfaces and makes explicit the underlying assumptions of the group. Development of measurable indicators is analogous to developing an organizational testing capability. Actionable measures increase the organizational capacity for effective action. In depth discussions of the balance between indicators reveal areas of dynamic complexity.

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In the 'Surgery on Day of Admission' case study, existing organizational norms that cardiac surgeons decide procedures and that out of town patients could not be admitted on the day of their procedure were surfaced and challenged. Double loop learning occurred as objectives were changed to reflect this new understanding of the system. The 'measurement of psychotropic drug usage in the Cognitive Support PSU' described in Case Study 1 was an example of improving the organizational testing capability. This allowed to PSU leadership to run a variety of experiments without having to redevelop the testing system each time. Developing the data collection and analysis system had previously been a stumbling block and in general ongoing measurement is a weak aspect of continuous quality improvement projects.

Enhanced learning capabilities or 'disciplines' include systems thinking; improving mental models; fostering dialogue; nurturing personal vision; and building shared visions (Senge, 1990). The Balanced Scorecard development methodology contributes to all of these capabilities. Considering the interrelationship between indicators and focusing on areas of high leverage encourages a systems thinking view; Deliberation about the indicators improves mental models. The process fosters dialogue among the management team as well as dialogue both up and down the organization. Definition of a group Balanced Scorecard with ongoing discussion about the mission of the group helps individuals define a personal vision and build a shared vision.

8.4 The Balanced Scorecard and the Serial V methodology

The "Serial V" approach integrates outcome measurement, process improvement and continuous improvement methodologies (Bataldan, Nelson, & Roberts, 1994).

Outcome measurement uses aggregate data to identify variations in outcomes of care and resource utilization. Process improvement provides an explicit method for decomposing a process of healthcare delivery into a set of activities that are associated with an outcome of care. Problem areas in the process are identified and improved. While knowledge of process

is important, it may not be sufficient for understanding how a group of interconnected processes affect a system outcome. Continual improvement typically uses the Plan - Do - Check/Study- Act (PDCA) model for improvement trials. This model cycles through planning a change, doing a small scale pilot, studying the outcome and then taking actions to consolidate the process redesign and organizational learning.

The "Serial V" concept defines an outcome of interest and then links measurements, process knowledge and continual improvement cycles to the outcome alternating between ever more focused measurement and process improvement activities as shown in Figure 18. The approach unites outcome measurements, process analysis and improvement and ongoing pilot tests to create a comprehensive methodology for improving healthcare delivery outcomes. The "Serial V" methodology was not intended to help an organization relate outcomes to its strategic objectives nor to provide a mechanism for understanding the management tradeoffs between different outcomes of interest for the system which is being managed.

Measurements

outcome measures basic process performance measures high leverage process variation measures Quality improvement pilot results and outcome measures

basic process high leverage subprocesses Quality improvement pilot

Process and Improvement
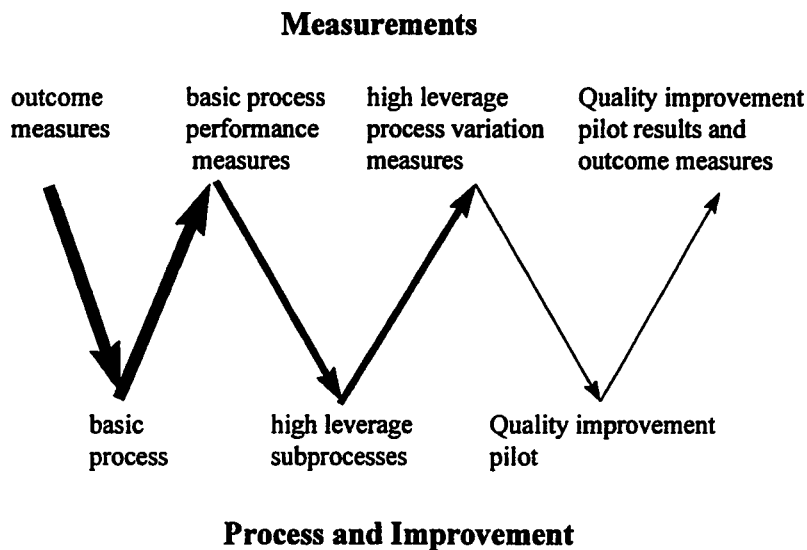
Figure 18: The Serial 'V' Methodology

(after Bataldan, Nelson, & Roberts, 1994)

The Clinical Value compass is a methodology for helping providers decide how to measure the value of care to a patient population by comparing pre and post treatment indicators (Nelson, Mohr, Bataldan, & Plume, 1996). Serendipitously, it too advocates the use of limited measures in each of four quadrants: functional status and well being; costs; satisfaction with care and; clinical outcomes. The methodology for improvement is that of the Serial V approach. The Clinical Value Compass explicitly illustrates the flow of clinical care processes and how these combine to create a result for the patient population in question as shown in Figure 19.
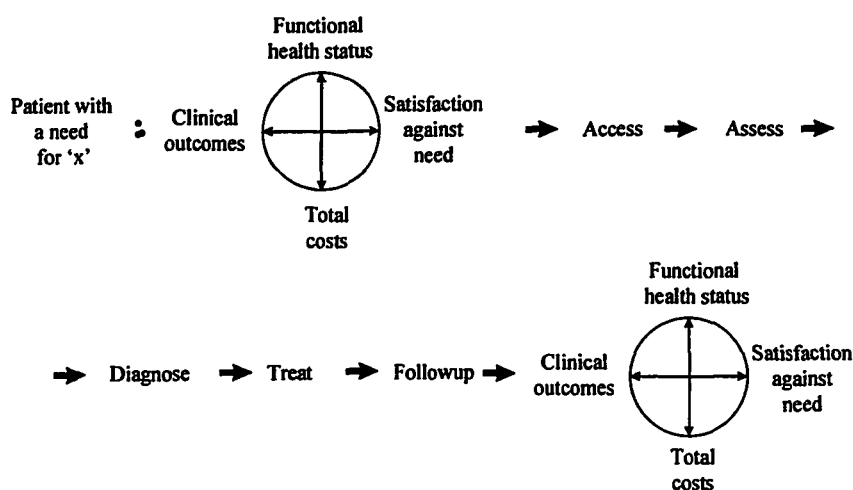
Figure 19: The Clinical Value Compass

(after Nelson, Mohr, Bataldan, & Plume, 1996)

This focus on process underscores a fundamental weakness of the Balanced Scorecard approach, that is, its lack of explicit mechanism for linking performance measures or

objectives to processes. Consequently, in order to improve the processes that will result in enhanced performance, the Balanced Scorecard must be linked to a process improvement methodology.

We propose that the Balanced Scorecard, Serial V and Clinical Value Compass are complementary methodologies that can be used in a customized combination for performance measurement in healthcare organizations. The Balanced Scorecard helps the management group formulate its objectives and strategies and decide which outcomes are of interest from a management perspective. The Clinical Value Compass can be used for looking at the outcomes for the patient populations that would be defined in Balanced Scorecard project. Analyzing the Cardiovascular PSU Balanced Scorecard and a Clinical Value Compass for Acute Myocardial Infarction described by Nelson, we note that there are measures in common and there are measures which are different between the two methodologies. The Serial V provides a complementary strategic implementation approach for ensuring that the required improvements take place.

8.5 Management decision support technology

This project has demonstrated that no single piece of technology is sufficient for this undertaking. From a strictly computer technology point of view, we required a database management system as well as a tools for extracting data from various mainframe and other systems. In the context of the hospital information systems, the Balanced Scorecard system is a part of the decision support environment. Clinical and administrative operational systems all feed this decision support environment. This view of the hospital information systems architecture firstly allows functional subsystems to be improved independently as suggested in section 9.2, secondly allows the development of standards for linking systems and thirdly demonstrates the relationships between decision support and patient information systems.

We can define technology more broadly than the computer system. It also includes the Balanced Scorecard framework, the methodology for defining the indicators, the set of

indicators themselves and the organization to put the system in place. Benjamin refers to these latter items as soft infrastructure (Benjamin & Levinson, 1993). They are typically not afforded as much weight as the hard infrastructure, but are no less important to success. We note that our lack of ability to deliver data was due to administrative difficulties and lack of organizational compliance - soft infrastructure rather than a computer technology deficiency.

8.6 Systems thinking

A basic theme underlying this work is the emphasis on a holistic view rather than a mechanistic or reductionist focus. This holistic view is called Systems Thinking. The main characteristics of systems thinking emerged simultaneously in several disciplines during the first half of the century. It was pioneered by biologists who emphasized the view of living organisms as integrated wholes, enriched by psychologists and adopted by physicists in the study of quantum mechanics (Capra, 1996). (Bertalanffy, 1968) has defined a system as a 'set of elements standing in interrelation ' which together constitute a whole. Systems can also be thought of as mechanisms that receive inputs and transform them into outputs. Systems thinking is a framework for seeing interrelationships rather than linear cause effect chains and seeing patterns of change rather than static snapshots (Senge, 1990). The specific tools and techniques originate both from the feedback concepts of Cybernetics and in servo mechanism engineering theory.

Systems thinking is a means for understanding two types of complexity (Senge, 1990). Detail complexity refers to complex instruction sets. Dynamic complexity refers to situations in which cause and effect are subtle and where effects of interventions over time are not obvious. Dynamic complexity occurs when the same action has different effects in the short and long run; when an action has one set of consequences locally and another different set in a different part of the system; or when obvious interventions produce non obvious outcomes. Leverage in many systems situations lies in understanding dynamic complexity, not detail complexity.

The Balanced Scorecard encourages a systems view of an organization and facilitates an understanding of the interrelationships between important variables and objectives. It promotes an understanding of the properties of the whole, which none of the parts have. It is complementary to program management by promoting thinking about the whole program rather than the functional subspecializations of the past. Balanced Scorecard thinking by a management team reinforces the multirole nature of management.

Holistic thinking about PSUs begins to explicitly identify not only those factors over which the PSU has control, but also those factors which are outside their purview. The Balanced Scorecard helped the PSU management teams understand their coupling with other PSUs, central services or with entities external to Sunnybrook. For example, the Time in Emergency measure of the Emergency PSU is very dependent on admitting patterns in other acute care PSUs. Their critical care bypass indicator, a measure of how much time they are over capacity and closed to the public depends on the load on other hospital emergency units. As demonstrated in Case Study 4: Time to treatment for patients with acute myocardial infarction (AMI), the Balanced Scorecard project identified cross PSU coupling and catalyzed improvement.

In addition to being semi autonomous organizational units, the PSUs are also subsystems of the larger Sunnybrook whole, an entity which is more than the sum of its parts. A key input in developing each Balanced Scorecard were corporate objectives and strategic plans such as patient focused care, continuous quality improvement and cost containment. Focus group feedback indicated that there was demand for a corporate level Balanced Scorecard both to understand the corporate case-effect hypotheses. Developing a corporate level scorecard and a process for melding corporate and PSU level Balanced Scorecards would enable greater alignment of various organizational initiatives and would focus organizational attention on those factors that drive continued success of the enterprise. It may also help to identify the Sunnybrook core competencies - those enterprise wide traits that cut across PSUs that give the organization its competitive differentiation (Prahalad & Hamel, 1990). This realignment

would provide a unifying perspective and language for organizational members to act and learn collaboratively (Kinney & Gift, 1997) in the development of core skills, capabilities and competencies related to organizational objectives, strategies and its ultimate purpose.

9. Future Directions for Research

Future directions for research pertain to the improvement of strategic capabilities, specifically, the development of the Balanced Scorecard as a strategic management system and the development of information delivery systems.

9.1 The Balanced Scorecard as a strategy management system

In their more recent work, Kaplan and Norton move away from the measurement system aspects towards the Balanced Scorecard as a strategic management system (Kaplan & Norton, 1996).
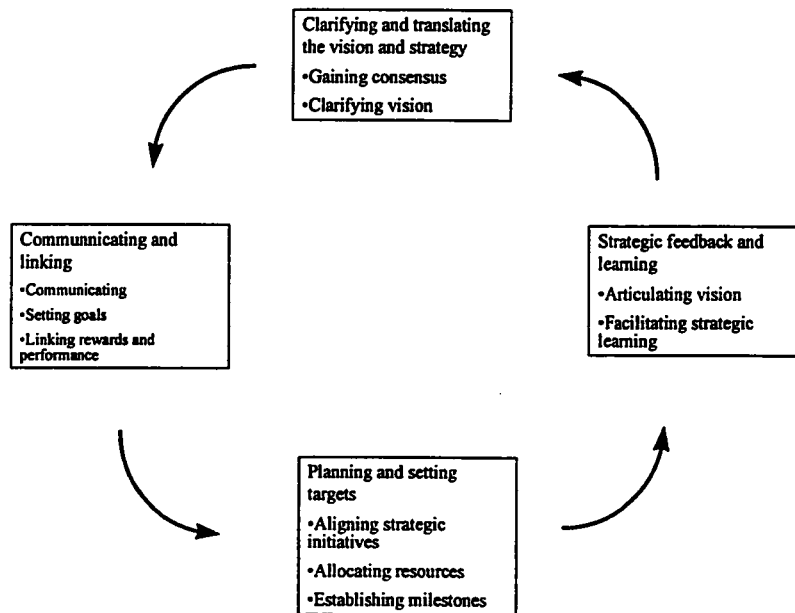
Figure 20: The Balanced Scorecard as a strategic framework for action

(after Kaplan and Norton, 1996)

Figure 20 illustrates the key components of their model of the Balanced Scorecard as a strategic framework for action. The key management processes are:

- Clarifying and translating the vision and strategy
- Communicating and linking
- Planning and setting targets
- Strategic learning and feedback

A properly constructed Balanced Scorecard should articulate the theory of the business unit based on a series of cause-effect relationships derived from the strategy. The process of thinking through the information needs provides value. The relationship between indicators is valuable knowledge. This ongoing discussion leads to an understanding of the core skills required by the PSU and its core processes Figure 21 illustrates a strategic map developed by the Cognitive Support PSU based on their Balanced Scorecard efforts. This is similar to the strategy activity system maps which examine the relationships between activities designed to deliver a business unit's strategic position (Porter, 1996).

