VICTORIA UNIVERSITY OF WELLINGTON

GRADUATE SCHOOL OF BUSINESS AND GOVERNMENT MANAGEMENT

WORKING PAPER SERIES 6/92

Customer-oriented strategic information systems

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June 1992

ISSN 0114 7420
ISBN 0 475 11450-7

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ABSTRACT

A major problem facing Information Systems (IS) managers is how to plan for a new corporate environment that is emerging as the result of increased competition, both national and international. The changes that have been brought about have been dramatic and far-reaching. Nowhere does this impact more than in application of information technology (IT) to corporate activities. In particular, the IS manager needs to be able to plan for systems that support the current emphasis on providing improved products and improved customer services. The accent is now on the development of "strategic" information systems (SIS), positioned so as to gain a "competitive advantage" (CA). However, the current planning models do not adequately explain how one goes about developing a plan for a "customer-oriented" strategic system.

This paper attempts to redress that omission. A start is made with a manufacturing model which is modified slightly to be customer-focused and in a form more familiar to IS people. The potential IT opportunities inherent in the various manufacturing processes are then highlighted as the manufacturing sector struggles to maintain its competitive position. A transition is then made from the manufacturing environment to an "information factory" environment. The result is a model that can be usefully used for developing an IT plan and especially as an aid in the planning of customer-oriented strategic systems.

KEYWORDS: Strategy, information systems planning, competitive advantage, customer-oriented systems, manufacturing systems

Customer-Oriented Strategic Information Systems

1. INTRODUCTION

It is almost impossible to pick up a business section of the newspaper, without finding some reference to the organizational restructuring now going on. The changes that have been brought about to the corporate organizational form have been dramatic and far-reaching. Nowhere does this impact more than in the application of information technology (IT) to corporate activities.

The problem facing Information Systems (IS) managers is how to plan for this new environment, and in particular, how to plan for systems that support the current emphasis on providing improved products and improved customer services. In response, the accent has been on the introduction of "strategic" information systems (SIS), often positioned so as to gain a "competitive advantage" (CA). In responding to this environment, various authors have proposed models that have a market or customer orientation. Several of these are presented in this paper. But these and similar models do not adequately explain how one goes about developing a plan for a "customer-oriented" strategic system.

This paper attempts to redress that omission. A start is made with a manufacturing model that is modified to be customer-focused and in a form more familiar to IS people. Then the IT opportunities within that model are explored. Finally the leap is made from the manufacturing environment to the "information factory" environment. The result is a planning model that can be used in approaching and developing the planning process.

2. THE CHANGING NATURE OF THE FIRM

2.1 Why Firms Have Restructured

The common buzz words encountered with regard to business restructuring are *downsizing* (or *rightsizing*) and *disaggregation*. Why are these conditions occurring?

Basically, according to Powell (1987), the "system" is crumbling in the face of competition and, for the United States especially, in the face of international competition. Firms are being refashioned in a "lean and mean" manner. The original argument for vertical integration, with the US automobile industry providing a classic example, was that the stability sources of supply could be guaranteed during periods of peak demand. Under the vertically integrated regime, the automakers rigourously inspected supplier facilities, including quality control procedures (but still inspecting incoming goods as they were delivered), cost data, and management quality and depth.

This degree of vertical integration led primarily, in Powel's view, to three failures:

- an inability to respond quickly to competitive changes (i.e., inflexibility);
- a resistance to process innovations (in part because of the pursuit of a strategy of cost minimization); and
- a systematic resistance to the introduction of new products.

Further, under the arrangement, supplier firms had little incentive to innovate, update equipment, to suggest technological changes or to make long term plans.

The perception is now that fast response to client and customer needs is best provided by smaller firms - or flat decentralized ones - not the large ones with multiple layers of hierarchy. There is the increased use of *outsourcing* to firms with a lower cost structure for particular goods or services (even to low wage areas), and there is an increased reliance on collaborative ventures in R & D, development, production and marketing. In the textile industry, for instance, there is now a perception that the more distinctive each firm is, the more it depends on the success of other firms' products that complement its own. The emphasis is on *strategic partnerships*, with firms seeking to combine their strengths and overcome weaknesses in a collaborative effort that goes much broader and deeper than the marketing joint ventures and technology licensing that were used in the past.

The vertical disaggregation has meant that firms are now smaller, and are moving away from strongly centralized organizational structures. The removal of levels of hierarchy, and the establishment of such organizational forms as autonomous units, new venture groups and the like, has allowed firms to look at risk taking from a different perspective and to speed the information necessary to make rapid decisions.

But the restructuring process is not limited to the firms themselves. There has been a fundamental change in the way in which work itself is done. And as Scott Morton reports in his introduction to the book "The Corporation of the 1990s" ("MIT90s") (Morton, 1991), much of the change has been brought about through the use of IT. In fact the amount of change that occurs is seen to depend on the "information dependency" of the work. Examples where the nature of the work has changed include:

- *Production work* including robotics, process control instrumentation, intelligent sensors; information production related to accounts receivable and accounts payable; and CAD/CAM environments.

- *"Coordinative" work* where distance is effectively irrelevant for information flows; time-critical operations are routine; and where an "organizational memory" is maintained through a common data base.

- *Management work*: for direction, i.e., sensing changes in the environment, staying in close touch with the organization, and where timely changes are important; and for control, i.e., measurement, especially with CSFs, and the interpretation of measures against the plan.

From the viewpoint of the current study, an important additional finding in the MIT90s study is that *the successful application of IT will require changes in management and organizational structure.* Thus, "IT permits the distribution of power, function and control to wherever they are most effective". Likewise the unit costs of coordination are falling.

The above has important implications in terms of management structure. One result of downsizing is the substantial loss of middle management positions. *Business Week* estimates the loss to be in excess of 2 million persons since the mid-1980s. Losses have been in both line and staff management positions.

Emery (1992) reminds us that the line manager "makes decisions and coordinates the actions of subunits", while staff "perform the specialised tasks needed to support line activities". Staff also perform certain control functions - internal audit, compliance with labour laws, etc. (The reason for having staff in the first place is so as to gain efficiencies by not duplicating activities in each functional area.) But Emery observes that decision-making and control functions performed by middle management can inhibit creativity and initiative at lower levels. For instance the act of coordination

inevitably introduces delays. Middle management also tend to filter information coming from above or below.

Emery sees the real question as being whether the middle manager adds sufficient value to justify the costs involved - not only salary, but also the cost associated with the penalties of restricting the freedom of action of lower-level units. Clearly many firms think not. The trend is thus to move to new organizational forms, with responsibilities pushed much nearer the firing line. It is expected that restructuring will be accompanied by (actually preceded by) the simplification of essential processes which will, in many cases, be integrated across organizational lines. Then, after restructuring, decision aids will be embedded within the information system, perhaps with electronic mail and teleconferencing to support dispersed collective decision making, plus widespread access to shared databases to avoid the limitations of hard hierarchical links.

2.2 The Hybrid or Network Organization

Rockart and Short (1991) provide a caveat to the restructuring process discussed in the previous section:

> "We have tended to build large and complex organizations to produce multiple, integrated products and services. Then, using the same organizational form, we have tried to streamline and simplify the firm's key processes to enable flexibility and responsiveness to local market needs." (p. 191)

They go on to extol the advantages of the so-called "networked" firm:

> "The attractiveness of the networked firm as such is that by adding IT as a design factor, we may be able to design firms that can simultaneously increase size, complexity, and responsiveness." (p. 191)

The essential element of the *networked organization* is the presence of multi-disciplinary teams (Norton, 1987). These teams cut across the formal functional lines of the organization, are fluid, and come and go as issues arise and are resolved. Often teams involve members of another firm - a strategic partnership. The seven key attributes of the more networked approach are seen to be shared goals, expertise, work, decision making, timing and issue prioritization, responsibility accountability and trust, and a shared recognition and reward (Rockart and Short ,1991).

The nature of the management task has changed as a result of the move to the networked structure. There is seen to be a need to focus more on people-oriented roles, with the key being to coordinate work across suborganizations through direct contact, liaison roles, task forces and, of course, teams. The effort goes towards managing interdependence, for instance, product engineers and product designers. In firms that practice it, the team approach is designed to bring as much knowhow as possible into the design and production of a product or service, as early in the life-cycle as is possible.

3. POSITIONING IT - A CHANGE IN FOCUS

Over the years various writers have grappled with problem of "positioning" IT activities within the firm. In the days of the "fortress computer centre" this was relatively easy. Now, however, the new organizational structures dictate that computing power be dispersed throughout the organization. But the key IT management task is to allocate its resources so as to provide a satisfactory level of

support as the firm copes with the task of becoming more competitive. Coupled with this is the difficulty associated with justifying a given investment when any future payoff is inextricably intertwined with other actions the firm may take.