From this map, the linkages between Balanced Scorecard measures is clarified organizationally. For example, reducing the number of falls increases both quality of care and reduces costs. Another example is that of participation in activities. Participating in activities will increase a resident's quality of life and will improve resident/family satisfaction. But additional resources are required to provide those activities and so cost per resident increases. The map also starts to clarify system delays such as resources to increase activities being required in the short term with the resident satisfaction only improving in the longer term.
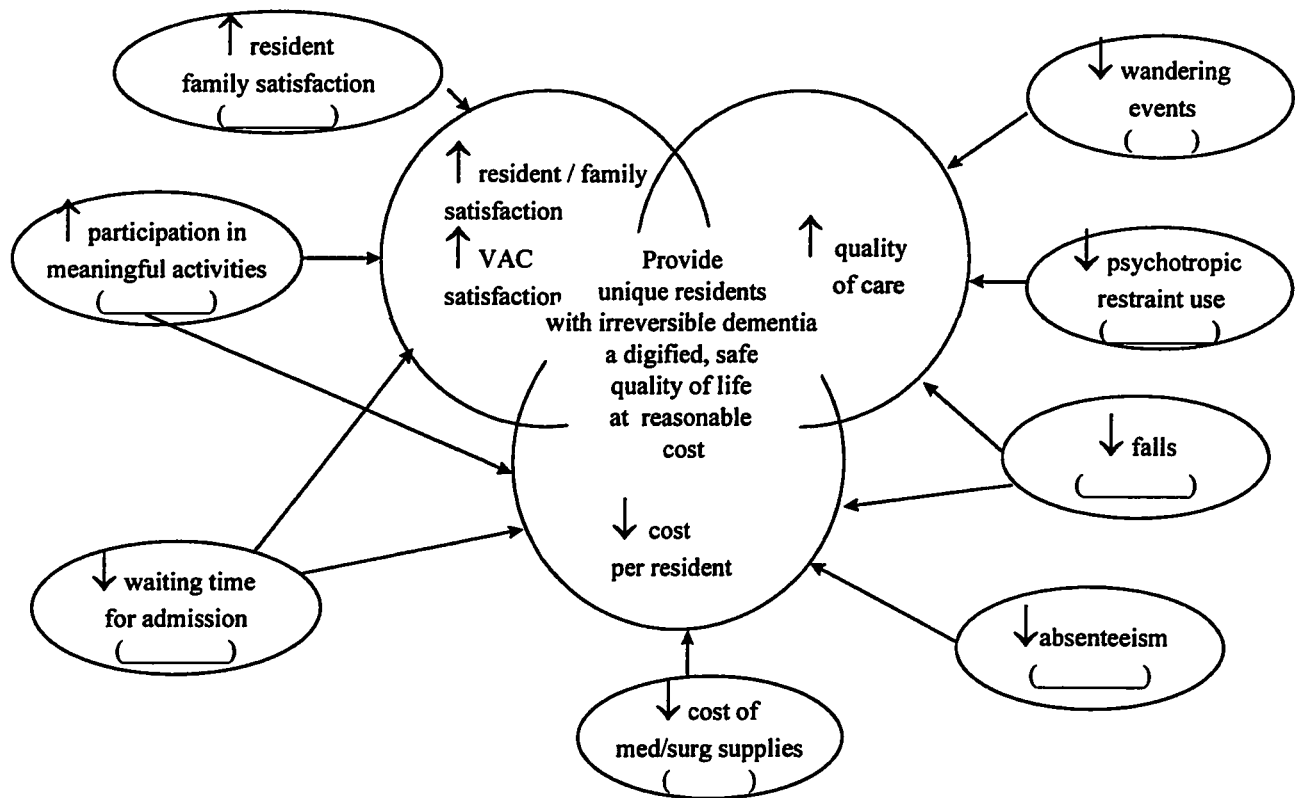
Figure 21: Cognitive Support PSU Strategic Map

(Arrows next to indicator shows desired direction of trend. External lines and arrows show cause effect relationships between indicators. Spaces under indicators are for the name of the manager accountable for that indicator.)

The map has been useful in other ways to facilitate discussion about strategic alternatives. For example, the Cognitive Support PSU had to reduce their budget by a massive 15%. The management group considered two alternative strategies: Reduce the staff / resident ratio or reduce the relative numbers of highly trained expensive registered nurses compared to less trained, less expensive assistants. The effects of both these alternatives were estimated indicator by indicator and plotted on the map. By reviewing all the effects and their

relationships, the group concluded that the second alternative had a less negative impact on the system as a whole, while achieving the lower budget objective.

The PSU also used the map to note collectively who was responsible for which indicator.

A further area of research is to advance this type of systems thinking applied to management. The research might evaluate the impact of this thinking and investigate the organizational learning effects. Research is also needed to investigate how best to implement these management tools and how to link them to the indicator measurement system. A further important area for research is to define the relationships between organizational and business unit objective setting, strategy formulation, resource allocation and budget development, in particular a methodology for interrelating corporate and PSU level scorecards. This research might also include a study of the feasibility of using this approach to help identify core competencies.

9.2 Information delivery systems

An obvious area where the Balanced Scorecard project was less successful than anticipated was the organizational capability for information delivery. This was party expected because of the nature of prototypical research and the scope of the project. Figure 22 is an information delivery architecture we propose as a robust solution for the delivery of management information.

Clinical or business systems generate granular data. These could be the byproducts of transaction systems described earlier or systems specially developed to capture process data. These systems feed the data into an operational datastore whose purpose is to automatically capture data from a wide variety of source systems. This would likely be an industrial strength relational database management system, complemented by a variety of tools for extracting data from proprietary, mainframe and relational databases, automatically

scheduling and running these data extract jobs and for transmitting data files from one technological environment to another.

The operational datastore, implemented using relational technology is organized from the perspective of the source data systems. It is not intended nor designed for end user data synthesis, analysis and consolidations, functions collectively known as Online analytical processing (OLAP) or multidimensional data analysis.
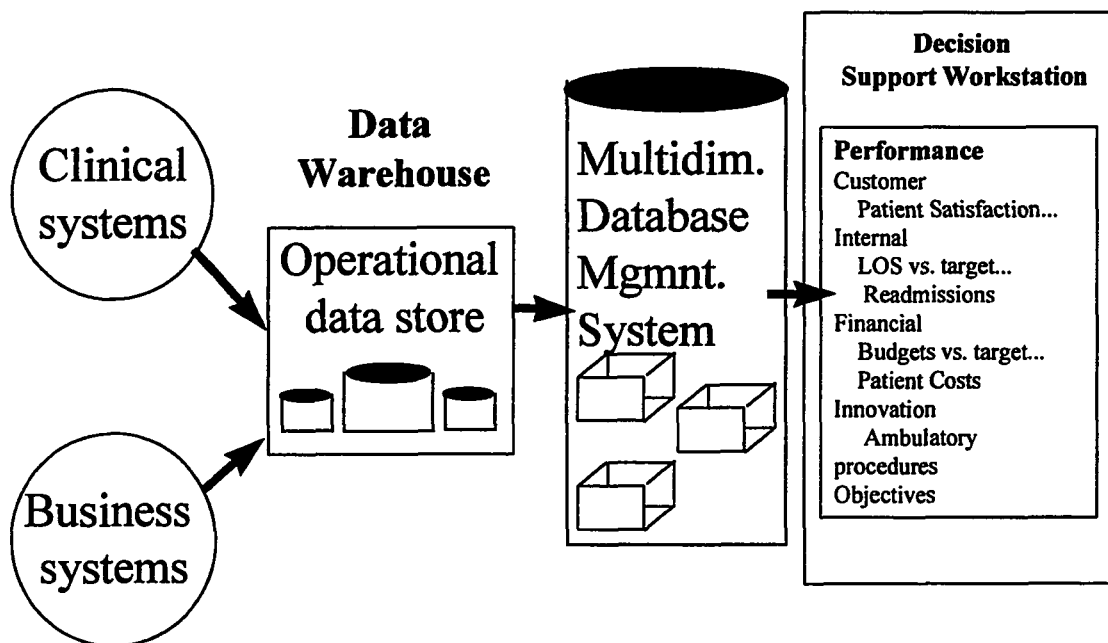
Figure 22: Information Environment to support multiple Balanced Scorecard Decision Support systems

Online analytical processing (OLAP) tools enable a user to build and work with analytical data models easily and view data in multiple dimensions. Instead of columns and rows, users get a matrix of information. The principle tool for OLAP is the multidimensional database management system. Each axis of the multidimensional model represents a data dimension. The data is organized hierarchically along each axis as illustrated in the three dimensional example shown in Figure 23. Each cell contains a value that is a function of all the dimensions at that point. For example, the average Length of stay for Coronary Artery Bypass Graft Surgery (CABG) with catheterization in 94/02 was 13.2 days. Depending on the granularity of the data 'cube', users can discover different views of the data. For example, a user might compare length of stay for CABG with catheterization and for uncomplicated CABG over time. Alternatively they might compare a variety of indicators for a particular case mix group for a snapshot in time, or look at an indicator for several case mix groups at a snapshot in time.

Multidimensional concept

	9401	9402	9403
ALOS			
CABG no cath	6.2	7.1	8.3
CABG with cath	12.5	13.2	14.1
AMI with comp	7.7	6.3	6.3
AMI no comp	3.2	3.1	3.2
pacemaker	5.2	5.1	4.7

Workload
Total wght cases
Cost per case

Indicator
Time
CMG

■Cell value = f(time, CMG, Indicator)
■6.2days = (9401, 185, ALOS)
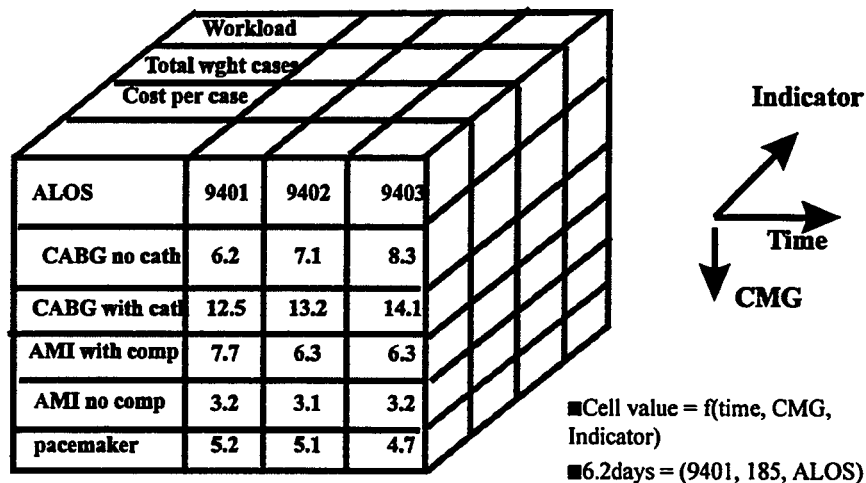
Figure 23: A multidimensional data 'cube'

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Multidimensional data analysis facilitates the simultaneous analysis of multiple data dimensions with data integrated from multiple sources. The result of this arrangement is that users can see new relationships in data.

Future research in this area is required both for the operational data store and for the multidimensional database design. The optimal design and toolset for the operational datastore requires elucidation. The administrative issues and a methodology for automating data extracts from multiple systems are unknown. The people and organizational issues are no less important. A vital area of research is to identify the data ownership and organizational compliance issues.

The OLAP environment also requires additional research. This is an area where technological capability is greater than the organizational capacity to use it. The appropriate dimensions for such a system are not clear. It is unclear whether a single set of dimensions would serve the needs of multiple business units or whether each business unit requires a separate set of dimensions. The research should also focus on the data consolidation and synthesis paths which determine how data is aggregated and summarized and which details are visible to the end user. A significant area of research it to determine how this technology supports the Balanced Scorecard methodology and how it might facilitate investigation of aggregate trends. In addition the organizational effects of this system require research to determine how such a system contributes to decision support, whether managers would use such a system or still resort to 'chauffeured' use by an external resource (Keen & Hackathorn, 1986).

10. Conclusion

In doing this work, we have achieved our objectives and have demonstrated our hypothesis in varying degrees:

- We have investigated a methodology, based on the Balanced Scorecard, which helps hospital managers define and use important management information;

- We have developed an information system which has made this information accessible and which has provided a context for integrated decision making. The information system was functionally acceptable, but the indicator data was not timely enough or sufficiently detailed;

- We have investigated the impacts of the prototype system on the organization.

The first part of our hypothesis is correct. The Balanced Scorecard methodology has provided an effective tool for healthcare business units to formulate their strategic information needs. The second part of our hypothesis is also correct, but with qualifications. The Balanced Scorecard project has helped management teams manage strategy implementation by providing information to track strategies, an accountability mechanism and an instrument for catalyzing additional work associated with their strategies. It is one tool in the manager's arsenal which helped with strategy implementation.

The iterative prototyping development methodology keeps managers engaged in the process and provides them with ongoing value. A Balanced Scorecard project requires significant organizational commitment in the form of management time and development resources. Key aspects of the concept are the focusing effects and the systems approach to balancing strategically important objectives. The Balanced Scorecard generates pervasive positive effects and catalyzes the development of organizational capabilities for strategy formulation, implementation, process improvement and information delivery. It promotes organizational learning about critical processes, skills and capability required by the business unit for success.

As a result of this work, senior executives have decided to transform the research Balanced Scorecards and associated information technologies into production systems for the organization. They have also endorsed the preliminary design of a corporate Balanced Scorecard.

In these ways, the Balanced Scorecard concept has proved its value for hospital management.

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Appendices

APPENDIX A: SCOPE STATEMENTS FOR THE PATIENT SERVICE UNIT AND BALANCED SCORECARD PROJECTS

APPENDIX B: INDICATOR DEFINITIONS

APPENDIX C: BALANCED SCORECARD RELATIONAL TABLES

APPENDIX D: BALANCED SCORECARD USER SURVEY

APPENDIX E: SURVEY DATA ANALYSIS

APPENDIX F: FOCUS GROUP INTERVIEW GUIDE

APPENDIX G: BALANCED SCORECARD EVALUATION CODE SHEET

APPENDIX H: FOCUS GROUP RESPONSE BY THEME

APPENDIX I: CARDIOVASCULAR PSU OBJECTIVES IN BALANCED SCORECARD FORMAT

Appendix A   Scope Statements for the Patient Service Unit and Balanced Scorecard projects

Appendix A .1   Cardiovascular PSU

The Cardiovascular Patient Service Unit links cardiology, cardiovascular surgery and vascular surgery into one mini hospital for the treatment of patients with cardiovascular disease. It has several nursing units as well as diagnostic laboratories for cardiac catheterization, ECGs, echocardiography and angiography. The PSU operation is driven by the volume of patients that go through it. The PSU design team has defined an initial set of balanced scorecard indicators which express the strategic direction of the PSU as shown below.

Customer	Internal
How do customers see us?	**At what must we excel?**
• Cancellations of procedures • % change in overall patient satisfaction • Average waiting time • Results reporting response time (by patient type and by referring physician.	• Average length of stay by inpatient (days) or outpatient (hours) • Turnaround time • Complication rate / national standard
Innovation	**Financial**
How are we continuing to improve?	**How well do we utilize our resources ?**

• Patients in program studies per period
 • % cases done as same day admission
 PSU Objectives:
    • Average number of staff seen by patient - number of caregivers charting
    • Internal PSU vs. external procedures - number of times patients go off unit
	• Aggregate workload vs. budgeted and actual cost
	 • % change in cost per weighted case by period
	 • % change in imputed profit per weighted case by period

Most important (highest cost or highest volume) CVPSU patient subpopulations

- acute myocardial infarctions
- abdominal and thoracic aneurysmal disease
- heart catheterizations
- isolated coronary bypass surgery
- permanent pacemaker insertions
- percutaneous transthoracic coronary angioplasty (PTCA)

Figure 1: The Cardiovascular PSU Balanced Scorecard

Appendix A .2   Cardiovascular PSU Phase 1 Scope

This section describes the indicators and their data sources to be developed in the first iteration of the prototype.
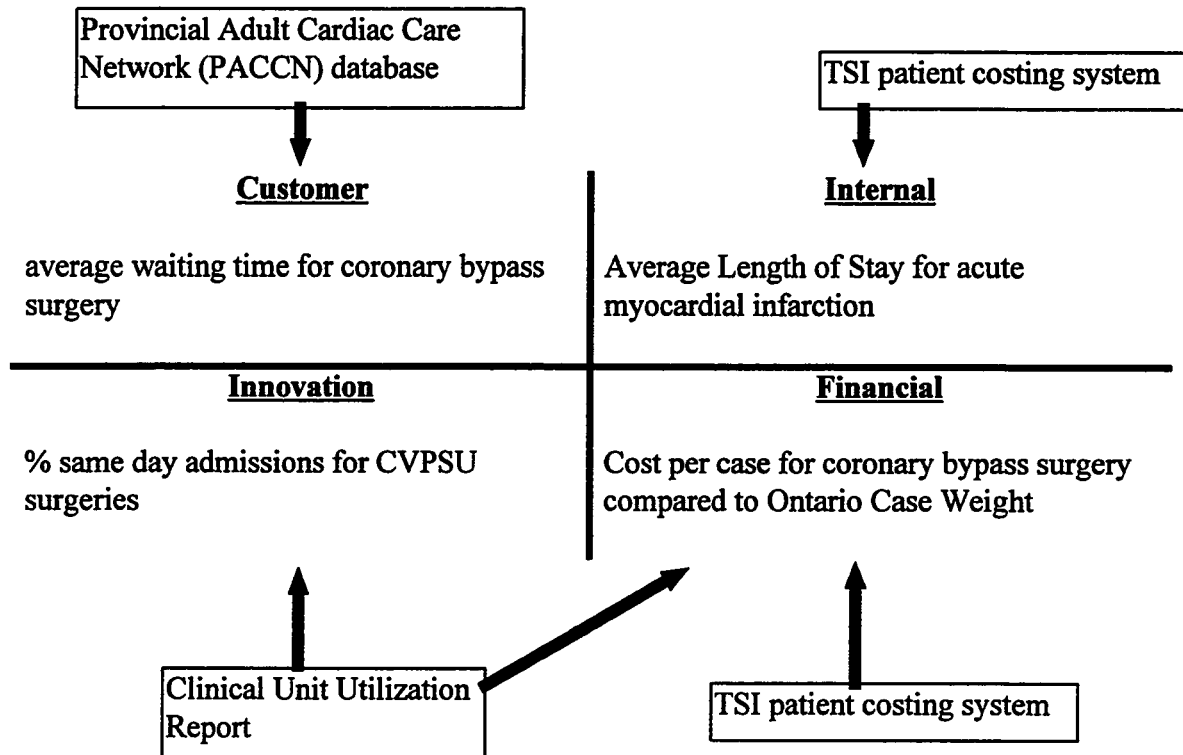
Appendix A .3   Cardiovascular PSU Phase 2 Scope

This section describes the indicators and their data sources to be developed in the second iteration of the prototype.
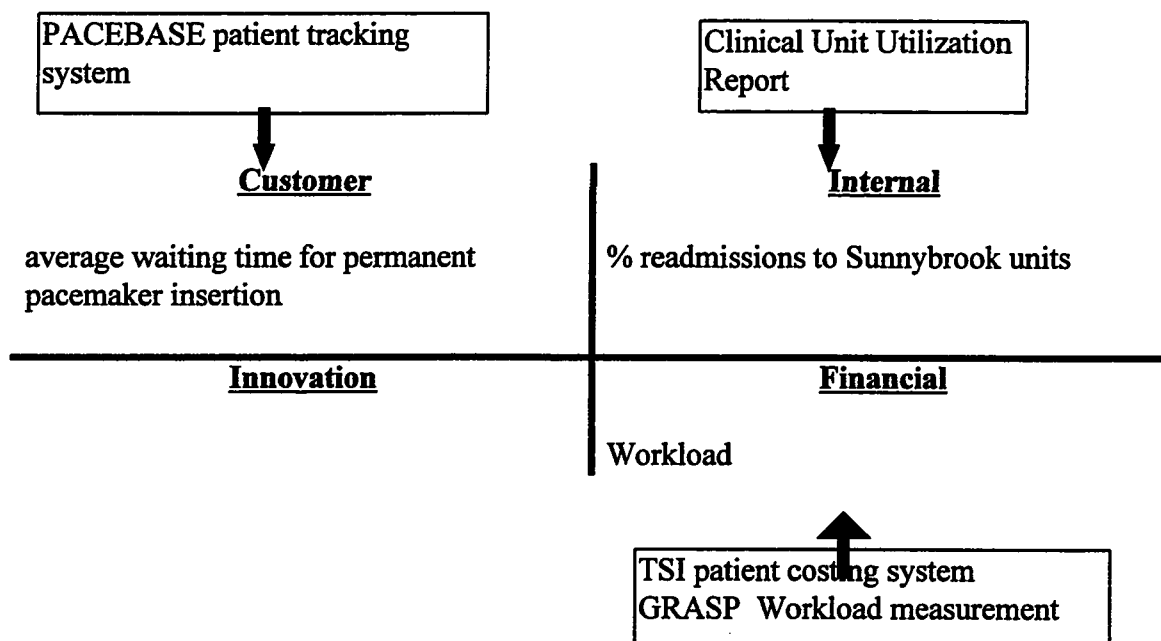
Appendix A .4   Patient populations

Case Mix Group	Patient populations
177	Cardiac valves with pump, no catheterization
179	Coronary bypass surgery no complex circulation
180	Coronary bypass surgery with cardiac catheterization
184	Major reconstructive surgery comps and comorbidities
188	Pacemaker implants, excluding myocardial infarctions
194	Acute myocardial infarction (AMI), no cardiovascular complications.
195	Acute myocardial infarction with cardiovascular complications.
222	Percutaneous transthoracic coronary angioplasty (PTCAs)
	Cardiovascular PSU
	Cardiac Surgery

	Cardiology	
	Vascular Surgery	

Appendix A .5 Cognitive Support PSU

The Cognitive Support Patient Service Unit planning team has defined the performance indicators that reflect critical success factors, corporate priorities and the priorities of the PSU.

Customer (How do customers see us)	Internal (What must we excel at ?)
- Resident evaluation survey (family, one off, baseline) % time spent in meaningful Interactions / activities (# activities attended, participation rate in daily living activity programs) - Family satisfaction - Mcgivern patient satisfaction	- Consistency of care - death rate - Continuity of care - Restraint use - physical or chemical (psychotropic medicatio - average dose/ 24 hours/resident or % on antipsychotics) - Time spent retrieving residents (Times or wandering events) Outcome evaluation of program of care - continence management - Number of skin breakdowns by resident severity - Number of bowel preps - Intercurrent disease - Number of bladder infections, pneumonias - Improvement in functional status - Number of falls
Innovation (Are we improving?)	**Financial (How well do we use our resources ?)**
- Education of family, caregivers, staff - Patient focused care objectives - Number of people involved in approved (funded, peer reviewed) research projects - Number of family members participating in programs % time spent in direct patient care	- Cost per resident per period (East and West) - Weighting - functional assessment for dementia (DAT) and other diseases or RUGS - Cost of continence products - Aggregate workload

- Quality of life is the most important objective of the Cognitive Support PSU
- Duration of stay is not important
- Maximize functional, cognitive, spiritual and social abilities
- Minimize excess disability and excess morbidity
- Resident population predominantly Alzheimer's Disease
- Environmental press - reduction in aggressive behavior / rummaging

Appendix A .6   Cognitive Support PSU Phase 1 scope

This section describes the indicators to be developed in the first iteration of the prototype.

Customer	Internal
Complaints and concerns	Medication use (psychotropic)
Innovation	**Financial**
Participation in recreational activities	

Appendix A .7   Cognitive Support PSU Phase 2 scope

This section describes the indicators to be developed in the second iteration of the prototype.

Customer	Internal
Average waiting time for PSU acceptance	Falls and fall related injuries
Innovation	**Financial**
	Absenteeism

The prototypes will include real data collected from a variety of corporate and local Cognitive Support PSU databases. This will give the PSU a chance to map useful data from current systems into the indicators and will demonstrate the ability to acquire and integrate data from multiple information sources.

Appendix B   Indicator Definitions

Appendix B .1   Cardiovascular PSU Balanced Scorecard

Indicator 1:   Average waiting time for coronary bypass surgery

Definition of terms:

Waiting time is time from acceptance for surgery to date or procedure.

Rationale

The objective is to minimize the average waiting time at all urgency ratings

Description of indicator population

All patients accepted for coronary bypass surgery at Sunnybrook and still waiting for the procedure as monitored by the Provincial Adult Cardiac Care Network (PACCN).
Average the waiting time of patients still waiting for the procedure by urgency rating
Urgency ratings are: 2.0 - 4.0 : Urgent ; 4.0 - 5.0 : Semi urgent; 5.0-7.0: Elective

Indicator data collection logic

Waiting times are collected from Provincial Adult Cardiac Care Network (PACCN) database. PACCN produces a text file (cardsurg.txt) which tables average waiting time by urgency rating. The text file must be manually copied from the PACCN UNIX system to the CVPSU data directory. Average waiting time for each period is calculated from the weighted average. This is compared to the average waiting time over the past six months.

Display

103
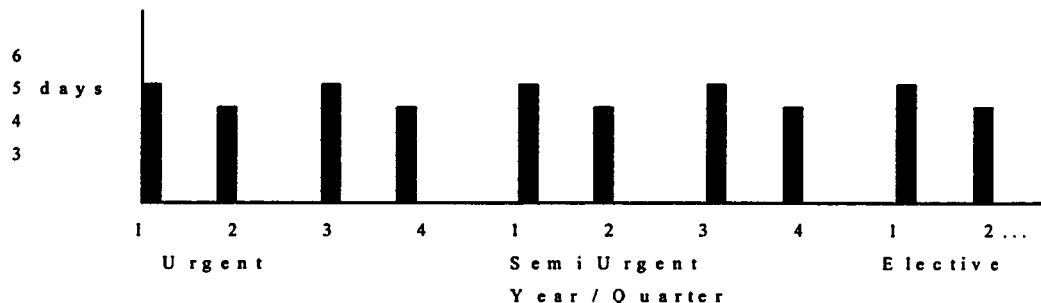
Indicator 2: Average Length of Stay for acute myocardial infarction

Definition of terms

Arithmetic 'average' length of stay of all patients who were discharged during that period (i.e.: Total days stay/total discharges);
Patients are from Case mix group (CMG) 195 - acute myocardial infarction with cardiovascular complications. Patients with no cardiovascular complications (CMG 194) are excluded

Rationale

Indicator of the efficiency of care.

Description of indicator population

Numerator - Total days stayed ;
Denominator - total discharges

Indicator data collection logic

Average LOS for CMG 195 by period - from TSI study set for this CMG. The study set must be regenerated each period to get current data

Display

Year / Period
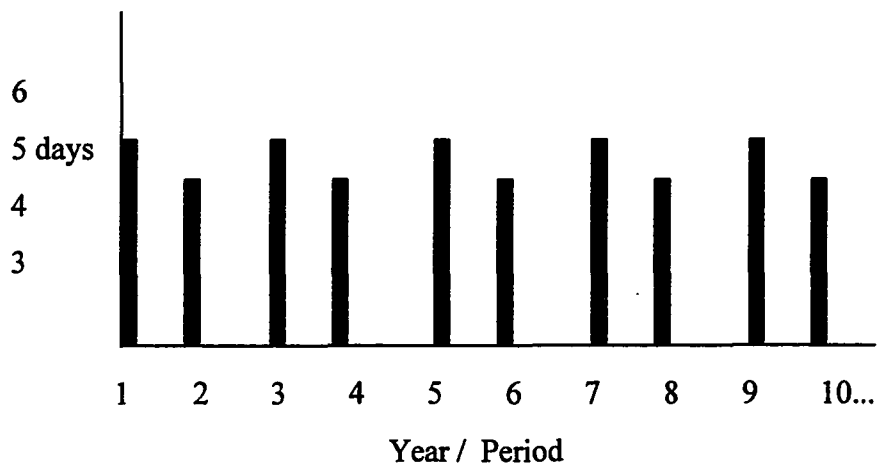
Indicator 3: Percentage of CVPSU surgeries on same day as admission

Definition of terms:

All CVPSU urgent and elective surgeries done on same day as admission divided by all CVPSU urgent and elective surgeries by period. (Cases include cardiac, vascular and pacemaker surgeries. Emergent surgeries are excluded.
Cardiovascular procedures excluded are outpatient heart catheterizations, temporary pacemaker insertions and PCTAs)

Rationale

This indicator will monitor the trend from inpatient to same day admissions. Surgery on same day as admission are expected to rise over the next few years and inpatient procedures expected to drop by the same proportion.

Description of indicator population:

Numerator - all CVPSU urgent and elective surgeries done on same day as admission
Denominator - all CVPSU urgent and elective surgeries by period expressed as a percentage

Indicator data collection logic

Clinical Utilization Report, part 5 - % Elective and urgent Ors not done on day of admission :

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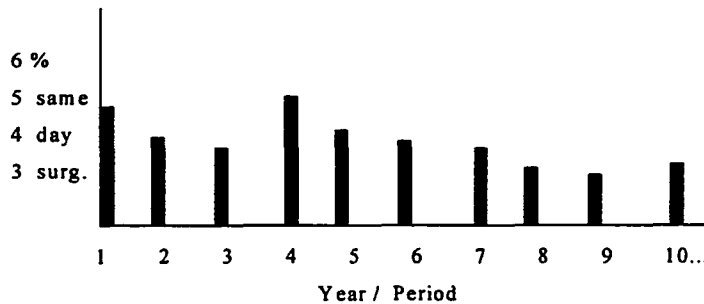
Indicator 4: Average cost per case for coronary bypass surgery (weighted)

Definition of terms

Average cost per case plotted against number of weighted cases
Cost includes direct fixed (equipment maintenance, leasing) and variable (e.g.: film, syringes) expenses, but not indirect (hospital overhead) costs.
Cases are coronary bypass cases with no catheterization (CMG 179) Cases do not include coronary bypass cases with catheterization (CMG 180). Ontario Case Weights are normalized for patient acuity and resource intensity.
Average cost = sum of all individual costs divided by the number of weighted cases.

Rationale

This indicator tracks resource utilization efficiency

Description of indicator population

numerator 1 = average cost per coronary bypass cases with no catheterization (CMG 179) in this period
numerator 2 = Ontario case weight for cardiac surgeries in the period (all coronary bypasses and all valves)

Indicator data collection logic

average cost per CMG 179 = TSI database study set
Ontario case weight for cardiac surgeries - Clinical Utilization Report part 4 - CIHI data

Display

106
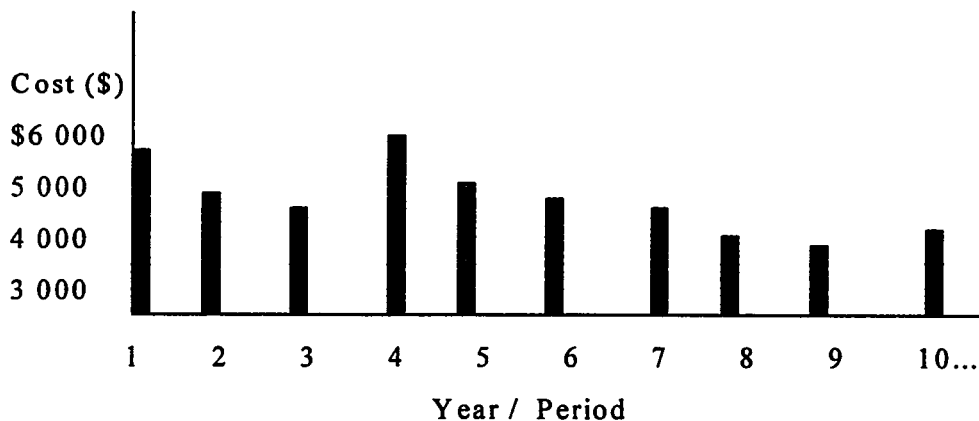
Indicator 5:   Average waiting time for pacemaker insertion

Definition of terms:

Waiting time is time from acceptance for surgery at Sunnybrook Pacemaker clinic to date of procedure. All patients accepted at Sunnybrook for permanent pacemaker insertion
Urgency ratings are: Urgent ; Semi urgent; Elective
Average waiting time for a period is the average of the times waited by all patients who were operated on during that period.