The approach traditionally taken is to present senior executives with a "model" or "framework" of the potential use of information technology in the organization. This framework then acts as a talking point or focus for discussion for the usage and potential payoffs associated with possible programmes of action. Executives are encouraged to "match" a chosen model against their organization, with a view to obtaining the "best fit", both in terms of business circumstances and the degree to which they can "relate" the model to their own organization. In some respects the use of such models results in "planning by example".

Associated with the development of the various models has been a concern that the IT plan will be *aligned* with the corporate plan. Over the years there has been considerable difficulties in achieving this. Numerous reasons have been given; the following are broadly based on Lederer (1988):

- There may be lack of awareness of IT within top management;
- Computing is seen by them in strictly operational terms;
- The IS function has a credibility gap, in part because previous systems failed to live up to expectations;
- Top management demands financial justification, which may be difficult to quantify for strategic systems.
- Top management is more interested in short-term results and may not be prepared to invest in strategic systems.

The opportunities to counter the above problems may include:

- Establishing an education programme for top management. This is may be on a one-to-one basis, together with presentations, seminars, white papers on strategic impact, circulation of published papers. etc.;
- Have a champion for the project;
- Establish systems that respond to outside (i.e., customer) forces;

In line with this last point, Lodal and Redditt (1989) emphasise that the *focus of IS should move from improving internal efficiencies to directly delivering products or services to the customer*. This may involve dispersing IS resources so that IS staff report directly to business managers. Brophy and Monger (1989) found that many expectations for IS for competitive business advantage remain unmet, with many managers reporting their concern about the long lead times necessary to implement technological solutions. The result is that long-term technology investments are frequently ignored because of the time lapse before a benefit is realised.

3.1 Models for Market-oriented IS Strategy

The evolution of strategic IS planning processes has developed along a number of different fronts. A selection of those which have an emphasis on addressing the marketplace, or on a firm's customers, is presented below.

3.1.1 Strategic Positioning Frameworks

The positioning frameworks are seemingly based on the premise that before you know which way to go to get from *here to there*, you need to know where *here* is. The classic but contentious model which supports this approach is, of course, Nolan's stage hypothesis theory (Nolan, 1979). Others have been adequately summarized by Ward (1988).

The most popular matrix in the IS area is probably the McFarlan matrix (McFarlan, 1984) which can be used to analyze the market forces affecting IT use in the industry, together with how much IT currently contributes to the organization. The model plots the "strategic impact" of existing systems against the "strategic impact" of those systems being considered for development. Thus when a firm's existing systems have little strategic impact and it doesn't intend to develop any new ones, the organizational systems fall into the *support* category. When both existing systems, and systems considered for development, are strategic the firm's overall IS strategy falls into the *strategic* category. A *turnaround* situation exists when a firm is on the way to becoming strategic. However, it falls into the *factory* category if it allows its existing strategic systems to become out-of-date and is not developing new ones.

The McFarlan matrix can be used in the initial stage of analysis of a firm to determine a possible strategic direction. For instance a firm in the "factory" category may require a significant investment in strategic- oriented systems to "catch up" with the competition. Similarly a "turnaround" firm is moving in the right direction, but its level of investment may need to be reviewed.

A minor difficulty may be encountered with the term *factory*. Current usage tends to assign "factory" systems to the high-volume transaction-based systems which are strategic in the sense that they are critical to the commercial functioning of the organization. Sometimes such systems are referred to as *backbone systems*.

3.1.2 Addressing the "Constituents"

An early work by King (1978) identified distinct constituencies which are seen to drive the behaviour of the firm. These include the major stakeholders in the firm' operations - the customers, the stockholders, management, etc. The impact these constituencies have on the firm's objectives is then quantified by the IS planner, together with the conduct necessary to achieve those objectives. These are termed *organizational strategies*. The process is then repeated for the MIS function, with the development of objectives, constraints and design strategies which map back on to the organizational strategy set. A degree of alignment is thus obtained. With respect to the customer as a stakeholder, King's approach still seems to make sense although it has not been as prominently featured as those proposed by other writers.

3.1.3 Models of Competition

Implicit in many of today's frameworks is the model of competition in which a firm seeks to gain a competitive advantage by modifying the structure of the industry in which it operates. The most commonly cited example is the "impact model" of Porter (1980), who observes that "strategic thinking begins by thinking about the marketplace". He defined the five competitive forces of threat of entry, intensity of rivalry, pressures from substitutes, and the bargaining power of buyers and of suppliers. These could be countered with the three generic strategies of cost leadership (e.g., becoming a low cost producer), product differentiation, and focus (e.g., finding a niche). This was subsequently expanded to include strategies involving the application IT (Porter and Millar, 1985).

A further contribution was by Wiseman et al, (1985, see also Wiseman, 1988) who based at least some of his thinking on work done by Chandler (1962). Chandler had provided an early linkage between strategy, information flow and structure. Wiseman proposed "strategic thrusts", based on the logic of Chandler's "growth strategies", in which various options are selected, based on the "strategic target", i.e., supplier, customer or competitor. He proposed strategies of product differentiation and cost (economies of scale, scope and information), but added product and process innovation, growth (including value added growth), and the establishment of alliances. In contrast to the work of Porter, which is difficult to relate to in practical terms, Wiseman provides many examples of firms which have actually implemented an IT strategy and which fit comfortably into his framework.

3.1.4 The Customer Resource Life Cycle

The life-cycle perspective is well known in a number of areas, from the product life cycle to the systems development life cycle. The IBM Business Systems/Strategic Planning (BSP) process has advocated a similar life cycle approach for both products and the supporting resources. Still within IBM an 11-stage product/resource cycle was developed which was expanded to 13 by Ives and Learmonth, (1984). The authors focus on a single relationship, namely between the provider of goods and services, and the customer. The idea is that the products that a customer acquires are, from the customer's viewpoint, supporting resources. These resources have their separate life cycles. It is suggested that it may be possible to differentiate a suppliers's product from that of its competitors, by assisting the customer in managing his/her life cycle. A number of examples, given for each step, are useful for helping categorizing existing information systems and as a "prescriptive tool for generating new applications."

3.1.5 The Transaction Cost Approach

Transaction costs are incurred during the "flow of goods and services between economic activities" (Clemons and Row, 1991). As early as 1985, Ciborra considered that with the transaction cost approach (TCA), phenomena such as retention of information, and centralization versus decentralization issues could be carefully understood and planned. There would probably be general agreement with the more recent opinion expressed by Suomi, (1991) that transaction costs are significantly increased either by insufficient information or because the information is costly to process. It follows that information systems should be able to reduce those costs.

A study of transaction costs can lead to a focus on the relationships between parts of an enterprise and those firms with which it does business. (We will see later that shortening the transaction cycle should be an objective of a firm wishing to become more competitive; on the assumption that "time is money", this could be seen to be inducing a reduction in transaction costs.) Indeed systems that focus on interactions form a significant segment of strategic systems.

From an organizational view, a firm with high external transaction costs may wish to form a closer relationship with an external agency. An example would be a firm establishing closer ties with suppliers or with customers. A firm with high internal costs may well move horizontally to the market, for instance through some outsourcing arrangement.

3.1.6 Innovation and Strategic Resource Differences

A strategic resource is a long-lived productive capacity, either physical (e.g., plant or equipment) or intangible (e.g., customer relationships, know-how, or brand name recognition) (Clemons and Row, 1991). Typically it constitutes a significant portion of a firm's investment base and is not available on the open market. This is in contrast to resources which are readily available, for instance computer technology.

Clemons and Row believe that strategic resource differences are important in explaining and predicting the competitive outcomes of strategic applications of IT. When a technological innovation is made in a firm there are a number of strategic resources that are affected in terms of their value (both up and down). These are termed "complementary" resources. What is interesting is that the differences in these complementary resources are "structural", that is they affect the degree of vertical integration, diversification (i.e., horizontal), or in resource quality or organization. For instance, IT can change value of resources by better integration and coordination of economic activities. Further, the benefits obtained from such an innovation can be more readily defended if the system exploits the unique resources of the innovator. This aspect will be referred to in Section 3.2.

3.1.7 Customer-oriented Strategic Systems

A customer-oriented strategic system (COSS) is simply a system that links a firm with its customers (Reich and Huff, 1991). In the authors' definition, a COSS is based directly on the information system itself (i.e., on information), and only indirectly on the primary products or services.

The following observations are based on a study of eleven companies, in banking, insurance, distribution and computers. They are considered important because they provide an excellent summary of the key qualities in developing a strategic system.

1. *Industry:* There was substantial rivalry within the respective industries, both product-oriented and COSS-inspired. In several instances, the firms had a small number of large customers so that many of the systems were built in the hope of increasing the quality of the relationship and to raise switching costs.

2. *Company support:* The role of the corporate champion was found to be very important in successful systems. Champion continuity was seen as critical in this regard. Strong support of the CEO was also important.

3. *IS activities:* Sixty percent of the COSS systems were extensions of existing systems. Furthermore, nearly all companies had previous COSS experience. In most of the organizations the IS function was very proactive. Most of the systems were developed outside the organization's IS planning guidelines, effectively jumping the priority list - " Pressures from customers and competitors made spending time in the IS backlog queue unthinkable".

4. *Project level:* Most systems had a very high profile while being developed. They were supplied with "an abundance of resources."

5. *Adoption:* The customers rarely, if ever, asked for an information system to solve their problems. They did, however, complain of the lack of information quality, timeliness, and availability. Being that the users are in other organizations, careful piloting enhanced the prospects of success, with no shortcut testing. Well-trained sales people are also essential.

6. *Pricing:* Covering costs may not be important if competitive advantage is the ultimate goal.

7. *Sustainability*: Winners had achieved significant sales penetration, with sales up, and (transaction) costs down. The losers had failed to differentiate their product, or to lower their costs substantially. The observed COSSs were relatively large, complex systems, not easily duplicated. The winners obtained a *first mover* lead time which enabled them to add new features and extensions, while the competitors were playing 'catch-up'. In fact the 'losers" systems were seen as being 'under-powered'.

3.1.8 The Value Chain

The value chain model, popularized by Michael Porter (1985), has been widely postulated as a framework for determining the potential for SIS identification. The grouping of activities into the "primary activities" (inbound logistics, operations, outbound logistics, marketing and sales, and service) plus the "support activities" (firm infrastructure, human resource management, technology development and procurements) will be well known to most readers. The framework is intuitively attractive in that it serves as a focus for possible systems. For instance, inbound logistics can be "enhanced in value" through the use of JIT. The service group could be enhanced through an on-line parts location system. The value chain fits comfortably into the "planning by example" category mentioned above.

One of the problems, however, is that value chain is difficult to apply beyond the intuitive level. For instance, it is not obvious what the next step will be after categorizing a potential system as being, say, in the 'marketing and sales' arena. The situation was helped but not solved when Porter and Millar (1986) applied the value chain to the IT arena. They talked about the "information intensity" of the value chain (and of linkages between the value activities) and of the potential for adding value by applying IT to enhance the information content (as with value-added networks, for instance).

In trying to apply the framework in "live" organizations, the author found it helpful to think about the framework in the following terms:

- *The value chain:* A mechanism for disaggregating a firm into strategically relevant activities or building blocks. The value chain consists of the sequence of value activities that progressively add value to the product of a firm.

- *Value activities:* Distinct activities, both physical and technological, that a firm performs. Each value activity could be considered as being a "mini-business" within the firm, with inputs, outputs, etc. Value activities consist of two types of activities: primary activities and support activities.

- *Primary activities:* These consist of the activities making up the actual production of the product today.

- *Support activities:* These are "enabling" activities which add value by making things happen downstream (i.e., to the primary activities). For instance technology development activities must have already been carried out, and the technology be in place, to be able to utilize a specific technology in the primary activities. Similarly, appropriate skills (human resources) must also be available.

- *Linkages:* The *relationships* between the way one value activity is performed, and the cost or performance of another. (Note: These are not linkages such as EDI; rather they reflect the interdependence between value activities, i.e., organizational units.)

In applying the value chain to help identify strategic opportunities, it is suggested that one approach is to successively break each activity down to a level such that strategic action may be identified.

While that is a useful approach, it basically involves trying to fit the organization to the framework, rather than the other way round. Perhaps this is because the value chain implies a sequence of events or activities, whereas, in practice many, if not all, of the "value activities" occur simultaneously.

The non-sequential nature of activity sets will be addressed later in this paper. In the meantime we can explore the value chain somewhat further. Rockart and Short, in the MIT study "The Corporation of the 1990s", drew on earlier writings in industrial economics in commenting on "between-function integration". Their thesis is that the successful use of computers, communications and databases has enhanced the degree of integration to the extent that the value chain can be simplified into three elements only:

- Product development
- Product delivery
- Customer service and management

The collapsed value chain is seen in Exhibit 1. It will be noted that there is a considerable degree of overlap between the value activities, in recognition of interactions that occur (see below), and perhaps in partial recognition of the non-sequential activities that occur.

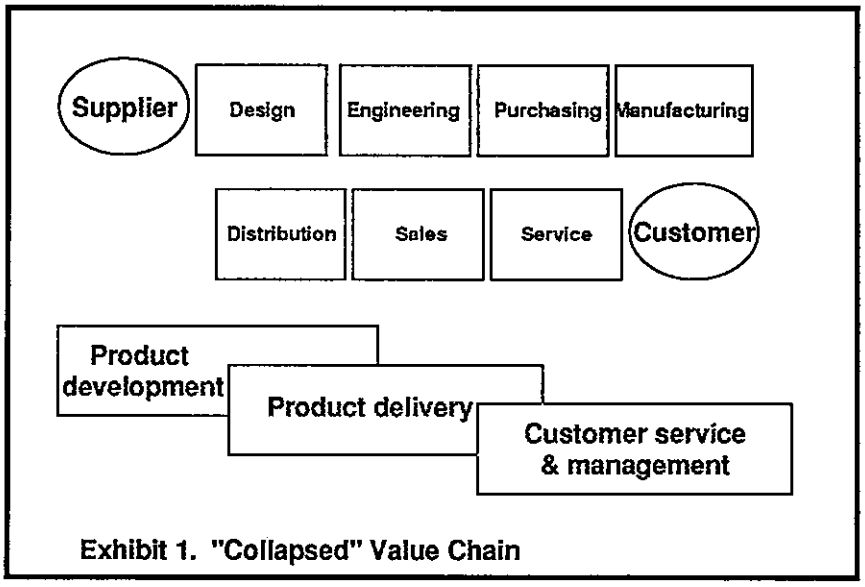

Exhibit 1. "Collapsed" Value Chain

Rockart and Short note that in the new "networked" organizational forms that are emerging, there is an increased need to effectively manage interdependence (for instance between product engineers and product designers) with the key management activity coordinating work across sub-organizations, e.g., direct contact, liaison roles, task forces and teams.

The resulting organization will be "communications-rich environments, with information flows blurring traditional intercompany boundaries". Such "networked" firms would use IT to "streamline and simplify the firm's key processes to enable flexibility and responsiveness to local market needs".

The above simplified value chain is of interest to the present study because it implicitly contains some key elements of what we are trying to model:

- The recognition of a set of activities that precede actual production (e.g., product development);
- Product delivery (encompassing purchasing, manufacturing and distribution) is an integrated function; and
- The separation and importance of customer service and management.

3.1.9 The EWIM model

In discussing the array of planning frameworks presented in the literature, mention should be made of an explicit model aimed at achieving the goal of alignment - namely the result of work of Parker and Benson (1989) with their Enterprise-Wide Information Management (EWIM) approach. They identify two types of IT planning: one that results in systems and data architectures (i.e. the infrastructure), the other that identifies competitive opportunities.

Parker and Benson (1989) propose a circular linkage between the business and technology domains of the business:

. A connection between business planning and information technology planning, with the business plan driving the technology plan;

. The planning link is based on relationships between the business domain and the technology domain of the enterprise; in the business domain longer range planning identifies products and markets;

. Planning focuses on each line of business in the business domain, with attention given to the allocation of resources plus the business strategy for each product, customer, and market, as well as the basic competitive plans;

. In the technology domain, planning focuses on the infrastructure (i.e., data, communications networks, end user support and MIS portfolios) to support the business domain plus application portfolios that support current business needs.

While this approach has been widely quoted in the IS literature, it may be that we can derive a similar model that is more directed towards providing the required customer focus.

3.2 Sustained Competitive Advantage

Probably the flavour of the (last) decade has been the use of IT to gain competitive advantage. However, a consensus seems to be emerging that says that most advantages, so obtained, are likely to be transitory, to say the least. One writer who commented on this is Ciborra (1991) who observes that little attention has been given in the literature to the problem of how an SIS can provide a significant or *sustainable* CA, so that a pioneering company can get a valuable performance edge from a strategic application.

The above view corresponds to that of Clemons and Kimbrough (1986), who, in the cases they investigated, found little evidence of sustained competitive advantage (SCA). They argued that many applications of IT are, in fact, *strategic necessities*. If a CA is to be obtained at all it should be tied to organizational learning; related to structure and hybrid forms, and to the activities of knowledge workers. To some extent how the advantages are achieved becomes "opaque" to the competitors.

It is also quite clear that if all the major players in a given industry use the same technology, or the same SIS, any CA initially gained would quickly evaporate. Basically all the players would have access to the same information, and on the open market, to the same or similar computer hardware. If consultants were used, they may even have access to the same people. Consulting firms are also likely to use similar development frameworks which inevitably will lead to similar systems. In fact the innovators may well be penalized; followers can learn from earlier mistakes and are likely to be able to obtain cheaper and more powerful technology.