Rationale

The objective is to minimize the average waiting time at all urgency ratings

Description of indicator population

All patients accepted for and operated on for permanent pacemaker insertions at Sunnybrook as monitored by the Sunnybrook p acemaker database (PACEBASE).

Indicator data collection logic

Waiting times are collected from Sunnybrook pacemaker database (PACEBASE). PACEBASE produces a comma delimited text file (pacewait.txt) which tables patient id; date of procedure, urgency rating, waiting time in days. The text file must be manually emailed from the PACEBASE system to the CVPSU data directory. Average waiting time for each period is calculated by grouping patients by urgency rating and then calculating the average waiting for each of the past 8 corporate quarters. average waiting times for current fiscal year quarters are compared to last year in the three urgency rating groups.

Display

107
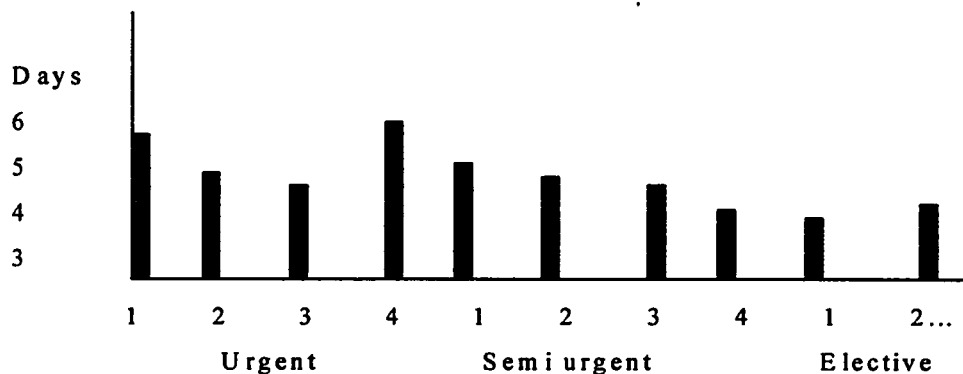
Indicator 6: Average waiting time for Percutaneous Transthoracic Coronary Angioplasty (PTCA)

Definition of terms:

Waiting time is time from acceptance for surgery at Sunnybrook Angioplasty program to date of procedure.
Average waiting time for a period is the average of the times waited by all patients who were operated on during that period.

Rationale

The objective is to minimize the average waiting time at all urgency ratings

Description of indicator population

All patients accepted for and operated on for Percutaneous Transluminal Coronary Angioplasty (PTCA) at Sunnybrook as monitored by the Sunnybrook Angioplasty database.

Indicator data collection logic

Data in I:\psudss\cvpsu\data\angio\ fpreptca.dbf and I:\psudss\cvpsu\data\angio\fptcadat.dbf. Average waiting time for each period is calculated by grouping patients by urgency rating and then calculating the average waiting for each of the past 8 corporate quarters. Urgency ratings are: Urgent ; Semi urgent; Elective . Average waiting times for current fiscal year quarters are compared to last year in the three urgency rating groups.

Display:

108
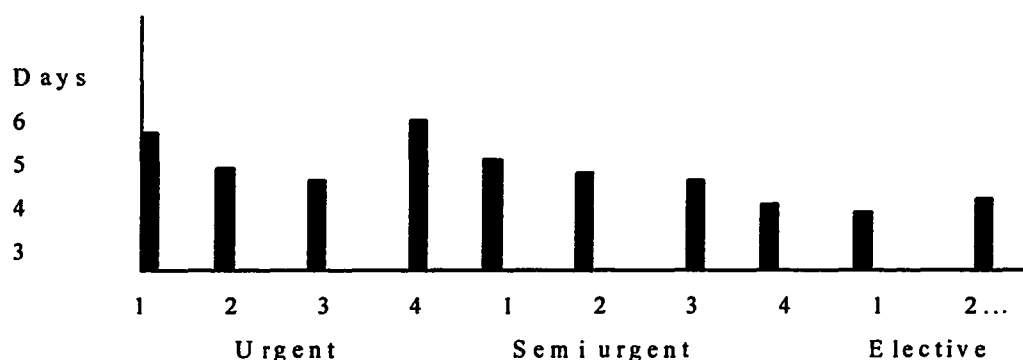
Indicator 7: Time to Treatment for Myocardial Infarction (Cardiology)

Definition of terms:
The time to treatment is the time from arrival to ER admitting with an acute myocardial infarction to the start of treatment with Thrombolytics (TPA or Streptokinase), recorded in minutes. Data is plotted for each of the events in which patients received thrombolytic treatment in two types of graphs:
1. <u>Average Time to Treatment for MI</u> - time to treatment is plotted as the average waiting time (i.e. total time to treatment/total no. of cases) for each quarter.
2. <u>Individual Time to Treatment for MI</u> - time to treatment is plotted for each patient who received the TPA/Streptokinase.

Rationale:
The objective is to minimize the waiting time for the drug. The more time waited, the more heart muscle is lost. The goal is to provide treatment within 30 minutes of arrival to ER admitting.

Description of Indicator Population:
The indicator population consists of all patients admitted to the Sunnybrook Emergency Unit who are diagnosed with a myocardial infarction and treated with TPA/Streptokinase and subsequently recorded in the Coronary Care Unit database.

Indicator Data Collection Logic:
Waiting times are collected from Sunnybrook documentation and entered into the CCUDBASE by the cardiology research nurse.
<u>Database</u>: i:\cv\programs\cvpsu.mdb
<u>Form File Name</u>: Average Time to Treatment Graph: frmAWTMI
                           Individual Time to Treatment Graph: frmIWTMI
<u>Form Source File</u>: CCUDBASE_Extract_3
<u>Fields</u>: ERADMDATE - date of admittance to emergency
           CCUADDIAG - diagnosis where "1" = acute myocardial infarction
           ER_TPA - time to treatment in minutes (difference between TPA/SK
                treatment & ER arrival time)

Display 1: Average Time to Treatment for Myocardial Infarction

Time to Treatment - TPA/SK   ■ Avg_ER_TPA

#patients

Avg Time (minutes) vs Year/Quarter
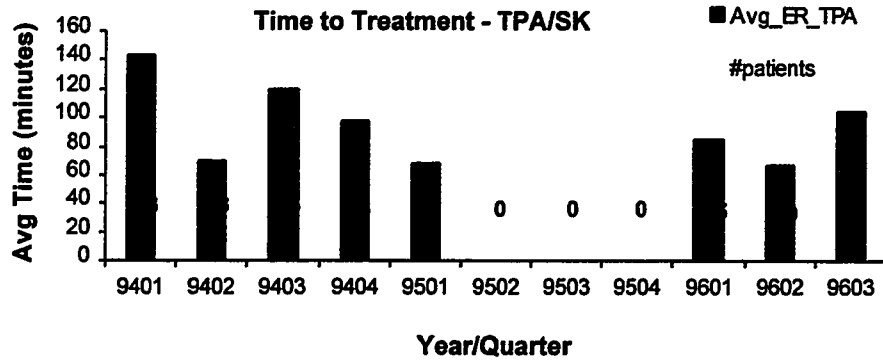
Display 2: Individual Time to Treatment for Myocardial Infarction

Individual Time to Treatment Data

June 01/9[
Treatment Moves to ER

Time To Treatment (min) vs Date of Event

110
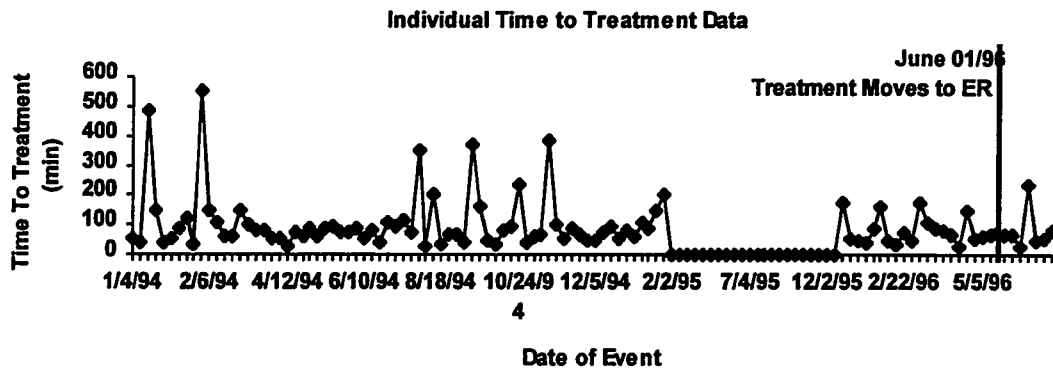
Indicator 8: Percentage of Readmissions to CVPSU

Definition of terms:

Percentage of Readmissions are all CVPSU urgent and elective readmissions divided by all CVPSU urgent and elective surgeries by period.

Rationale

This indicator will monitor the internal perfomance of the PSU. Readmissions unless planned are unnecessary.

Description of indicator population:

Numerator - all CVPSU urgent and elective surgeries done on same day as admission
Denominator - all CVPSU urgent and elective surgeries by period
Cases include all patients who were in the cardiovascular PSU and have been readmitted back to the Cardiovascular PSU or any other PSU within one month of discharge.

Indicator data collection logic:

Number of readmissions: Clinical Utilization Report part 1
    to same unit within one month: Item code A120005
    to a different unit within one month: Item code A130005
    Total admissions: Item code A110020
% = (# of A120005 + # of A130005) / # of A110020 * 100

Display

111
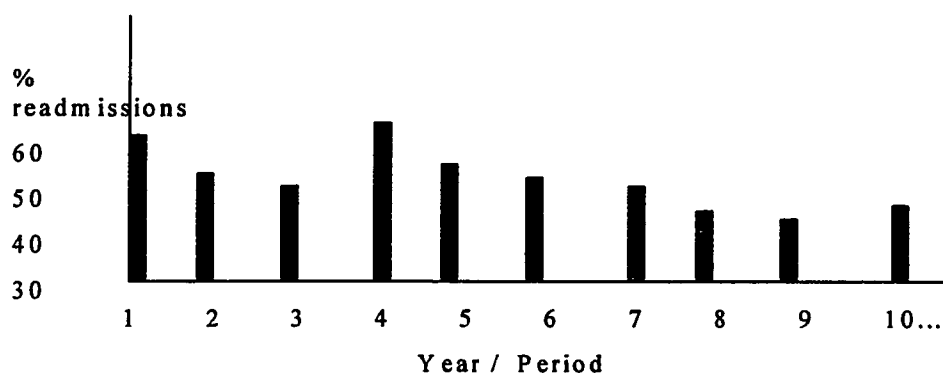
Indicator 9: Average workload by patient type

Definition of terms

Workload is equated with nursing dollars per patient. Sum and average to get average nursing dollars by patient population

Rationale

This is a measure of nursing productivity

Description of indicator population:

numerator - total nursing dollars by patient population
denominator - number of patients

Indicator data collection logic

Average nursing dollars per patient can be found directly from TSI which receives the data from the workload measurement feeder system

Display
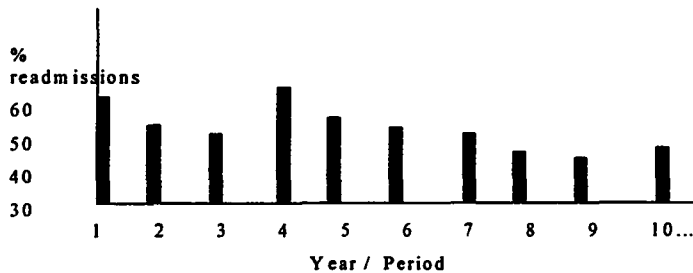
Indicator 10: Number of callbacks to the Cardiac Surgery Unit

Definition of terms:

Callbacks are telephone calls from patients about concerns they have.
Concerns can be broken into three areas: pain management and control; physiotherapy /
activity; and wound management.

Rationale

This indicator will monitor the internal discharge education performance of the CVPSU.

Description of indicator population:

Numerator - all telephone calls logged by PSU staff.

Indicator data collection logic:

The Clinical Nurse Specialist collects all call data. She will enter the aggregate data into the
data collection table every period

Display
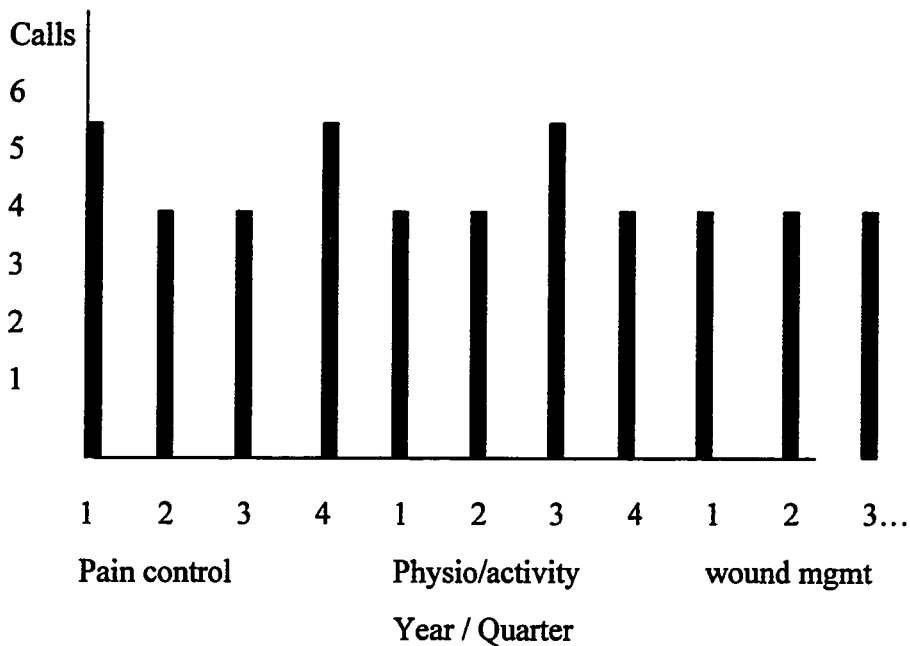
Data Collection table (separate from graphical display table)

FY	Period	Callback type	Total

113

Indicator 11: Severe and moderate intra-hospital and 3 month post discharge complication rate for cardiac surgery

Definition of terms:

Cardiac surgery patients comprise patients admitted for coronary surgery
Intra-hospital complications happen during the admission for surgery
3 month post discharge complications occur within 3 month after discharge for the surgery
Severe and moderate complications are defined as:

	Severe	Moderate
Intra-hospital	Death Myocardial infaction (MI) Intra-aortic balloon pump (IABP) Cardiovascular aneurism (CVA) Sternal infection Permanent pacemaker	Chest reopening Leg infection Low output syndrome (inotropic)
3 month post discharge	Death Myocardial infaction (MI) Cardiovascular aneurism (CVA) Sternal infection Emergency hospitalization Repeat Catheterization, CABG or PTCA	Leg infection Anti coagulant

Rationale

This indicator will monitor the internal clinical perfomance of the PSU.

Description of indicator population:

Numerator - all complications of specific type and severity.
Denominator - all surgeries
Complication rate is number of events compared with number of surgeries, NOT number of patients who had an event compared with number of patients who had surgery
Data collated and displayed quarterly :
   For intrahospital: surgery date happened in that quarter
For followup: for each followup done in that quarter, the event also happened in that quarter.