A similar situation applies to the establishment of external linkages. For instance industry standards organizations often promote the use of EDI. This clearly must undermine any advantage to an individual firm. In fact, in the marketplace, everyone is basically willing to do business with everyone else, so that it is philosophically desirable to have systems interconnected. Such cooperative systems may increase the efficiency of the industry (resulting in lower prices for the customer), but leave little or no possibility for CA. There may be some possibility, however that vertical linkages could achieve a SCA; this aspect will be explored later.

While this paper has an IT focus, it is useful to look at what actually constitutes a sustainable competitive advantage (SCA), at least from a marketing theorist's viewpoint. Coyne (1986) considers that a (SCA) is only meaningful when three conditions are met:

1. *Attributes:* Customers perceive a consistent difference in the *product/delivery attribute* between the producer's product or service and those of the competitors. This is something the customer can see and feel. The attribute covers such aspects as price, quality, aesthetics, availability, visibility and after sales service. While lower costs may increase margins, CA results only when these are used to enhance the customer-perceived attributes.

   An attribute is important, however, only when it constitutes a *key buying criterion* in the marketplace. The few key buying criteria are likely to be basic (e.g., quality), rather than an add-on. Further, the product/delivery attribute must command the attention and loyalty of a substantial customer base, in other words produce a *footprint in the market.*

2. *The Capability Gap:* A competitive advantage must consist of a differentiation that cannot be easily erased. Examples of illusory ones are "faster delivery" and "superior product quality" attributes, ones that can be easily imitated. (Faster delivery might provide a SCA, for instance, if a firm had a large fleet of delivery vehicles.) If a competitor can imitate a product/delivery attribute only with a maximum of effort, then a SCA may be possible.

3. *Advantage Sustainability:* Here Coyne talks about the durability of both the attributes and the gap. Attributes will be sustained when they continue to meet a basic customer need while existing competitors either cannot, or will not, take the actions required to close the gap. For instance a competitor may not move:

   - if the costs (perhaps to achieve economies of scale) exceed the benefits of closing the gap ;

- where closing one gap may open a gap elsewhere;
- where there is a fear of reprisal, or
- where there is management inertia.

It is noted that the mere possession of a SCA does not guarantee financial viability. Examples where problems may occur include:

- if the market sector is not viable (the costs exceed the return from the customer);
- if the producer has severe operational problems; strategic thinking won't make up for operational difficulties; or
- if competitors inflict tactical damage (e.g., price cuts).

If a firm finds itself competing with another with a SCA, all is not necessarily lost. Situations where appropriate action may be feasible include:

- where the market itself is expanding rapidly (an example is the computer software industry), or if the competitors are small relative to the size of the market;
- if the main competitor has only a shallow or unimportant advantage;
- if the main competitor has finite capacity.

An important point raised in this section is that becoming a low-cost producer may not, of itself, lead to a SCA. While it may increase the return to the shareholders (which may itself be a strategy), it will not be enough without an investment in the customer end of the business. Similarly, an increase in the degree of vertical integration may well increase the internal efficiency of the firm, but again these must be translated into customer gain.

Bamberger (1989), also provides an insight into what makes a strategic competitive advantage. He performed a study was of 1135 "small/medium" firms in the clothing, food and electronics industries. He found that SCA is seen to consist more than just the 'product/delivery' attribute; rather it embodies a wide range of attributes and attitudes throughout the whole organization and structure of the firm.

1. *Industry and market characteristics:* Demand, cost, quality, service, image etc. all form the arena for competition. Together these combine to form the "key competencies" a firm must have to succeed in the market.

2. *The internal resources of the firm:* Available physical resources, plus knowhow and organizational culture determine what sort of CA the firm should develop, with the firm's strategy based on its strengths. Contributing resources may include production equipment and facilities, logistics and sales outlets, the information system, R & D capabilities, financial resources, customer knowledge, and/or management and employee competencies.

3. *The objectives perused:* CA is particularly affected by a firm's orientation towards profit, growth, and market share. Its objectives are influenced by values and attitudes, together with firm's current situation and past performance.

4. *Personalities of the decision-makers:* This could have a significant impact, especially in a small to medium firm. Factors include attitudes towards change, innovation, growth, cooperation, etc.

5. *The firm's product/market strategies:* The firm's activities with respect to technology, products, customers, customer needs, definition of the firm's niche, and determination of the type of CA wanted are all interdependent. Within this

category, product quality is considered by far the most important factor for the achievement of CA in the marketplace.

3.3 How Strategic Systems are Built

One would naturally expect that strategic information systems would come out of a strategic planning process. There is some evidence, however, that does not necessarily occur. A principal researcher in this regard is Ciborra (1991) who considers that the development of an SIS that can deliver sustained competitive advantage must be treated as *a process of innovation.* This involves either

- extending routine behaviour gradually to cope with a new task, incremental learning and decision making, and "muddling through"; or
- attacking the competency gap directly by forging new competencies and by restructuring the "cognitive and organizational backgrounds that give meaning to practices, routines or skills at hand" (in other words smashing established routines) It involves learning by doing and learning by trial and error.

The idea with the second approach is that the "background context is restructured-in-action", allowing participants to devise new strategies and to look at both the environment and organizational capabilities in radically new ways.

Ciborra goes on to comment on the IS literature's most commonly cited "strategic systems:

- *American Hospital Supply (Baxter's) ASAP* - started as a localised response to customer need in that a manager of a local office gave punched cards to the hospital's purchasing department so clerks could transmit orders through a phone terminal. From this local *ad hoc* solution to a particular problem a system gradually emerged linking all hospitals (using later technology as it became available).
- *American Airlines SABRE system* - initially started to address an internal inefficiency in inventory (seat) management, and was not thought of as having anything to do with competitive advantage. It was only later that by tying in travel agents it was seen as a barrier to entry.
- *Minitel (French telephone system)* - this was similar to a number of mainframe based data base systems available elsewhere. The key difference was that the terminals were provided free of charge. Initial use was sluggish. It apparently took a well-published act of hacking to set the system off. (A hacker got into a set of videotex classified ads and established a direct electronic dialog with their authors.) Indeed the demand was so great that the initial system went into overload.

Ciborra emphasises that the frequently cited SIS successes were "not fully designed top-down or introduced in one shot; rather they are tried out through prototyping and tinkering".

3.4 The IT Infrastructure

The examples quoted by Ciborra in the previous section seems to provide evidence that the provision of an IT infrastructure is not a critical component of an SIS, at least

in the early stages. Perhaps this is because we tend to have a narrow view of an infrastructure as a technology-based platform. The reality is that the IS function has not remained isolated from the broader changes occurring in many firms worldwide. Thus the organizational changes noted earlier in this paper have impacted IS also, inducing significant changes in how the IS function is organized and carries out its work.

The view that an IT infrastructure extends beyond the purely technical domain is reinforced by Das *et al*, (1991), who see the infrastructure as consisting of the internal systems through which information resources are controlled and managed. An IS infrastructure has three interrelated components: *technical, organizational* and *administrative*:

- *Technical:* This embodies the formal IS architecture and formalised procedures encompassing operating systems, information content, and the degree of integration of the system architecture;

- *Organizational:* This component represents managerial choices about size, formal structure, reporting relationships, support groups and coordination mechanisms within the IS group. These support one another to eliminate confusion and minimise waste of resources, as well as supporting the needs of the technical component.

- *Administrative:* These comprise the managerial policies and actions that influence and govern employee behaviour in the IS area. Das *et al* (1991) report on a number of studies that indicate that attention to the administrative component of the IS infrastructure is important for the success of strategic IS planning.

The conclusion that can be drawn from the above is that a concentration on the purely technical aspects of the infrastructure could put a strategic IS plan in jeopardy. This has implications in terms of responsibility for infrastructure planning and development. Thus, whereas decisions on technology can be delegated, decisions affecting the other components of the infrastructure must be, at the very least, the responsibility of senior IS management. This poses a further problem in that it is already extremely difficult to cost justify a network or database technology in terms of its potential use (which will almost certainly increase "because it is there"; the addition of the organizational and administrative components make this even more difficult.

3.5 Levels of IT Investment

Weill and Olson (1989), concerned with tracking and ultimately justifying a firm's investment in IT, suggested that an IT investment could be fruitfully separated into four categories:

- *Strategic*: IT that changes a firm's product or the way it competes. The authors see strategic systems as being generally associated with long term investment considerations. This is certainly reflects a traditional view although it is increasingly apparent that "quick and dirty" systems can also have a strategic impact.

- *Informational*: This equates to the information and communications *infrastructure* (or the "system" component of the IT platform) which make up the base systems upon which strategic systems are built.

- *Transactional:* Supports operational management - processing of data with significant repetition. Could be "strategic" in the sense that these constitute *backbone*-type systems.

- *Threshold*: This is the investment in IT required for a firm or business unit to compete in their particular industry. Threshold systems are of interest because they are the base-level systems, competitively necessary to remain a competitive player. Even if such systems were already operational, they would not create strategic advantage, but are basically required to stay in business.