114

Note that a patient who has both a severe and a moderate complication during a stay is counted once in each group. A patient who had more than I (say moderate) event is counted as two events. This introduces an error into the rate calculation. Data from the past five years indicate that the error will be about 1% which is acceptable.

Indicator data collection logic:

The Cardiac Surgery data base administrator collects all cardiac surgery clinical data in two dbase databases - the SMCdata.dbf database for intrahospital data and the followup.dbf database for followup data. She will provide copies of the data

	Complication	Field
Intra-hospital		Database is SMCDATA
Severe	Death Myocardial infaction (MI) Intra-aortic balloon pump (IABP) Cardiovascular aneurism (CVA) Sternal infection Permanent pacemaker	Survival = 0,2,3 (123) MI = 1 (131) IABP = 1,2,3,4 (124) CVA = 1,2,3 (132) STERNINF = 2 (135) PACE = 1
Moderate	Chest reopening Leg infection Low output syndrome (inotropic)	REOP = 1,2,3,4,5,6 (128) LEGINF = 1 (136) INO = 1 (127)
Followup		Database is Followup.dbf
Severe	Death Myocardial infaction (MI) Cardiovascular aneurism (CVA) Sternal infection Emergency hospitalization Repeat Catheterization, CABG or PTCA	DECEASED = 1; DOD = date MI = 1 ; MI_DATE Neurological embolic event = 1 STERNINF = 1 STERN_DATE OTH_VASC = 1; OTHVASCDT CARDHOSPIT = 1; OTHCARDDAT CATH = 1; CATHDATE APLASTY = 1; APLASTY_DA REDO = 1 ; REDO_DATE MAJ_AC =1 MAJ_AC_DATE
Moderate	Leg infection Anti coagulant	LEGINF =1 LEGINF_DA MIN_AC = 1; MIN_AC_DATE

115

Display

Complications

6
5
4
3
2
1

1   2   3   4   1   2   3   4   1   2   3...

Severe   Moderate   Severe   ...

   Intrahospital   Year / Quarter   3 months Post discharge
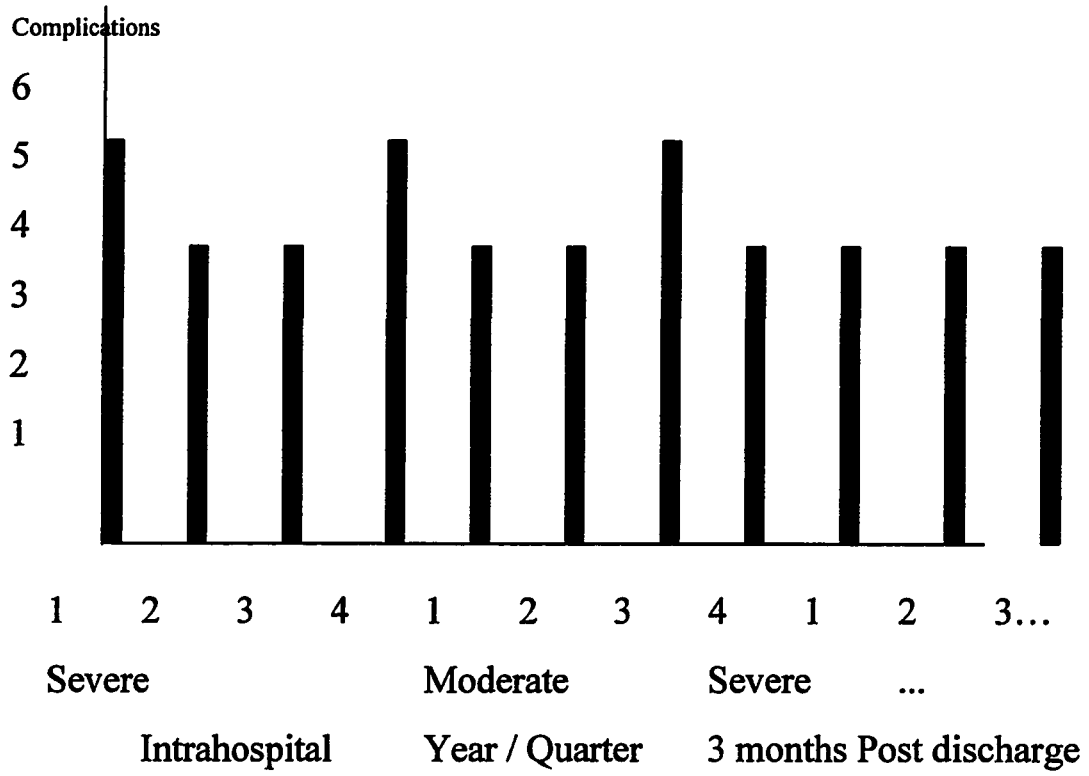
Appendix B .2   Cognitive Support PSU Balanced Scorecard

Indicator 1: Chemical restraint use : Average Haldol equivalent drug dose prescribed per resident.

Definition of terms:

Chemical restraint are excess doses of psychotropic drugs prescribed per resident per unit of the Cognitive Support PSU. These are Loxapine, Haloperidol, Thioradizine, Trazodone and Ativan. Haldol equivalent doses are the amount of specific drug multiplied by a Haldol equivalent factor. Average dose is the total dose of non PRN drugs for the unit divided by the number of residents using psychotropic medications on the unit.

Rationale

Excess chemical restraint reduces resident quality of life. The objective is to minimize the number of chemical restraints for all residents. . Some drugs are prescribed in combination producing undesirable side effects.

Description of indicator population

All residents in all units of the Cognitive Support PSU. All residents prescribed drugs as listed in the Sunnybrook pharmacy system

Indicator data collection logic

Drug data is collected from the pharmacy system active list. The report is a text file which tables resident, unit and drug. Calculate total dose of non PRN drug prescribed for each resident. Calculate total dose prescribed in a unit. Divide by the number of residents using psychotropic drugs.

Display:

117
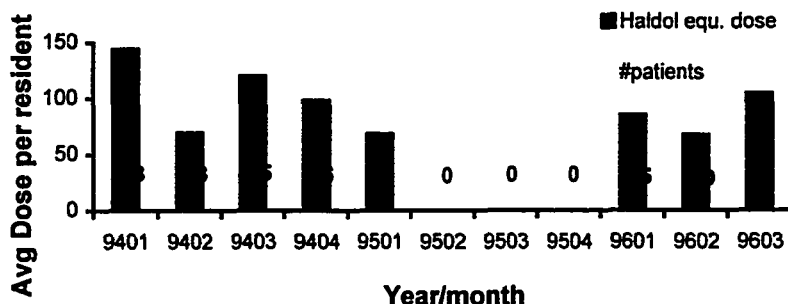
Indicator 2: Average waiting time to enter PSU

Definition of terms

Waiting time is from time application received until time of entry of resident.
Average is for all residents in that time period, reported by unit

Rationale

Average waiting time is a resident satisfaction indicator which may also indicate changes in customer requirements if waiting list falls to zero. It is also of interest to the Payor, Veterans Affairs Canada

Description of indicator population

All residents who are waiting in the period.

Indicator data collection logic

Veteran's Affairs will provide waiting time data from the Veteran's Affairs database VAClist.dbf. A new database will track admitted residents and the unit they were admitted to.

Display

Time (days)

6
5
4
3
2
1

1   2   3   4   5   6   7   8   9   10   11...

Year / Period
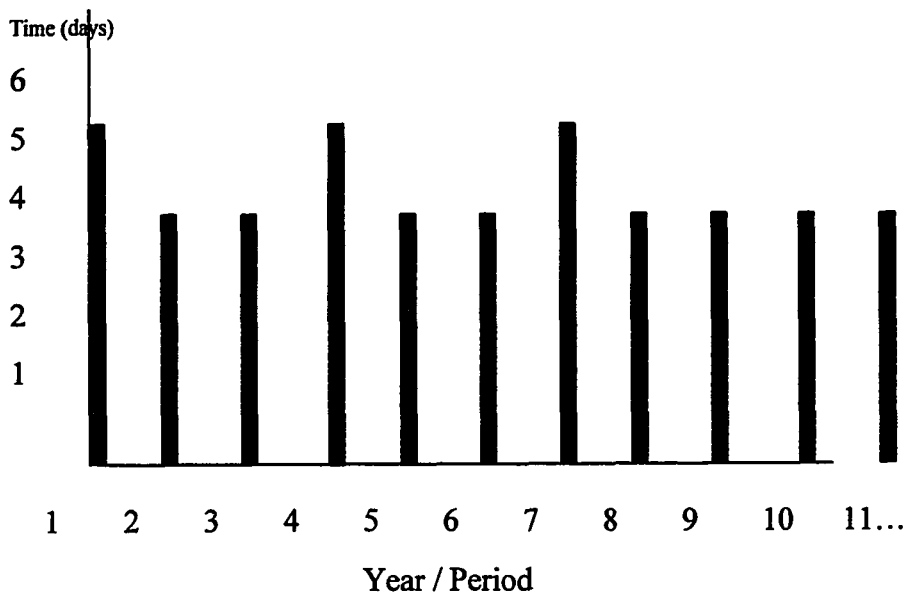
Indicator 3: Average resident participation in structured activities

Definition of terms:

Structured activities are organized activities that residents may participate in, including recreational therapy, physiotherapy and occupational therapy. Participation is the amount of time a resident spends in these activities. Average is the average time a resident spends participating.

Rationale

To improve quality of life, residents should be participating in activities meaningful to them.

Description of indicator population

Numerator - total amount of time that the residents in a unit of the Cognitive Support PSU spend per month
Denominator - total number of residents

Indicator data collection logic

Get Occupational Therapy (OT) and Physiotherapy data from TSI patient costing: encounter, Intermediate product dept = OT or Physiotherapy; Note that OT amounts are measured in minutes and physiotherapy amounts are in units. These must be normalized.
For Recretational Therapy data: get data from workload files: where
HFN is actually the encounter number; dcode are the intermediate products; and DTU is amount. Note Dtu is measured in units and each unit - 5 minutes. This files contains all recreational therapy patients. Get cognitive support patients from TSI and select out Cog Support patients from Rec therapy file. Encounter in Recreational Therapy matches first twelve digits of encounter number in TSI (the last 3 digits are the pseudo discharge number per period for long term care patients.)

Display:

119
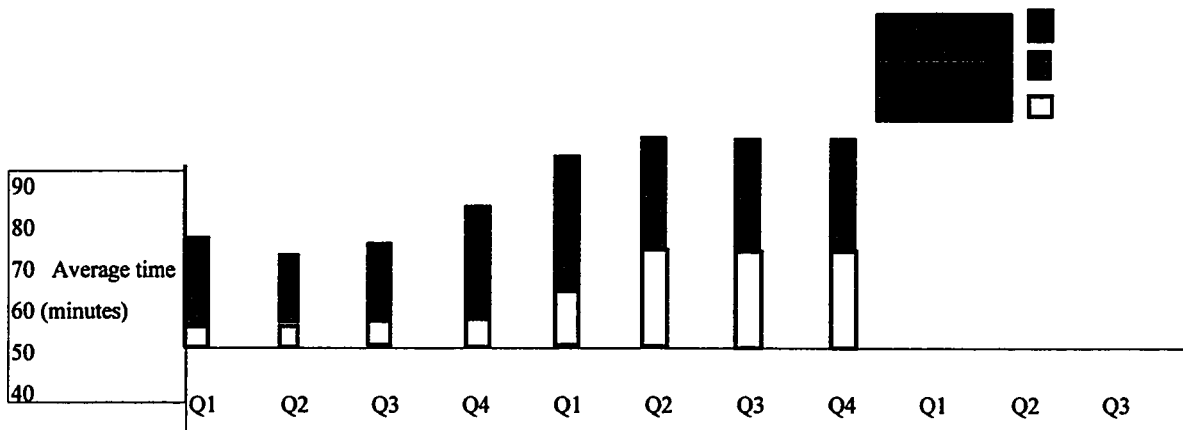
Appendix C   Balanced Scorecard relational tables

The Balanced Scorecard software was designed to be generic, but customizable for each PSU. We identified three types of software structures. Identical software did not change from PSU to PSU (or from prototype version to version). Identical software included the display graph and display help modules, the Introduction screen and initialization modules. Class software retained its data structure, but not its data. Specific software changed from PSU to PSU. Because of the significant differences in data types for different indicators and because of the iterative development cycle, we did not attempt to design a comprehensive, generic entity relationship diagram for all PSUs. All the indicator data was stored in specific tables with purpose defined table structures. Some of these tables could be copied from PSU to PSU or could be modified slightly between indicators. In this way, we reused data structures and past experience.

Three relational tables are needed to display the relationship between indicators and patient populations as shown in Figure 1: Indicator, Patpop and an intersection table, Ind_Patpop

Figure 1: Indicator - Patient Population Relational diagram

These were class structures - the table structures were the same from PSU to PSU, but the data in the table changed.

The detailed descriptions of the Indicator, Patpop and Ind_patpop tables are shown below

Table: Indicator

Field	format	comment	Naming convention	Example
ID	N*	unique ID for this indicator, divided by quadrant	nnn	100, 101
quadrant	A20	Four quadrants of scorecard See note (1) - normalization	customer, internal, innovation, financial	customer
description	A100	Full indicator description		
abbreviation	A50	indicator abbreviation		
Display button	A20	Button that invokes graphical display	but...	butAWT

Table: Patpop

Field	format	comment	Naming convention	Example
ID	N*	unique ID for this patient population, CMG if possible	nnn	100
code	A20	Either a CMG code, CMG combination or unit name		Cardiovascular, 188
description	A100	Full patient population statement		
abbreviation	A50	Short patient population description		

Intersection table Ind_Patpop

Field	format	comment	Naming convention	Example
Indicator$ID	N*	unique ID for indicator		
Patpop$ID	N*	unique ID for this patient population		
table	A20	table name for this data	Tables![...]	Tables![AWT]
dataform	A50	form name for displaying the tabulated data	Forms![dat...]	Forms![datAWT]
graphform	A100	form name for displaying the graph	Forms![frm...]	Forms![frmAWT]
graphtype	A30	Assume that there will be a limited number of different graphical layouts	area/line ; bar/area1	
title	A50	Indicator![abbreviation] + Patpop![abbreviation]		
source	A20	data source table name. May be from TSI, CUUR, or text file from a local database	Reference.dbf txt etc	cardsurg.txt
sourcetype	A10	table type: Foxpro; text; Access, etc	Fox; mdb; txt; db	
sourcesystem	A10	computer system that provides the data	Name of system	PACCN
lastupdate	D	Date of last update	dd mmm yy	03 Feb 94
updatebutton	A20	name of button for refreshing the table from source data	Button![btn...]	Button![btnAWT]
Clear table query	A20	Query that discards old data from table prior to refresh	Query![qrydlt...]	Query![qdltAWT]
source_convert module	A20	Code for updating table from source_table	mdl...	Module![mdlAWT]
update frequency		Frequency with which data should be updated	D,W, M, Q	D
update memo		Description of people, telephone numbers and process for getting source_table	M	Memo
HelpContextID	N	Identifying number of object in custom help		

Each indicator graph is an object that shows the performance of an indicator for a particular patient population The properties of the Scorecard object are stored in the Indicator table, the Patpop table or their intersection table. An example is shown in

Figure 2.

Graph![title] = Indicator![ID] + Patpop![ID]

Average length of Stay	-	Acute Myocardial Infarction

Object![graphtype] = bar

20
15
10
Days
5
0

2-4   4-5   5-7
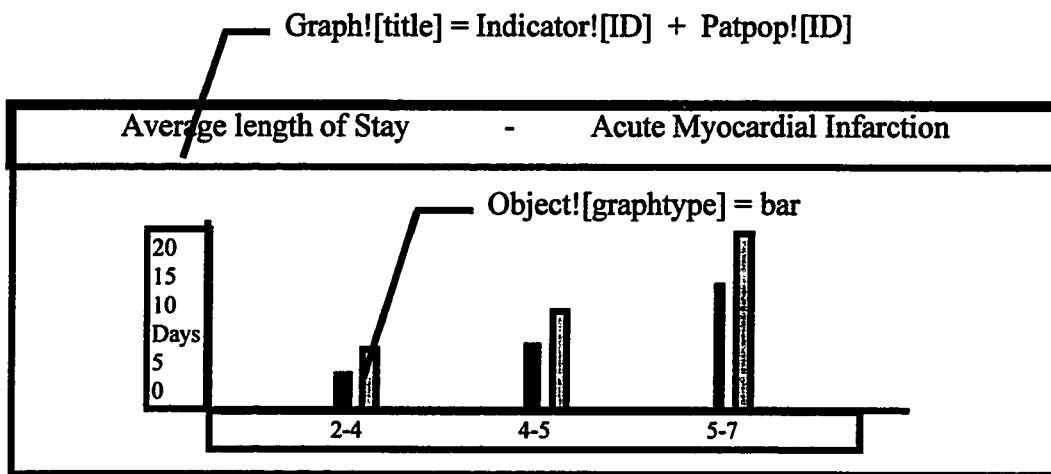
Figure 2: Properties of an Indicator object

Appendix D   Balanced Scorecard User Survey

Thank you for offering to participate in this study. The information you provide by completing the questionaire is crucial to our understanding how the Balanced Scorecard enables Sunnybrook PSU's to manage better.

As much as we want to hear from everyone who has been fully or partially involved in the Scorecard Project, we want to assure you that participation in the survey is entirely voluntary. We also want you to know that all individual responses will be completely confidential. There will be about 35 participants across three PSU's (Cardiovascular, Cognitive Support and Emergency) and we ask only that you indicate the PSU to which you belong and a broad classification of role on the management team (ie Director/PCM or General Team Member). The results of the survey will be shared with all participants.

The questionaire should not take more than 25 minutes to complete. We appreciate your assistance.
Sincerely,

The Balanced Scorecard Development Team

PS Dan Gordon is especially interested in a fully participative survey because he hopes to use this information as a significant part of his doctoral thesis research.

Please complete the survey and return it to Dan Gordon in G420 by **Friday May 24th 1996**

PSU Name:_____

➔   Team Role: please check one:
☐ Director/PCM   ☐ General Member Mgmt Team

Appendix D .1   The Balanced Scorecard concept and process

You are asked to read each statement carefully and to circle one of the comments that describes most clearly how you feel about the statement e.g.:

0	I find the Balanced Scorecard interesting	Strongly disagree	Disagree	(Uncertain)	Agree	Strongly agree

This would indicate that you agree with the statement.

Please keep in mind that what is important is your own opinion. There are no right or wrong answers to these questions. The questionaire is concerned with how you feel about each statement as it applies when the Balanced Scorecard is operational. For example, statement 1 " My job will be more satisfying" implies:
" My job will be more satisfying... when the Balanced Scorecard is in use."

We encourage you to make any comments on the right hand side of the page. There is also space for additional comments at the end of the evaluation.

Comment

								Comment
1	My job will be more satisfying.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
2	Others will better see the results of my efforts.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
3	Top management will provide the resources to implement the Balanced Scorecard.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
4	The Balanced Scorecard Project costs too much.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
5	I will be supported by my boss if I decide not to use the Balanced Scorecard.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
6	It will be easier to perform my job well.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
7	Decisions based on the Balanced Scorecard will be better.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
8	The results of the Balanced Scorecard are needed now.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
9	People will accept the required changes.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	
10	The accuracy of information I receive will be improved by the Balanced Scorecard.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree	

11	The developers of these techniques don't understand management problems.	R	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
12	I will have more control over my job.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
13	The Balanced Scorecard is important to me.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
14	I need the Balanced Scorecard.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
15	It is important that the Balanced Scorecard be used soon.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
16	Individuals will set higher targets for performance with the Balanced Scorecard.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
17	Top management sees the Balanced Scorecard Project as being important.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
18	I will be able to improve my performance with the Balanced Scorecard.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
19	The Balanced Scorecard project is important to my boss.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
20	The use of the Balanced Scorecard will improve performance.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
21	The Balanced Scorecard project is technically sound.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
22	Others will be more aware of what I am doing.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
23	The information I will receive from the Balanced Scorecard will make my job easier.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
24	I will spend less time looking for information.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
25	PSU Goals will become more clear.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
26	Implementing the Balanced Scorecard will be difficult.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
27	The Balanced Scorecard should be put into use immediately.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
28	Top management does not realize how complex this change is.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
29	People will be given sufficient training to utilize the Balanced Scorecard.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
30	The Balanced Scorecard project is important to top management.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
31	My counterparts in other PSUs /departments will identify more with the PSU's goals.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	

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32	There will be adequate staff available to successfully implement the Balanced Scorecard.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
33	The patterns of communication will be more simplified.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
34	It is urgent that the Balanced Scorecard be implemented.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
35	I will be able to see better the results of my efforts.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
36	I enjoy working with those who are implementing the Balanced Scorecard.	R	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
37	When I talk to those implementing the Balanced Scorecard, they respect my opinions.	R	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
38	My counterparts in other PSUs /departments are generally resistant to changes of this type.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
39	The sooner the Balanced Scorecard is in use the better.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
40	My performance will be more closely monitored.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
41	Benefits of the Balanced Scorecard will outweight the costs.	U	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
42	My goals and the PSUs goals will be more similar than they are now.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
43	The PSU will perform better.	P	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
44	Personal conflicts will not increase as a result of the Balanced Scorecard.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
45	The developers of the Balanced Scorecard will provide adequate training to users.	S	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
46	The aims of my counterparts in other PSUs /departments will be more easily achieved.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	
47	My personal goals will be better reconciled with the PSUs goals.	G	Strongly disagree	Disagree	Uncertain	Agree	Strongl y agree	

(Note: Each question weights on a different factor as shown: P = performance; S = Support?Resistance; G = Goals; R = Client Developer; U = Urgency)

Appendix D .2   Section 2: Balanced Scorecard Use

Please circle the number on the scale below that indicates the probability that you will use the Balanced Scorecard Approach.

0	.2	.4	.6	.8	1

Please circle the number on the scale below that indicates the probability that other managers in your PSU will use the Balanced Scorecard Approach.

0	.2	.4	.6	.8	1
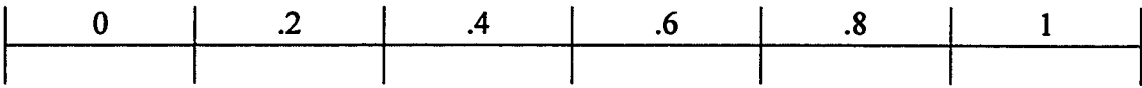
Please circle the number on the scale below that indicates the probability that Balanced Scorecard Approach will be
a success.

0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
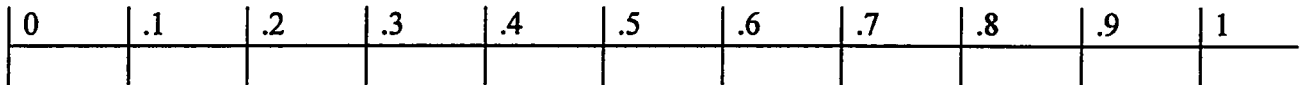
On the 10-point scale below indicate your evaluation of the worth of the Balanced Scorecard project.

0	1	2	3	4	5	6	7	8	9	10
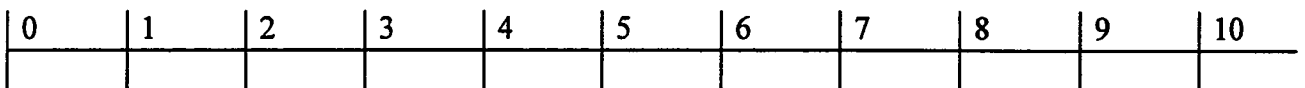
Appendix D .3   Section 3: Satisfaction with scorecard computer system

You are asked to read each question carefully and to circle one of the comments that describes most clearly how you feel about the question. Since the scorecard computer system is not fully implemented in each PSU, please respond as to how you expect it will perform when fully in place.

For example

1	Does the system provide the precise information you need?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always

indicates "Most of the time"

1	Does the system provide the precise information you need?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
2	Does the information content meet your needs?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
3	Does the system provide reports that seem to be just about exactly what you need?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
4	Does the system provide sufficient information?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
5	Is the system accurate?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
6	Are you satisfied with the accuracy of the system?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
7	Do you think the output is presented in a useful format?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
8	Is the information clear?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
9	Is the system user-friendly?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
10	Is the system easy to use?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
11	Do you get the information you need in time?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always
12	Does the system provide up-to-date information?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always

Appendix D .4   Section 4

Please provide further comment on the Scorecard Project in the following topic areas.

1. Which current improvement initiatives in the PSU have been encouraged or influenced by the Scorecard Project ?

_____

_____

_____

_____

_____

2. What changes in the methods of managing the PSU have resulted from the Scorecard Project?

_____

_____

_____

_____

_____

3. What do you think are the strengths of the Balanced Scorecard project ?

_____

_____

_____

_____

_____

4. What do you think are the weaknesses of the Balanced Scorecard project ?

_____

_____

_____

_____

_____

5. What other suggestions do you have for improving the Balanced Scorecard project ?

_____

_____

_____

_____

_____

Appendix E   Survey Data analysis

Appendix E .1

	Client/ Researcher	Goals	Performance	Support/ Resistance	Urgency	Global
Mean	1.06	0.45	0.52	0.45	0.54	0.56
- range	0	-0.44	-1	-0.27	-0.42	-0.36
+ range	1.67	1.11	1.08	0.91	1.25	0.94
S.D.	0.41	0.46	0.57	0.35	0.45	0.40
+ ve replies	16/16	13/16	13/16	14/16	15/16	14/16
+ ve replies %	100%	81%	81%	88%	94%	88%
90% CI	100%	69%	69%	77%	86%	77%

Global: Users are overall positive about the Balanced Scorecard implementation. This factor consists of all 47 questions. The mean score was 0.56 in a range from - 0.36 to 0.94. 14 out of 16 participants had positive scores (88%). At least 77% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence) .

Performance: Users feel positive about the effect of the Balanced Scorecard on their job performance and on the visibility of their performance. The mean score was 0.52 in a range from - 1 to 1.08. 13 out of 16 participants had positive scores (81%). At least 69% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence)

Goals: Participants feel that goals will be more clear, more congruent and more achievable. The mean score was 0.45 in a range from - 0.44 to 1.11. 13 out of 16 participants had positive scores (81%). At least 69% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence)

Support/Resistance: Participants report that the Balanced Scorecard project has adequate top management support, sufficient technical and organizational support and does not have undue resistance. The mean score was 0.45 in a range from - 0.27 to 0.91. 14 out of 16 participants had positive scores (88%). At least 77% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence).

Urgency: Participants feel the need for results, even with the costs involved. The feel that the Balanced Scorecard project is important to themselves, their bosses and to top management. The mean score was 0.54 in a range from - 0.42 to 1.25. 15 out of 16 participants had positive scores (94%). At least 86% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence).

Client Developer: Participants felt that the developers of the Balanced Scorecard understood management problems and worked well with them. The mean score was 1.06 in a range from 0 to 1.67. All 16 participants had positive scores (100%). 100% of users in the population would also have responded positively to the Balanced Scorecard implementation (90% confidence).
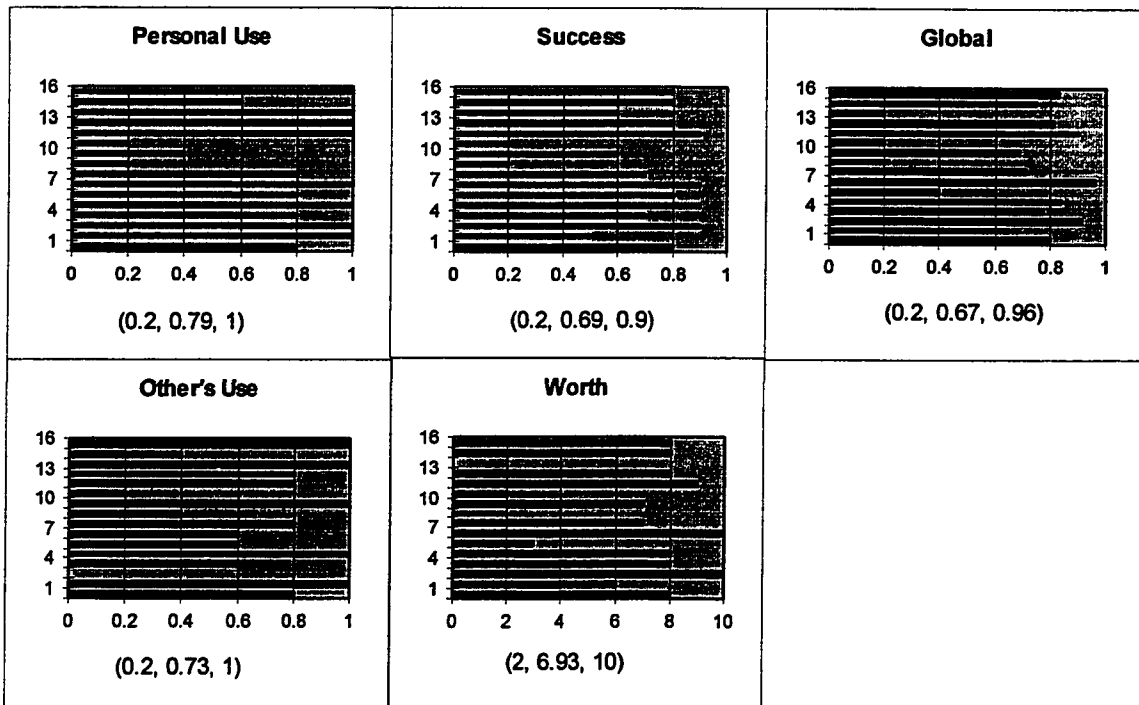
Appendix E .2

Personal Use
(0.2, 0.79, 1)

Success
(0.2, 0.69, 0.9)

Global
(0.2, 0.67, 0.96)

Other's Use
(0.2, 0.73, 1)

Worth
(2, 6.93, 10)

	Personal Use	Other's Use	Success	Worth	Global
Mean - all surveys	0.79	0.73	0.69	6.93	0.67
- range - all surveys	0.2	0.2	0.2	2	0.2
+ range - all surveys	1	1	0.9	10	0.96
S.D. - all surveys	0.29	0.25	0.23	2.52	0.26
+ ve % - all surveys	81.30%	75.00%	87.50%	75.00%	75.00%
90% CI - all surveys	68.80%	61.20%	76.90%	61.20%	61.20%
+ ve % Cognitive Support	100.00%	85.71%	100.00%	85.71%	85.71%
90% CI - Cognitive Support	100.00%	68.81%	100.00%	68.81%	68.81%
+ ve replies % Cardiovascular	62.50%	62.50%	75.00%	62.50%	62.50%
90% CI - Cardiovascular	40.60%	40.60%	55.40%	40.60%	40.60%

Personal use: the probability that you will use the Balanced Scorecard
Other's use: the probability that other managers will use the Balanced Scorecard
Success: the probability that the Balanced Scorecard project will be a success
Worth: respondents estimate of the worth of the project (on a scale from 1- 10)
Global   combination of the above scores

A high majority of participants (81%, 69% at 90% CI) report a high probability that they will use the system. 88% (77% at 90% CI) of participants think that there is a high probability that the scorecard project will be a success. 75% (61% at 90% CI) of respondents estimate that the Balanced Scorecard project is worthwhile (> 5 on a scale from 1-10).