4. Learning From Manufacturing

4.1 A Strategy Based on the Customer

It is increasingly being recognized that the key to corporate success is to satisfy the customer. US automobile manufacturers have found out that they ignore this dictum to their cost; the percentage of Japanese imports expected to reach one third of total sales in the next year or so. Our thesis is that the ultimate basis for IT planning and implementation must also be based on a strategy built around customer satisfaction.

The view that a successful strategy is customer-oriented is not unique. Beckman, et al (1990), describe a strategic manufacturing planning process implemented at Hewlett-Packard (HP). In a slight distortion of the original presentation, we have substituted the words *information systems* for the words *manufacturing*. We hope the original authors will not be offended.

1. Start with the business strategy. More specifically understand why customers will prefer your product or service to the competitors'.

2. Create an *information system* that is linked to the business strategy.

3. Identify (the) *information systems* tactics to execute the strategy.

4. Organize for *informations systems* success. Organizational design, including structure and performance measurement, must match strategic needs or success will be limited.

5. Measure the results and initiate further change. Strategies must be continually altered to meet the needs of a constantly changing environment.

In presenting this 5-step approach, the authors emphasise the following key point:

Ultimately a business strategy must begin with the customer.

Tying this in with point 1 above, the authors came up with a short list of possible answers, (headed *Critical Success Factors*), as to why customers buy products or services based on their perception of one or more of the following characteristics:

- Low product or service *cost.*
- High product or service *quality.*
- Prompt product or service *availability.*
- Distinguishing product or service *features.*"

The *cost*, above, includes the cost of ownership throughout the product or service life, as well as the costs associated with becoming a "low cost producer" (thus going beyond Porter (1980) in that after-sales service costs are considered). *Quality* is based

on customer expectations or perceptions of acceptable quality; *availability* measures the ability to deliver the product where and when desired; *features* refer to the unique features in the product design or service.

For each product line, HP focuses on one or more of the above as its primary strategic emphasis. The other elements are not ignored but contribute to the overall strategy.

4.2 Strategy in manufacturing - A model for IS

Not all firms have the same approach to strategy as HP. But the realities of the marketplace are that sales are becoming more volatile, and competition is forcing firms to focus on costs, on improving quality and on flexibility, and especially on making product life-cycles shorter.

In the light of this, some interesting material has been developed by Ed Heard (1990), supported in a separate document by Julie Heard (1990). This material is of interest because it seems possible that we can gain considerable insight into planning for an SIS by looking at manufacturing operations and then making the intellectual leap from a "factory-type" factory to an "information-type" factory[1] .

Ed Heard talks of the new battleground of *responsiveness*, and the need to reduce the time needed to perform various activities in a typical manufacturing company. Thus there is a need to shorten:

- New product introduction lead times
- Manufacturing cycle times
- Sales and distribution lead times
- White collar cycle times.

All-in-all, Heard identifies five "cycles" that help determine a firm's competitiveness (see Exhibit 2 for the original cycles).

If the time to perform each cycle can be shortened, the firm is able to be more responsive, which in turn will result in it becoming more competitive. The "cycle" concept applies because, as with most business activities, manufacturing is largely a repetitive process. The reader may care to refer to Exhibit 3 where the relationships have been recast in a more convenient form.

Two modifications have been made in moving to Exhibit 3:

1. IS readers will probably be unfamiliar with the term *book/bill*, even although the explanation is clear enough. However, it is useful for our model, if we rename the cycle Customer Support Services. The rationale for this will be explained later in the paper.

2. We will replace the term *cycle* with the term *process*, which indeed each one is. The use of the term *process* will fit more directly with our own approach to strategy building, although 'cycle' certainly has important connotations, especially in terms of reducing cycle time, achieving simplicity, and achieving flexibility.

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[1] The author wishes to acknowledge his colleague, Mr Don Murphy, who drew the author's attention to this work.

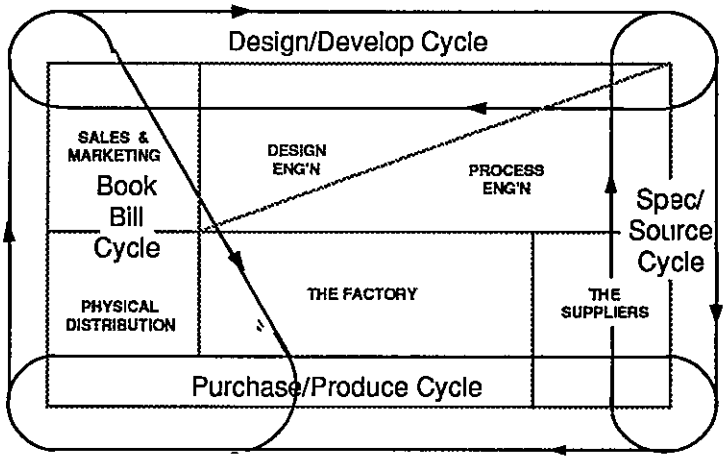

Exhibit 2. Manufacturing Cycles (after Heard, 1990)

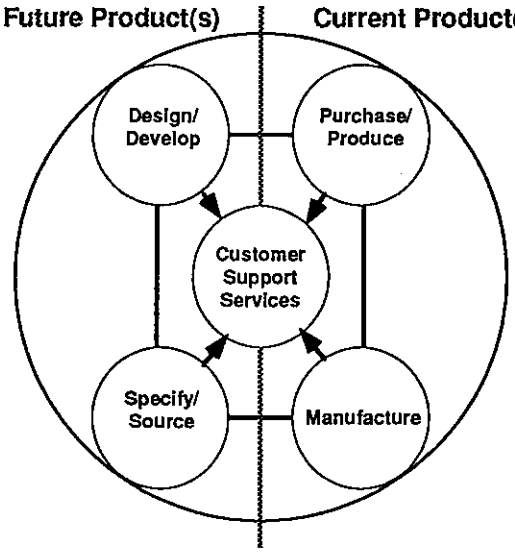

Exhibit 3. Manufacturing Processes

The (modified) Heard scheme involves (see Exhibit 3a):

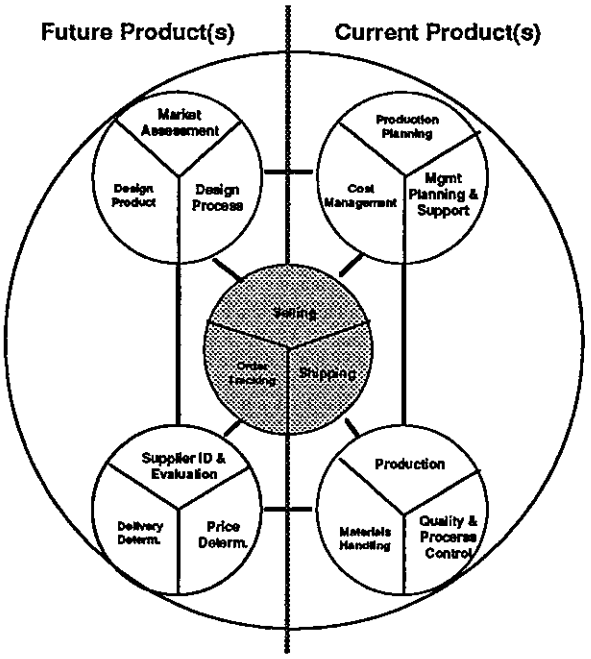

Exhibit 3a. Customer-Centred Manufacturing Processes

A. Future production

1. Design/Develop: Includes market analysis, technology definition, cost estimation, product definition and design, prototyping, testing. (These activities involve marketing people, designers, engineers, estimators, and programmers in activities characteristic of a hybrid organization).

2. Specify/Source: The identification, evaluation and selection of suppliers, and delivery and price determination.

B. Current production

Current production and order tracking involves:

3. Purchase/Produce: This includes - (a) Getting materials: identifying sources, setting up agreements, ordering and receiving materials required for production, updating inventories, and (b) preparing for production: initiating shop orders and requisitions, making tools, fixtures and machines ready. Purchase/Produce occurs at end of or during design/develop, and involves all the activities required to bring a product to the point of manufacture.

4. Manufacture - scheduling and planning production, quality management, movement of materials, personnel, and production control.

C. The Customer Focus

5. Customer Support Services: This includes most of the white collar activities, including selling the product, receiving a sales order, credit checking, adding to the open order file, providing necessary documentation, picking packing and shipping the order, and invoicing the customer (and we can add customer satisfaction tracking).

A focus on reducing the various cycle times is seen as being critically important if responsiveness is to be increased. For instance, Julie Heard sees the book/bill cycle as representing the discrepancy between when the customer would really like to have his or her order and when he/she can actually get it.