Appendix E .3

Accuracy
(1.1, 3.04, 5)

Ease of Use
(1.1, 3.91, 5)

Timeliness
(1.1, 2.73, 5)

Content
(1.25, 2.82, 4.5)

Format
(2, 4.03, 5)
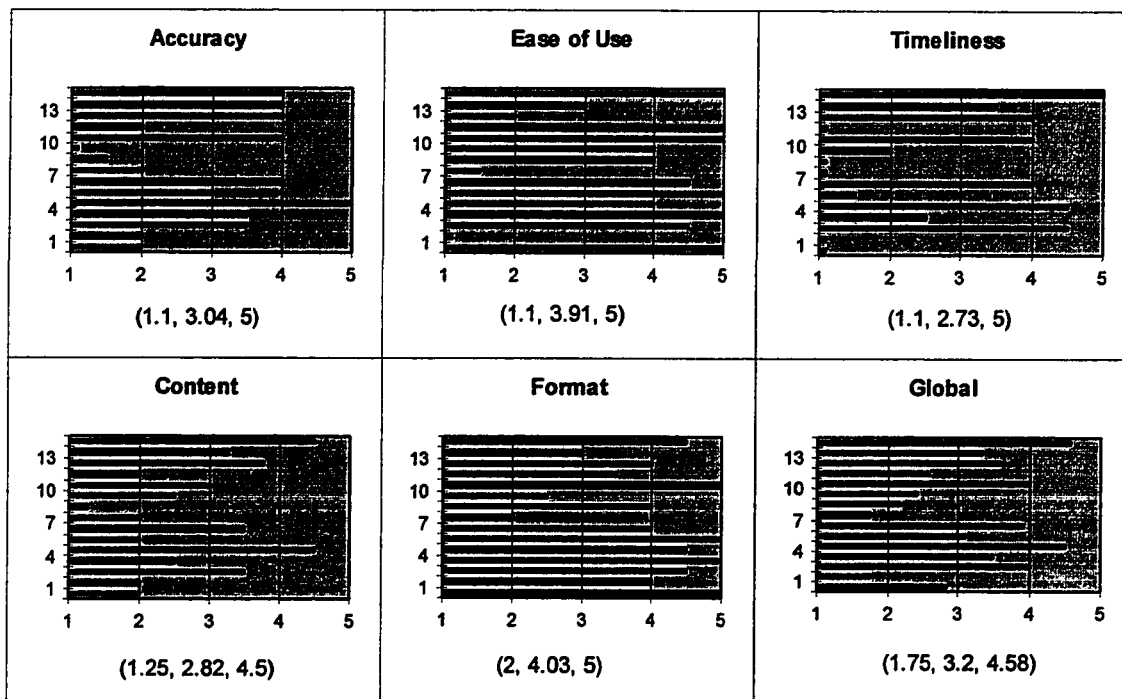
Global
(1.75, 3.2, 4.58)

Section 3 - All surveys

All factors have been scaled from 1 - 5

	Accuracy	Content	Ease of Use	Format	Timeliness	Global
Mean - all surveys	3.1	2.8	3.9	4.0	2.7	3.2
- range - all surveys	1.1	1.3	1.1	2	1.1	1.8
+ range - all surveys	5	4.5	5	5	5	4.6
S.D. - all surveys	1.2	1.0	1.4	0.9	1.5	0.9
+ ve % - all surveys	69%	47%	80 %	87%	47%	56%
90% CI - all surveys	54%	30%	67%	75%	30%	40%
+ ve % Cognitive Support	71%	43%	86%	100%	43%	71%
90% CI - Cognitive Support	50%	19%	69%	100%	19%	50%
+ ve replies % Cardiovascular	43%	43%	71%	71%	43%	43%
90% CI - Cardiovascular	19 %	19%	50%	50%	19%	19%

The results indicate that respondents are satisfied with the software (ease of use) and information display (format), but unhappy with the data (accuracy, content and timeliness.

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80% of sampled users (67% at 90% CI) are satisfied with the system ease of use and 87% of participants (75% at 90% CI) are satisfied with the format of the Balanced Scorecard graphs. 69% (54% at 90% CI) of participants are satisfied with the accuracy of the system.

Only 47% (30% at 90% CI) are satisfied with the content and timeliness of the data. These factors include the questions shown below:

1	Does the system provide the precise information you need?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	
2	Does the information content meet your needs?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	
3	Does the system provide reports that seem to be just about exactly what you need?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	
4	Does the system provide sufficient information?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	
11	Do you get the information you need in time?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	
12	Does the system provide up-to-date information?	Almost never	Some of the time	Almost half the time	Most of the time	Almost always	

Only 7 out of 15 respondents report that the system provides them with the information they need in a timely fashion 'almost half the time'. This is due to factors external to the Balanced Scorecards. Many of the source databases are not updated on a regular basis for a variety of reasons (lack of data entry resources, and database reorganizations) rendering the databases unusable. A major difficulty encountered during the project was to develop a mechanism to extract the raw data from multiple information systems on a regular basis and enter it into the scorecard. The development team did not satisfactorily resolve this problem at the time that the survey was done.

Only 7 out of 15 respondents report that the Balanced Scorecard provides them with the precise information they need almost half the time. This can be divide into several types:

Are the indicators the correct ones?.
Are the Balanced Scorecard indicators sufficient for PSU management needs - the vital signs hypothesis
Is there sufficient detailed information associated with the indicators

Appendix E .4   Comments

Current initiatives

The current initiatives which have been influenced by the Balanced Scorecard project are:

- Better understanding of existing gaps in pre-discharge education.
- Method of tracking patient calls back to the PSU following discharge from hospital
- Readmissions to PSU
- Same day admission
- Use of psychotropic drugs
- Activity Utilization and Staff realignment / allocation
- Waiting times for patient entry
- Geriatric Research

Changes in the method of managing the PSU are reported to be:

- It will influence the changes that will be made in the predischarge pt. education program following CV surgery. For example: more content for pre-discharge education will be emphasized in certain categories or themes [that] emerged from Balanced Scorecard data.
- Decentralization of ownership of data/results.

Strengths of the Balanced Scorecard project:

- Ease of access/usage; Fast access to information that is user friendly; the Visual display Analyze trends more easily; Summarizes data in a succinct and easy to understand manner; User friendly.
- The ability to identify key areas to "challenge" and make clinical adjustments; the ability to track changes in practice;
- Correlation of costs/events/circumstance [for] decision making [and for showing] the implications of decision making;
- Gets people thinking about the impact of various elements on customer service and quality; Ability to put things in perspective, ie, reasons for increasing length of stay, specific time periods, increasing nursing costs etc; Provides a focus for discussion to determine goals and objectives;
- Fits with CQI methodology
- More consistent $ concise approach to data collection. ; More visible method of tracking large volume of data.

Weaknesses of the Balanced Scorecard project :

- Old data; inadequate data available for data collection; Unless there are people to continuously update data, it quickly becomes out of date, Time consuming to help update
- Support for the data collection process was not built into the initial plan. Finding instrumental support for this aspect after the project was initiated was somewhat problematic

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- Depends on defining indicators well, Useful data is difficult to collect, defining on what is "useful" - determining appropriate indicators; inappropriate indicators,
- Requirement of ongoing, accessible data - some important indicators are not easily monitored on an ongoing basis
- Slow to implement,
- Not widely known in the organization; Physician not aware of need to track areas in such of the 4 quadrants
- Scorecard results are not up to date, when project is finished will IS have resources to support the databases.
- On 2 occasions, data entry had to be delayed due to problems with program
- Accessibility for all staff, 2) Validity of data, 3) Keeping database current
- The information is not current or accurate in all instances.
- Data sources - really beyond control of Balanced Scorecard group, we have a totally inadequate information system.

Suggestions for improving the Balanced Scorecard project include:

- Access to more current data.
- More education and promotion, 2) Regular update on data,
- Describe relationship to services, ie. changes in clinical protocols as a result of the BSC information.
- Focus on it as a tool to develop objectives rather than evaluate performance of individuals. Not one individual can possibly be responsible for an indicator.
- Information must be current and accurate.
- There should be a corporate balanced scorecard and PSU scorecards should support/reflect the corporate goals.
- Implement a patient tracking system, eg. Care Net

Stakeholder groups are not homogeneous. PSU management comprise senior PSU directors and front-line managers. Sunnybrook Information services includes the Chief Information Officer as well as the Scorecard development team.

Appendix E .5   Biases

Potential bias	Description	Remedy
Statistical representative ness	The sample was not randomly selected. The sample is not normally distributed. There is no evidence that the population is normally distributed. This group is not a statistically representative sample of all PSU managers	The team has not statistically inferred any characteristics from the sample group to a user population. The team used descriptive techniques for analyzing and presenting individual factor data as well as aggregate data.
Small survey census size	The evaluation survey was completed by about 16 managers out of a population of several hundred.	This sample group, which includes the senior PSU managers as well as the most active front-line managers, and constitutes a purposeful, information rich, adequate sample of the population of managers at Sunnybrook who could have used the Balanced Scorecard project over the past three years.
Selectivity bias	The prototype PSUs agreed to be part of the Balanced Scorecard project. This implies that the sample PSUs were predisposed to succeed.	A Balanced Scorecard project could not be done with a group of managers who did not embrace the concept and agree to the considerable amount of work involved in the project. This then restricts the size of the potential Balanced Scorecard user population, but does not imply that the sample is biased.
Selectivity bias	The Cardiovascular PSU, site of the first Balanced Scorecard prototype, has a well developed management structure, a data driven culture and a great deal of electronic data. These factors made it more likely to succeed.	In later prototypes, the Balanced Scorecard development team deliberately chose to implement prototypes in some PSUs which were known not to have good data or easily quantifiable strategic objectives. The implied extreme case sampling means that the development team has tested easy and difficult cases. Conclusions are

		probably applicable to the more 'typical' PSU which lies somewhere on this care spectrum.
Failure to clearly specify and control the nature of the treatment	Other initiatives apart from the Balanced Scorecard have occurred in the PSUs. There have been external and internal effects which may have affected the Balanced Scorecard development teams.	The objective of the project was specifically to understand the Balanced Scorecard in a natural setting rather than a controlled environment. The evaluation methodology reflects this context sensitivity.
Non homogeneous management groups	The unit of analysis was the management group rather than the individual PSU managers comprise senior directors and frontline managers and are not homogeneous.	This is mitigated by displaying descriptive data and addressing discrepancies between individual results.
Team changes over time during the course of the treatment	PSU leadership and their management team composition have changed over the course of the prototype. This is more pronounced in the longer running prototypes. There was an additional problem of new managers having to agree to strategic objectives and associated measurements defined by their predecessors.	The team made efforts to keep all managers educated about the Balanced Scorecard project.
Outcome criteria are vague	It is unclear what constitutes a successful Balanced Scorecard project outcome. This also implies that the outcome measures are non standardized, nor may they be the same across PSUs.	The team chose an inductive evaluation paradigm in which theories are built rather than a deductive methodology in which predefined theories are tested.
Evaluators have deep personal involvement	The evaluators are drawn from the Balanced Scorecard development team who clearly have a vested interest in the successful outcome of the evaluation. This introduces the possibility of selective perception and bias in the observations.	Triangulation and rich data collection mitigate these effects. Triangulation is the process of cross validating data from a variety of individuals and settings. Multiple sources and multiple methods increase the robustness of results. Collecting rich and detailed data makes it difficult for the evaluators to see only what supports their prejudices and

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		expectations.
The evaluation is to be used for formative purposes	Feeding the results of the evaluation back into the development process may bias either the subjects reporting or the evaluators perceptions or both.	This effect may cause more extreme results. Management groups who like the project were expected to report more positive results in order to ensure that it continues. Conversely, management groups were expected to report more negatively on questions where they thought they could influence change. Rich data and the solution of puzzles mitigate these effects.
The survey instruments were not designed for this specific setting	The changes to the tools, together with the different setting, may invalidate the previously established psychometric properties of the instruments.	The survey tools were customized as little as possible. Validity was improved by triangulation.
Possible reactive effects	The respondent's knowledge that they are being evaluated could have introduced a halo effect.	Triangulation and rich data

Appendix F Focus group Interview guide

We'd like to use the first part of this session to elicit your perspectives of the Balanced Scorecard project in your PSU. Some of the BSC projects are very advanced such as the Cardiovascular PSU and others are just getting started such as critical care. Other is this group have been introduced to the concept, but are not yet involved in Balanced Scorecard implementations. We feel that the diversity of this situation is a positive aspect of this focus group.

During the course of this session, we'd like to explore three main themes:
> the Balanced Scorecard concept
> implementation
> and outcomes

We are looking for a rich cross section of perceptions, feelings and opinions about the Balanced Scorecard concept, its implementation and its outcomes.

The objective is to find out what the Balanced Scorecard project looks like and feels like to your PSU. What are your PSUs experiences and your PSUs expectations? What changes do you perceive in your PSU as a result of your involvement in the project. At the end of this part, we'd be happy to answer any action oriented questions that you might have.

Introduction (15 min)

We'd like to set the stage by going around the circle in an introductory way. Briefly introduce your association with the concept and if applicable, the Scorecard projects in which you're involved commenting on such things as PSU name, length of time you've been working on the project and mention one or two key indicators.

BSC Concept (30 min)

Before we into details about specific implementations we thought it would be valuable to hear your opinions about the BSC concept.

1. *(Hand out BSC diagram)* What do you think about the value of the four quadrants as a measurement system?
2. *(Hand out feedback diagram)* What is your opinion about the BSC feedback model as a management system ?
3. What do you think about the idea of a limited number of 'vital signs' which help you understand the health of your PSU
4. *What are the strengths of the BSC concept?*
   What are its weaknesses?

5. Before we move on to a discussion about the outcomes, what other thoughts would you like to share about the concept of the Scorecard

BSC Outcomes (30 min)

1. One of the things we'd like to understand better is how the BSC project helps the PSU achieve its goals ?
    > enhanced definition of strategic direction and objectives
    > improved monitoring of progress towards goals
    > more reliable and rapid problem solving and initiative

2. How has the BSC changed your PSUs managers collective team performance ?
    > individual managers performance?

BSC Implementation (35)

The implementation process consists of introducing the BSC concept to the PSU, defining a list of indicators and then working consistently with PSU members to develop and use each indicator in successive prototypes.

1. What are the strengths of this implementation process ?
    What are its weaknesses ?

2. How would you describe top management and organizational support for the BSC project?
3. What is your opinion about the U of starting or continuing this project in your PSUs?
4. What is your opinion about the effectiveness of the BSC software
    > timeliness, accuracy of data,
    > user friendliness, functionality ?
5. This next question may be difficult to answer. Nevertheless, we'd like to get your thoughts on it. We'd like you to comment on the way in which the development team has worked with you.
    > How would you describe the development team's understanding of the issues that are important to you and to your PSU managers?

Closing questions (10)

1. What is your overall assessment of the Balanced Scorecard project? Please tell us about your feelings.
    > *(ROI)*

2. What other subjects would you like to discuss before we conclude ?

Appendix G   Balanced Scorecard Evaluation Code Sheet

Theme	Subtheme	Code	Subcode
Concept	The usefulness, value, strengths, weaknesses of the:	CON	
	Four quadrant idea		4Q
	Feedback model		FEED
	Vital signs analogy		VS
	Flexibility scalability		SCALE
	Multi level scorecards		MULTI
	Drill down to detail		DRILL
Outcomes	The usefulness, value, strengths, weaknesses of the scorecard in helping the PSU:	OUT	
	align and achieve its goals		GOAL
	improve team performance		TEAM
	improve manager performance		MGR
	improve its mental models of PSU functioning		MODEL
	Provides a framework		FRAME
	Integrating feedback and action		ACT
Implemen tation		IMP	
	Process and chronology of developing the scorecard		PROC
	Top management and organizational support / relationship to the scorecard		SUP
	U in implementing the scorecard		URG
	Relationship between the PSU and the developers		DEV
	Critical events in the scorecard development		CRIT
	Cultural attitudes and values		CUL
	organizational context		ORG
	Interactions with other initiatives		INTERACT
	Efficiency for information development		EFF
Software /Data		SOFT	
	Effectiveness		EFF
	Timeliness and accuracy		ACC
	User friendliness and functionality		USER

Appendix H   Focus group response by theme

Theme	Quote	Us	Pg
Current users of the scorecard are very positive about ability of the Balanced Scorecard concept to ask as an integrating force,	•The Balanced Scorecard summarizes a lot of innovations in management, no theories, but management direction, customer service... and quality	D	19
	•For me, it helped to integrate a lot of things that were happening all at once	F	19
	•Having the four quadrants and ..trying to link them is certainly better than the old Quality Assurance	F	21
	•The idea of the balanced scorecard seems to involve not rejigging everything in order to fit a method	S	4
	•The benefit of the scorecard is that it provides a framework for thinking about the many different parts of the work that we do	J	5
	•When we started in [ ] PSU, it was like a blank page and I didn't see the relationship between the objectives. I think that tool a while to learn	L	19
	I mean the scorecard project is really major in terms of what it does to the morale of the group working together	F	38
Participants like its ability to balance organizational focus	•It gives you a nice framework for talking about ...the balance...in terms of finances and how they effect patient care	L	12
	•...if you are always driven by money.....at least you can talk about your concerns and what might happen	L	12
	•It just helps people think about different kinds of outcomes, that we may want to have and not just focus on the financial	J	5
	•The emphasis is survival in this economic time. The question it seems to me for this group is whether these two things [patient focused care and cost reduction] can be balanced. I think that the group generally believes that it can and the question is how do you do that. It may very well be that the something like the Balanced Scorecard is something you want to spend money on	F	31
	•The key for me was that it focused the thinking in terms of having to balance. So its the balance that is the issue, not the scorecard		
Participants like its ability to focus discussions in important areas	•The sense of who the customer is, was a really interesting discussion.	D	5
	•If you chose to develop some indicators for your work redesign, you can put them on the scorecard just to keep them front and center, to monitor what's going on.	L	5
	•It allows you to ask questions with a lot of people sitting around		
Participants like its ability to focus action in important areas	•We found a framework which allowed us to begin to talk about this stuff and the consequences are that people are looking at it and will do something about it.	S	34
	•...you look at an indicator and you figure out, oh we have got a problem here, so let's do a CQI project around that problem. It does mean that you know your CQI project is going to be relevant to you because you know it is going to impact on one of your indicators.	G	26
The process of developing scorecards in an ongoing fashion	•I think that [the Balanced Scorecard framework] helps build that common vision... or common understanding of what you are doing	F	16
	•We didn't use to have those forums [discussions generated by the scorecard framework]	F	19
	•Developing the scorecard and ongoing discussion about it allows.... some	F	19

helped participants articulate a common vision with their management team	education and clarification of concepts which is good. There are so many things that have come on the scene in the last three years, it's a way to bring them together. For me, it helped to integrate a lot of the things that were happening all at once. •[The scorecard project] has generated lots of discussion that I think is so valuable that I wouldn't want to stop it.	L	38
There is value in limiting data to the highest priority highest value indicator information and recognition that this is a limited view	•[The limited number of indicators offered in a scorecard] is all you can really handle within a PSU. You can't handle endless limits. You don't have the facilities, the capability to keep measuring everything. You have to prioritize before you can do that.	N	16
	•What will give you the most leverage? I get hundreds of pieces of data, all kinds of data. Most of it I can't deal with it, its too much. So let's look at the leverage.	T	16
	•You can identify the things that are most important. It will never be the entire picture when you are just looking at the numbers.	F	15
	•If the blood pressure goes up and the pulse goes down, you have to look a lot further to know if the person is going to live.	F	15
	•I don't think that …that will give us the answer, but it does tell you to look if things are changing	L	6
The scorecard project provides a data collection mechanism and value to existing data	•When we did the [ ] project, we had to collect the data. It was incredibly data intensive. It was a lot of hard work.	D	4
	•Well son of a gun, when we started to do the scorecard, it looked like, even though not perfect, there were some data elements we were collecting and we just didn't have access to them before. So I think that it was a real eye opener.	D	4
	•The Balanced Scorecard has been very very meaningful…We would never have had that information before.	M	10
	•What it did was focus energy in that area and put a structure around having to measure it, where formerly you might put some kind of innovation In place, but not really put anything in place to track it or measure it. It really accentuated the need to monitor how well you are doing something and then decide whether you are going to do it ongoing or drop it and adopt something else.	D	8
PSUs feel committed to the scorecard project	•We've spent a lot of time investing in this…We've done training, its part of our culture now	F	14
	•I think to lose it …would be a big step back	D	38
	•The PSU will think that they have lost something	D	38
	•Dreadful. Its sort of losing support for the changes the organization is trying to make. I am absolutely serious.	S	38
	•No I don't want to stop it	F	38
	•Stopping [the scorecard project] is ludicrous. I mean there is an outcome here. You are getting something, so you need it.	F	38
The scorecard is a communication tool both upwards and downwards	•I have also been using it with staff to make them understand some of the financial things as well as the patient focus and that we are trying to look at both sides.	F	13
	•I believe that the scorecard has been educating senior management	F	12
The method is applicable at all levels of the organization	•We need to comment on the fact that it can deal with different sizes of PSU's. There is flexibility. You can focus in at different levels in the balanced scorecard. I think that is a real plus.	E	9
	•As you get on with the big work of redesign, just use the scorecard for [a] piece of your PSU	F	39
	•[It] is one little component of the PSU, but as a program, it could really	F	38

	benefit from this structured framework.		
There is confusion about Sunnybrook's key corporate directions and its long term commitment to them. The idea of a corporate scorecard is strongly supported as a means to understand the balance of priorities	•I think that the constant change in what is valued at the corporate level is a real issue.	W	11
	•I think to me the key issue is that in fact whether they may say so or not, the actual vision of the hospital changes from year to year and what it is committed to. That's where we run into major issues because you know three years ago it was the customer. But I think more and more it's the customers of corporations as opposed to a customer as a patient. So the issue to me is that what's really important, what is being valued, what is given attention to.	T	10
	•The hospital still has to give some direction as to what the major activities and directions are	F	12
	•I think it is a good communication tool upward right now and if the whole organization got into the concept, we might all be talking some of the same stuff.	F	12
	•I think that its up to the PSU to make certain that it's looking at the things that it believes are most important at whatever point in time and those things may change.	F	15
	•It seems to me that we have gone from a very hard nosed pushing from the top for patient focus to now looking at the finances, because that is the critical thing and shift is a shift of emphasis.	S	11
	•You interpret at the PSU level. What does that [corporate] direction mean for the program and the patients you work with	F	12
	•The corporate objectives need to be refined a bit more	L	11
	•In my mind, there is potential for developing a corporate Balanced Scorecard that translates the strategic direction of the hospital	F	9
Major components of the scorecard methodology	•I think picking the right indicators is a crucial piece	F	21
	•We assigned responsibility for each indicator to the most appropriate person so that different members of the PSU have the responsibility of monitoring the information and for investigating variances	L	5
	•... having an individual responsible for an indicator is a really helpful idea	F	27
Non users of the scorecard are confused about how it is used in practice	•What questions did you ask to get at the right indicators?	T	21
	•...I wasn't sure of ... how the indicators were going to fit with a lot of other things were are doing within the PSU	M	3
The scorecard should not become a fad that fades as the next fad becomes fashionable	•I don't see it as an ideology. I see it as a tool. [The data was either inaccessible or it was presented in a format that made absolutely no sense. So I just see it as a tool. The organization is committing resources to make some of those elements of data you could use available.	T	13
	•I would hate it to end up as being another shelved project as we move on to yet another way of collecting data or another quality improvement	F	12
Balanced Scorecards must be flexible	• If you lose that flexibility of being able to change what things are critical, that you need to measure, then I'd be worried because I think that changes the effect of the tool.	F	15
Different PSUs have different attitudes towards data. PSUs must buy into the concept of management by data	•We are not very data driven	W	2
	•Historically [ ] PSU is not very data driven	T	2
	•It's absolutely imperative ...[that] staff buy into the concept of any kind of data driven analysis that would effect their practice or effect how the units operate	W	2
	•The education about the scorecard was definitely important	W	33
Scorecard indicators are sometimes	•We don't really know what it is that we are measuring...I think it helps to develop that common understanding of what is it that you are looking at	F	25

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complex. They need to be collected for some time before targets are set or CQI processes started	and then set the target •There is no target for that particular indicator...We are now integrating the information we learned ...into a quality improvement process that is going on at the [unit] level	L	26
	•How to convert [the indicator] into what it means and what we can do about each one of the units remains the outstanding challenge.	W	3
Data must be timely and accurate. Timely means last corporate period (or quarter) and the preceding 6 months	•It has to be accurate and timely	W	42
	•I don't need to get back huge numbers of years.....the most recent [I need is] the last corporate period....[going back] six months for me	F	42
	•The data should be as least as timely as the Clinical Utilization Reportreport	F	43
Drill down into detailed data is essential to solve problems. High level trends indicate where drill down must be done	•I am still looking three weeks later, because you have to keep digging, digging, digging to understand what's going on. The Scorecard has a complications [indicator, but] that just gives you a trend, then you have to get down into the specifics and find out which complications and you have to get the clinical people involved to do some analysis. The whole explanation... may be related to another innovation...	L	6
	•You drill down, you drill down, you drill down	W	26
Users appreciate the software ease of use	•So it is data that everybody can access, no matter how in depth their technological skills are.	W	3
	•One thing that makes the scorecard from a management perspective is the way it is presented and the ease of access. You know its so revealing wen we don't have to scan...reams and reams of paper	W	20
	•I certainly like it online. It drives me nuts that Finance is not online for me to view. I have to have all of these pieces of paper to go through.	F	3
	•...the interaction, the ability to drill down right there is a lot more fun than flipping through a piece of paper	F	16
The Balanced Scorecard facilitator role is valued for scorecard novices. Participants who have been through one scorecard feel that they could do another without a facilitator. However, an external person who can facilitate the group dynamics is valued. Facilitation does not include sourcing data which is definitely a non PSU role. Facilitators also need	•Certainly I [a non Scorecard user] don't feel that I have the capability to do anything [without a facilitator].	F	22
	•The concepts aren't what's difficult, its the dynamics. I don't think that I would want to do without a facilitator	F	23
	•People who have been through it probably could go through it without a facilitator the next time	F	22
	•Surfacing the issues is sometimes difficult for you to do in your position	S	23
	•It always helps when you have somebody external there, I think, to help facilitate what's going on and to have somebody that you can bounce ideas off of.	F	28
	•It's just probing the conversation and trying to get people to focus, that's the skill	L	33
	•I might be able to facilitate a discussion about what's important and what do I want to know, but you need that IS backup to know whether it is possible. I don't want to do the work about where do I get the information and whether it is available.	L	22
	•We could manage without [a facilitator] resource, but I can't manage the information part, the computer part.	T	30
	•The technological piece lead[s] to IS and in my mind there is no one else who could do that. Then there is the facilitation piece...Maybe somebody else could facilitate [it]	T	32
	•The ...PSU is so large, it has been quite a challenge to come to which CMGs [to measure]	E	1

to understand CQI data analysis techniques (pareto analysis, histogram etc) Conversely, the link into the PSU is perceived by both managers and developers to an important medium for really understanding the PSU business.	•We started providing more services into the PSU and becoming the PSU link with IS. I think that was another valuable thing to come out of this. •[Non clinical people] often don't understand clinical priorities and you don't understand the clinical business. I think what you learned on your side from doing this work is incredible valuable	G S	35 35
There is confusion about the roles that different decision support groups play. There is support for decision support to be decentralized to PSUs	•The total resource used for data and information should be looked at. Look at the whole picture. •There's lots of resources here that are sort of spread out all over the place and quite fragmented. •The other way is to decentralize the resources so in fact they could serve the PSUs better •...I feel very confused about the [roles and resources] between [the Scorecard project], [Decision Support] and the information managers •I was having a conversation about [IS supporting the PSUs] last week....how they connect with us in terms of working together. I think that's a really critical issue and I think its the same thing for Finance	F S T F	31 32 32 35
Negative aspects include perverse incentives, gaming the data and inappropriate actions	•You get a lot of perverse incentives regardless of the system that you choose •You made a point that this is not a witch hunt. That would be misusing [the balanced scorecard] •You always find data to defend [your position]...And you will do things not to report it.	S W T	17 18 18

Appendix H .1   Analysis Methodology

[ ] show that a phrase was not included in the original utterance. It has been added to indicate context

... shows words have been left out of the original utterance

In both cases, the investigators have made an effort to retain the original intent and context of the utterance and only to enhance meaning or preserve anonymity.

Appendix I Cardiovascular PSU Objectives in Balanced Scorecard format

Category	CVPSU Objective	Measure	Target	Responsibility	Initiatives
Customer satisfaction	Improve access to catheterizations and reduce waiting times	Number of catheterizations per month New funding Waiting time	New catheterization lab operating and funded for X cases per month All catheterization patients waiting time below PACCN recommendation		Scale new catheterization lab operating times to full capacity within 6 months
	Improve access to cardiac surgery and reduce waiting times	Number of cardiac surgeries	160 cases more than 1995 funded level		Decrease ICU and ward LOS to accomodate increased volume
	Improve secondary prevention capability		Secondary prevention clinic open and operating; research started		Develop and get research proposals funded

Internal excellence	Improve patient flow and care	Number of care maps developed and used	Care maps for:
			  acute MI
			  Emergency chest pain
					MI care map team
					Emergency chest pain care map team (cross PSU)

	Improve patient coding	?	?		Coder presentation to cardiologists, cardiac and vascular surgeons Compare month to month changes
	Decrease pacemaker ALOS	# pacemakers implants done as day surgeries	70 % ?		Develop same day admission procedure for pacemaker implants in catheterization lab
	Reduce length of stay	number of same day surgeries	30%		?
Operational	Maximize efficiency				Develop PAA role

restructuring					
Financial viability	Reduce costs of main CVPSU procedures	Procedure costs of diagnostic catheterizations , PTCAs, Pacers, CABGs:	Procedure costs of diagnostic catheterizations: $, PTCAs: $ Pacers:$ CABGs: $ (or % reduction instead of actual dollars)		Develop a common database Develop a Balanced Scorecard mechanism to compare costs year by year
Innovation Measurement	Improve access to relevant management information	Balanced Scorecard Indicator development	Scorecard complete One year baseline data collected		Complete 4 th prototype of Balanced Scorecard
	Patient focused care				

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