4.3 From cycles to processes

As noted above, the "white collar activities" necessary to progress an order for delivery have been included in the *Customer Support Services* process. Essentially these involve the transaction processing activities associated with traditional IS. The orientation is different, however. Instead of all the "paperwork" been seen as a burden, these activities have been positioned as being central to the provision of a quality customer service. Thus, not only must the cycle time be reduced but the firm must be seen to be efficient in its interaction with the customer (for example through the use of linkages such as EDI). An intent to reduce transaction costs could also provide a significant impetus.

The Exhibit 3 also highlights the linkages between central customer-oriented service process and the four other processes. For instance, market assessment and product design invariably involve an interaction with current and potential customers. Quality has a strong customer focus. The reader will also note the segregation of the process into future-oriented and those associated with current production. To some extent this corresponds to the support activities (future) and the primary activities of Porter's value chain (see above).

4.4 The transition: Customer-oriented IT strategies in manufacturing

We now perform a "run up" to our intellectual leap by looking at the IT opportunities in our modified manufacturing process diagram (see Exhibit 4). What we hope to do is firstly to look at possible strategies, and then look at opportunities for the use of IT in the execution of those strategies.

At this point it is useful to draw a comparison with the *value chain* model espoused by Porter and subsequently "collapsed" by Rockart and Short (refer to Exhibit 1). It will be recalled that a criticism of the value chain approach was that it implied a sequence of processes when in fact any or all of them can occur simultaneously. Also the actual nature of Porter's linkages are not intuitively obvious and need further explanation as provided earlier in this paper.

It is suggested that the "circular" model, discussed in this and the previous section, is more realistic in terms of approximating what is happening in the new flat and semi-hybrid organizations of today. For a start, processes do not have to occur in any particular sequence, other than there being a separation of "future-oriented" processes from "present-oriented" ones. This reflects the separation of planning for strategic services from the delivery of those services. (Together with the customer focus, this has a parallel with the "collapsed" value chain of Rockart and Short.)

It will be seen that the model also reflects a continual focus on the customer, mirroring the imperative of modern business practice. Further, linkages between processes may be either direct, or made up of a combination of activities with the *Customer Support Services* activity set. Again this reflects the reality of modern linkages (e.g., joint design teams, quality enhancement, designing for service, EDI, and so on).

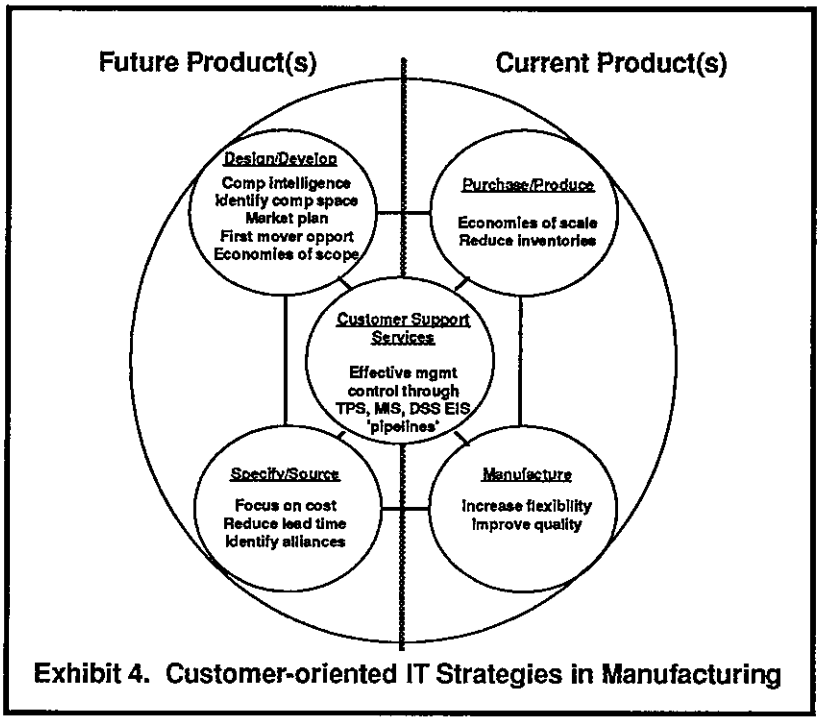

Exhibit 4. Customer-oriented IT Strategies in Manufacturing

A. Future production

1. Design/Develop: The key addition is to make the *marketing* aspect explicit. Marketing is quite distinct from 'selling', which generally occurs after a product has already been built. Marketing is a key factor in future product definition and other future-oriented activities.

The driving force in the marketing domain may be described as finding a competitive space, that is finding where a potential competitive advantage might conceivably be hiding. The need for a system for competitive intelligence may well be dictated by the average industry product life and the dynamics of the market.

The obvious application of technology is in design work, (e.g. CAD), but this may well fall into the *threshold* category of IT application (Weill and Olson, 1989), that is more of a competitive necessity than a source of competitive advantage. On the other hand a firm, through innovative design capabilities, may be able to position itself as a "first mover" in product development, achieving a competitive advantage until such time as other firms can catch up.

However a firm could take advantage of existing capabilities in that a design team could explore possible *economies of scope.* Economies of scope describe a situation where savings are generated from using the same process to produce a number of different goods in a given timeframe. For instance a market study might have identified niche markets that on their own are beyond the manufacturer's ability to satisfy on an economic basis. If they could be *piggybacked* onto an existing assembly line and infrastructure (in our case the 'customer service system'); it may be that a previously uneconomic niche now becomes economic. Equally, variations on an existing model could be justified on an economies of scope argument. The key to both approaches is, of course, *flexibility*, This means that the system (presumably IT-based) is in place so that batches or units of production can be changed rapidly as market demand dictates.

An important aspect of the Design/Develop process in a modern manufacturing environment is the achievement of cost and quality improvements through *simultaneous engineering* (Dean and Sussman, 1989). In a variation on the hybrid (network) organization, an integrated design team is formed, not only to achieve "manufacturability", but also to examine related aspects of packaging, distribution and marketing.

2. Specify/Source: This process involves locating sources for materials and parts, working with future suppliers and determining price and delivery capabilities. Opportunities exist for minimizing future transaction costs through the use of technology or as a result of forming alliances. All these activities take time and money, and while cost is important, a long lead time reduces a firm's ability to respond rapidly to customer requests.

B. Current production

3. Purchase/Produce: *Economies of scale* may be considered here as well as for the manufacturing process. Increased quantities can come about as a result of productivity increases, but to achieve this it may be necessary to completely restructure the process, for instance through the introduction of CIM (Computer Integrated Manufacturing).

Cost advantages can be, and have been, achieved through the reduction of inventories, especially WIP (Work in Progress). The use of JIT facilitates this in its own characteristic manner.

IT also has a significant potential to increase efficiencies in obtaining materials and in the preparation for production (components of the Purchase/Produce process). This in turn can impact what is often referred to (e.g., Manheim (1992) as the "order cycle", that is the time between when a customer places an order and the delivery of the final product to the customer.

4. Manufacture: The three key objectives here are to reduce product cost, to improve quality and at the same time increase flexibility. The linkage between product design and the manufacture process can ensure that manufacturing costs are reduced while quality is increased. This can be achieved through the development of a better design so that the actual manufacturing process is simplified. IT related systems such as CIM (comparatively "high-tech") may also result in an overall reduction in costs.

C. Customer Focus

5. Customer Support Services: These include all the transaction-based activities associated with dealing with the customer. In our holistic view of customer service this also includes after-sales service. As Manheim notes, in many cases, this is a critical issue. "Customers are demanding a high level of maintenance, including spare parts availability and technical skills in service staff. Add-on products and services, such as training, documentation, and product upgrades, are also required." Manheim notes that such support can also be profitable, in some sectors supplying 10-20% of product-line net profit.

The need to "get on top of" paperwork is an important factor in upping the service level to customers. The concept of *pipeline management systems* may well apply here. Pipelines are tightly linked information flows, paralleling the pipelines of goods flow (Manheim, 1992). In manufacturing, the pipeline for managing the

material flows consists of transaction processing and MIS, with EIS for management reporting and analysis, supported with DSS for operational and managerial control. Mainheim considers it a *competitive necessity* (a threshold system) to have a world-class capability to manage the order cycle, but he notes that such pipeline systems, including an effective EDI strategy, are very difficult to implement.

4.5 Customer-oriented strategies in the *information factory*

It will be recalled that the processes in the manufacturing sector are divided into future activities and current production (refer back to Exhibit 3). In our information factory, *future activities* are invariably linked to the IS planning (both strategic and tactical) process. Similarly the *present activities* tend to be more concerned with the processing associated with transactional or backbone systems (see Exhibit 5).

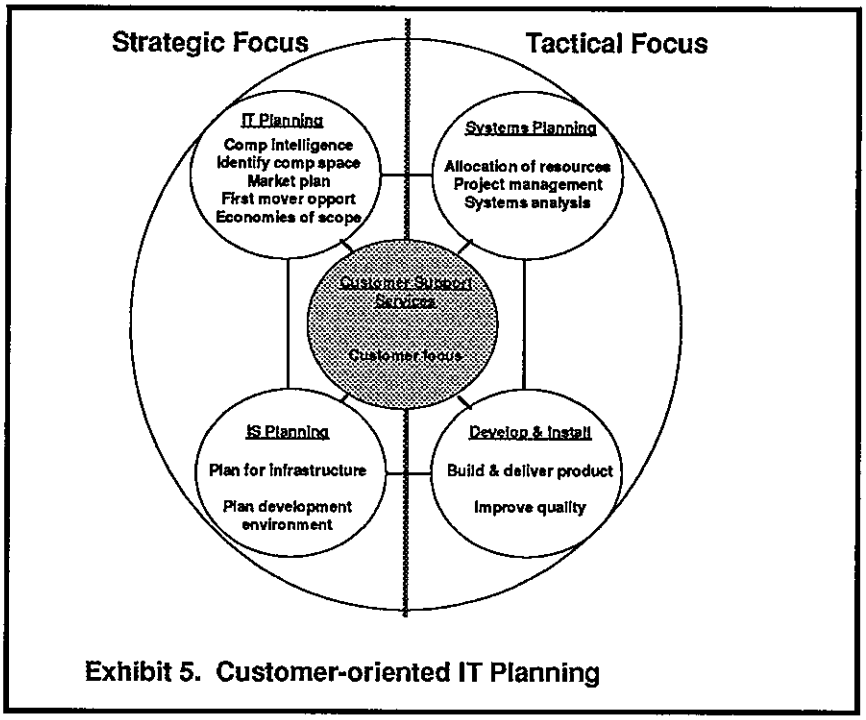

Exhibit 5. Customer-oriented IT Planning

There is a caution, however, that when we talk about customer focus we could be talking about two distinct customers - the *ultimate customer*, that is, the organization's external customers, as well as the *internal customers* of the IS group (i.e., the line or business unit managers who will use the systems). "Traditional" planning is thus seen to be a two step process, with the longer term strategic planning activities primarily focusing on satisfying external customer needs at some time in the future, and shorter term tactical planning aimed at satisfying the internal customers.

A major difference with a strategic SIS is that it may not follow the "traditional" model. In fact the term *strategic* need not imply long-term at all. Suffice to say that in our terms, an SIS is a system designed to provide a competitive advantage, which may indeed have only a short term impact, and may even be acknowledged to be unsustainable in the longer term.

A. Future (Strategic) Focus

1. IT Strategy Formulation (Design/Develop)

IT strategy formulation, and associated IT direction and policy formulation, are usually carried out under the umbrella of the firm's IM function. Just as in manufacturing, a representative team will determine the strategic direction for the firm. This team will typically consist of representatives of top management, functional or business unit management (users), people in contact with the eventual customers (e.g., marketing), IS people and possibly a senior financial officer.

The planning process involves analysing the competitive environment and developing strategies consistent with the firm's financial and other resources. Given the mix of people involved, it seems reasonable to expect that a measure of strategic alignment will be achieved virtually automatically. A key factor is that the IT plan, while acting as a cover for a multitude of technical issues, is expressed in business terms. Then, as an integral part of the planning process a two-way linkage can be established between the business plan and the IT strategy. Thus on the one hand, while the business plan must drive the IT strategy, in the reverse direction the examination of a particular IT option could open up a business opportunity that may not have been apparent otherwise. This process of developing the co-joint business/IT plan is usually iterative, and is carried out until a degree of consensus (i.e., alignment) is reached.

The emphasis during SIS planning is to focus on the customer. The basic linkages established between the business strategy and the IT strategy (i.e., alignment) are insufficient of and in themselves. Each of these linkages must be examined in terms of its impact on the customer (See Exhibit 5). Put another way, and extending the analogy, "If the planners were in the customers' shoes, how would the elements of the strategy look to them?".

In summary, within the context of "Design/Develop Strategy Formulation" the IT strategy evolves incrementally, all the time keeping a clear focus on what the potential impact will be on the customer.

2. IS Planning (Specify/Source)

It will be recalled that the original Specify/Source categorisation involved the identification, evaluation and selection of suppliers, make or buy decisions, as well as examining delivery mechanisms and timing, and price determination. All of these activities are equally necessary as part of the IS plan. (Refer back to Exhibit 4.)

Conventional wisdom is that an early part of the 'Specify/Source' process in IS planning must be concerned with the establishment of the technical infrastructure consistent with the organizational aims. This would include the information architecture (i.e., where in the organisation data is stored), together with the network topology (how the information is going to be moved around the firm and how it is going to be delivered).

But recognising that a SIS could very well be developed through process of innovation, we will need to pay attention to providing the right sort of environment for that situation to occur. Thus it is suggested that rather more attention be given to the *organizational* aspects of the infrastructure when we focus on the customer-oriented aspects of our strategy.

A paper that has given some attention to the nature of the IS infrastructure was written by Das *et al* (1991), who see an IS infrastructure as being made up of three interrelated components: *technical, organizational* and *administrative.* The *technical*

component embodies the formal IS architecture and formalised procedures encompassing operating systems, information content, and the degree of integration of the system architecture. The *organizational* component represents managerial choices about size, formal structure, reporting relationships, support groups and coordination mechanisms within the IS group, while the *administrative* component comprises the managerial policies and actions that influence and govern employee behaviour in the IS area.

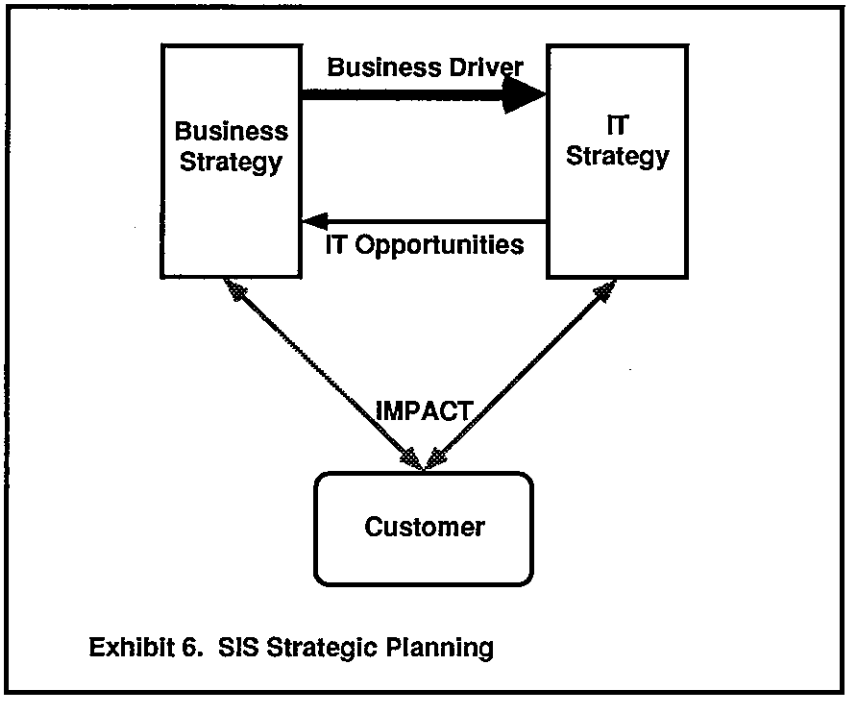

Exhibit 6. SIS Strategic Planning

Following Das's (1991) classification, the IS planning committee, would be constituted along *"organic"* lines, that is planning activities would be performed by a cross-functional team rather than having the planning sessions dominated by technical people.

With the organic component of the infrastructure in place, the planning team must focus on the development aspects, as basically the *raison d'etre* of an IS group is to deliver systems. But it should be noted that the organic characteristics of an infrastructure do not preclude designing and subsequently building the more traditional platform involving information architectures, networks and the like. The desirable goals of rapid response and flexibility may only be possible if such an infrastructure is in place. For instance the selection and familiarisation of appropriate development tools (e.g., CASE or 4GL), takes time and existing systems may have to be reengineered so that the new performance characteristics can be integrated into older legacy systems.

B. Current (Tactical) Focus

3. Systems Planning (Purchase/Produce)

In our topology, the remaining processes in our "factory" are more concerned with "present" activities in that they involve tactical considerations related to the development of a customer-oriented SIS. It will be recalled that 'Purchase/Produce' occurs at the end of or during the Design/Develop process, and involves all the

activities required to bring a product to the point of manufacture. Thus, just as factory management must ensure that resources required for production will be there when required, so the IS manager must marshal the group's resources for efficient development.

Again planning at this level should be a team effort. The dictum of "simplification before automation" should be the golden rule with every effort made to eliminate the paperwork, and move information electronically rather conventionally, all with a view to shortening cycle times and improving flexibility. With quality of the product a key issue, the IS manager must satisfy him/herself that sufficient system planning, analysis and review activities are provided for so that true quality is built into the final product. True quality is here defined as being delivery of a system that meets or exceeds customer expectations in terms of performance and system integrity, reliability and robustness, as well as being within the original cost and time constraints.

4. Development and Installation (Manufacture)

The 'Manufacture' process, a while distinct and important set of activities, has little special significance from a customer viewpoint. Issues such as where development will take place (i.e., within the IS group, or as part of the disaggregation process, through outsourcing) will already have been resolved as part of planning for the infrastructure. The modern trend is to have representative customers as an integral part of the development team, especially during project reviews and during the implementation phase.

C. Customer Focus

5. Customer Support Services

Although *Customer Support Services* are covered rather briefly here, sufficient material has already been presented to give its flavour and to highlight its importance. A customer focus is a key element in the overall planning cycle, being the dominant feature at the strategy level and being a background driving force as systems are being designed and built. The focus keeps the planners and designers honest as it were. Thus, with a system designed from a customer perspective, the interface where the customer meets the system becomes of paramount importance. The goal is to produce as smooth and as seamless an interface as is possible.

SUMMARY

This paper explores the possibility of treating the IS function as an "Information Factory". This model is seen as being particularly appropriate where customer-oriented strategic systems are necessary to gain sustained competitive advantage. Various existing models are examined in the context of the degree of orientation towards the customer. Ideas that are helpful in planning for strategic customer oriented systems are then identified.

The intent of the paper is to derive a model which can be used to explain the processes necessary to plan and build such a system. The approach has been to start with a manufacturing model, modify it slightly, and examine the various activities that may be grouped together as processes. The potential IT opportunities inherent in the various manufacturing processes are then highlighted as the manufacturing sector struggles to maintain its competitive position. Finally the model is translated into the

IT factory environment where it can be used as an aid to planning for customer-oriented strategic systems.

REFERENCES

Beckman, Sara L, Boller, William A, Hamilton, Stephen A, and Monroe, John W, (1990),"Using Manufacturing as a Competitive Weapon: The Development of a Manufacturing Strategy" in *Strategic Manufacturing: Dynamic New Directions for the 1990s (Ch 12)*, Patricia E. Moody (ed), Dow-Jones Irwin, Homewood, Ill, pp. 53-75.

Bamberger, Ingolf, (Oct. 1989), "Developing Competitive Advantage in Small and Medium Firms", *Long Range Planning*, Vol. 22, No. 5, pp. 80-88.

Beckman, Sara L, Boller, William A, Hamilton, Stephen A, and Monroe, John W, (1990),"Using Manufacturing as a Competitive Weapon: The Development of a Manufacturing Strategy" in *Strategic Manufacturing: Dynamic New Directions for the 1990s (Ch 12)*, Patricia E. Moody (ed), Dow-Jones Irwin, Homewood, Ill, pp 53-75.

Brophy, Joseph T and Monger, Rod F, Winter (1989), "Competitive Capacity from an Integrated IS Infrastructure", *Information Strategy: The Executive's Journal*, Vol. 5, No. 2, pp. 26-33.

Chandler, Alfred D, (1962), *Strategy and Structure: Chapters in the history of the industrial enterprise*, The MIT Press, Cambridge, Mass.

Ciborra, C U, (1985), "Reframing the role of computers in organizations: the transaction costs approach", *Proc Sixth Int'l Conference on Information Systems*, Indianapolis, 1985.

Ciborra, Claudio U, (Dec 16-18, 1991), "From Thinking to Tinkering: The Grassroots of Strategic Information Systems" in *Proceedings of the 12th International Conference on Information Systems*, New York, New York, pp. 283-291.

Clemons, E K. and Kimbrough, S O, (Dec 1986), "Information Systems, Telecommunications, and their Effects on Industrial Organizations", *Proc Seventh Int'l Conference on Information Systems*, San Diego, pp 99-108.

Clemons, Eric K and Row, Michael C, (Sept., 1991), "Sustaining IT Advantage: The Role of Structural Differences", *IS Quarterly*, Vol. 15, No. 3.

Coyne, Kevin , (Jan/Feb, 1986) "The anatomy of sustainable competitive advantage", *Business Horizons*, Vol. 9, No. 1, pp. 54-61.

Das, Sidhartha R, Zahra, Shaker A, and Warkentin, Merill E, (Nov/Dec, 1991),"Integrating the Content and Process of Strategic MIS Planning with Competitive Strategy", *Decision Sciences*, Vol 22, No. 5, pp. 953-984.

Dean, J W Jr, and Sussman, G I, (Jan/Feb 1989),"Organizing for Manufacturable Design", *Harvard Business Review*, pp 28-36.

Emery, James C, "Downsizing the Enterprise", (Jan/Feb, 1992), *SIM Network*, Vol VII, Issue 1, pp 1-3.

Heard, Ed, (1990),"Competing in Good Times and Bad" in *Strategic Manufacturing: Dynamic New Directions for the 1990s (Ch 17)*, Patricia E. Moody (ed), Dow-Jones Irwin, Homewood, Ill, pp. 317-342.

Heard, Julie, A. (1990)"JIT for White Collar Work - The Rest of the Story" also in *Strategic Manufacturing: Dynamic New Directions for the 1990s (Ch 12)*, Patricia E. Moody (ed) Dow-Jones Irwin, Homewood, Ill, pp. 218-235.

Ives , Blake and Learmonth, Gerald, (Dec 1984), "The Information System as a Competitive Weapon", *Comm ACM*, Vol. 27, No. 12, pp. 1193-1209.

King, W, (Mar 1978), "Strategic Planning for MIS", *MIS Quarterly*, Vol. 2, No. 1, pp. 27-37.

Lawrence, P R and Lorsch, J W, (1967) *Organization and Environment: Managing Differentiation and Integration*, Richard D Irwin Inc.

Lederer, Albert L., (Dec. 1988), "Convincing Top Management of the Strategic Potential of Information Systems", *MIS Quarterly,* Vol. 12,4, pp. 525-534.

Lodal, Thomas M. and Redditt, Kay Lewis, (Feb. 15, 1989), "Aiming IS at Business Targets", *Datamation,* pp. 93-100.

Manheim, Marvin L, (Jan, 1992), "Global Information Technology: Issues and Strategic Opportunities", *International Information Systems*, Vol. 1, No. 1, pp 38-67.

McFarlan, F W, (May/June, 1984), "Information technology changes the way you compete", *Harvard Business Review*, pp. Vol. 62, No. 3, pp. 98-103.

Morton, S Scott (ed), (1991), *The Corporation of the 1990s: Information Technology and Organizational Transformation*, Oxford University Press, New York, pp. 3-23.

Nolan, Richard L, (Mar/Apr, 1979), "Managing the crises in data processing", *Harvard Business Review*, pp. 115-126.

Norton, David P, (Mar/Apr, 1987), "Making Transformation Happen", *Stage by Stage*, Vol. 7, No. 2, pp. 6-12.

Parker, Marilyn M and Benson, Robert J, "Enterprisewide Information management: State-of-the-Art Strategic Planning", (Summer 1989), *Journal of Information Systems Management*, v 6, n 3, pp. 14-23.

Porter, Michael E. (1980), *Competitive Strategy*, The Free Press, New York.

Porter, Michael E and Millar, Victor E, (July/Aug 1986), "How information gives you competitive advantage", *Harvard Business Review*, pp. 149-160.

Porter, Michael E, (1985), *Competitive Advantage*, Free Press, New York.

Powell, Walter W. "Hybrid Organizational Arrangements: New Form or Transitional Development", (Fall 1987), *California Management Review*, Vol. 30, No. 1, pp. 67-87.

Rackoff, Nick, Wiseman, Charles and Ullrich, Walter A, "Information Systems for Competitive Advantage: Implementation of a Planning Process", (Dec. 1985), MIS Quarterly, Vol 9, pp. 285-294.

Reich, Blaize Horner and Huff, Sid L, (Dec 1991), "Customer-oriented Strategic Systems", *Journal of Strategic Information Systems*, Vol. 1, No. 1, pp 29-37.

Rockart, John F and Short, James E, (1991), "The Networked Organization and the Management of Interdependence" in *The Corporation of the 1990s: Information Technology and Organizational Transformation*, Morton, S Scott (ed), Oxford University Press, New York, pp. 189-219.

Suomi, R, (April, 1991), "Removing transaction costs with inter-organizational information systems", *Information and Software Technology*, v 33, n 3, pp 205-211.

Ward, John M, (Sept 1988),"Information Systems and Technology Application Portfolio Management - an Assessment of Matrix-Based Analyses", *J of Information Technology*, Vol. 3, No. 3, pp. 205-215.

Wiseman, Charles, (1985; revised edition, 1988), *Strategy and Computers: Information Systems as Competitive Weapons,* Dow Jones-Irwin, Homewood, Ill.

Weill, Peter and Olson, Margrethe H. (March 1989), "Managing the Investment in Information Technology: Mini Case Examples and Implications", *MIS Quarterly,* pp. 26-36.

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