Computer Systems Development STrategic Resource Information Planning and Execution—STRIPE

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Introduction

It is rapidly becoming accepted that strategic planning of an organization's future direction is a must for survival. In the private sector, corporate management is becoming aware that an organization can no longer survive against its competition without clearly defined strategic plans for at least three to five years into the future. In the public sector, competition is replaced by deficit budgets, and critical communications media representing the general population which demand improved levels of productivity for their tax dollars.

Even though the realization of the need for strategic planning exists, most organizations do not know how to approach the problem. The larger companies and governments tend to go to consultants to provide this expertise. The smaller companies find it difficult to justify this type of expense, particularly as the return on investment cannot be easily quantified. Further, whether the organization is large or small, the return on investment occurs often months or years down the road. So, today's problems attract the most attention. As a result, though many agree that strategic planning is essential, few actually do it.

In any event, what does corporate strategic planning mean to the information systems department? In fact, don't we have enough problems trying to maintain existing application systems and to satisfy the ever increasing

demands of the users for new applications? Users, who now believe they know all about system design because they have a product like Lotus 1-2-3 on their PCs. Or, the company may be losing money and would it not be wiser at this time to freeze all new development and just make sure the present applications continue to operate? Possibly, there may even be some quick and dirty solutions? Maybe these new fourth generation languages combined with powerful data base management systems could solve all systems problems? Don't the vendors claim their products can almost work miracles?

On the other hand, senior management has become acutely aware of the high hardware, software and personnel overhead associated with computerized information processing. This high cost has brought the information systems department to the forefront of corporate management's consciousness. They also realize that data processing is the heart of the organization and the enterprise cannot survive without management information systems. Sounds familiar, doesn't it? Well, what can we do about it?

The first step is to acknowledge problems exist in information processing. Without this acknowledgment, strategic planning becomes a meaningless exercise where only the motions are executed and no worthwhile results achieved. The second step is to develop solutions using a management information services (MIS) strategic plan to determine where you should be headed in three to five years and to get you there safely. The third step is to develop tactical plans defining the specific projects and functions to be carried out during a specific time frame, such as a fiscal year. The fourth step is to plan each project in detail and execute it.

Before we develop the solutions, let's define the problems in greater detail.

1.1 THE PROBLEMS

In most organizations, many business applications have been put on the computer and appear to function adequately. For example, checks go out on time, information is available on computer terminals and all kinds of reports are produced and distributed. In this context, why should senior management not be satisfied with the status quo? Why should they consider the development and implementation of strategic plans for their MIS function? On the surface, everything may appear to be smooth sailing. But what is the real situation?

Operating Costs

In many companies, the cost of MIS including hardware, software and people amounts to 10 to 20 percent of the operating budget. It makes business sense to increase productivity in this area. Further, a major portion of the

MIS cost, from a third to a half, is the cost of system development staff, such as systems analysts and programmers, data base analysts and other support staff. And of this system development cost, 75 to 90 percent is spent on maintaining current systems, either for correcting errors in programs or for modifying these systems to meet changing user requirements. Major new system development costs can sometimes be equal to or exceed the maintenance costs. Some organizations fund this development through special one-time allocations, which can become self-perpetuating.

New Development

New system development takes an unacceptable amount of elapsed time, often years, and actual costs exceed originally approved budgets by wide margins. Further, when put into production, these systems require major modifications to meet the user's needs which have either changed or not been properly understood when the system was designed. This problem occurs because user management does not understand the system development process, and MIS management compounds the situation by making firm commitments when available information is imprecise.

Management Information

Management decision support data are not readily available and must be compiled manually or by feeding operating information into microcomputers and manipulating it there.

Why do these problems exist and how can they be solved? They exist for a variety of reasons which include data, programming languages, dependencies and system life-cycle control.

Data. Most organizations do not have a corporate view of data. Instead, every business application has its own files in which data inconsistency, redundancy and incompatibility are rampant.

What do these terms mean? Data inconsistency occurs when multiple applications use the same data but with different names and shades of meaning. Data redundancy occurs when the same data are stored in different files. As a result, file updates do not occur simultaneously and information extracted from different files for different purposes contain different data. Data incompatibility occurs when data are structured differently in different files requiring complex interfaces to pass data to and fro.

This problem is made worse when data base management systems have been used to store individual application files. Data dictionaries which can store information about records, data elements, programs, and modules, are rarely used. The widespread use of microcomputers has also contributed to a climate for data inconsistency, redundancy and incompatibility.

Programming languages. Most current programs are coded in a procedural language such as COBOL or PL1. (A procedural language uses "how" type instructions; a nonprocedural language uses "what" type instructions). Procedural languages are more complex to use than nonprocedural languages and can result in:

- large numbers of programmers being needed,
- the need for systems analysts to interface between the users and the programmers,
- higher education costs,
- difficulties in program testing, and
- the need for manually creating supporting program documentation.

On the other hand, nonprocedural languages (commonly referred to as fourth generation languages) are often machine inefficient and cannot cope with complex procedural logic.

Though it is inappropriate to discuss detailed solutions at this point, it is worth noting that many organizations have achieved considerable programming success using high level procedural languages such as IBM's Cross System Product (CSP), Cincom's MANTIS, ADR's IDEAL and Software AG's NATURAL. Another product is Paul Bassett's FRAME technology, which is marketed by Netron under the CAP (Computer Automated Programming) umbrella. This tool, using artificial intelligence, makes programming with any procedural language very simple and efficient. At present the language being supported is COBOL in the IBM and Wang environments. In the future, Bassett FRAMES can be expected to displace many so-called fourth generation languages because the FRAMES are simple to use and have all the power and efficiency of procedural languages.

Dependencies. Strong dependencies exist between data and program code because the data are buried in the code. Hence, changes to data require major program changes. Strong dependencies also exist between program modules. Hence, changes in any one module create a ripple effect throughout the system.

System life-cycle control. Management of the system life cycle from the identification of the need for the system to phasing out or replacement of the system is either casually managed or overcontrolled. In the first situation, the designers and developers are given a free rein to do as they please. In the second, controls are rigidly imposed through the mandatory use of

application system development methodologies which are either developed in-house or acquired from external suppliers. The latter become a problem when they restrict the use of more effective system design techniques because they do not fit the standards imposed by the methodology.

1.2 SOLUTIONS THROUGH STRATEGIC, TACTICAL AND OPERATIONAL PLANNING

These problems can be solved by developing and implementing effective strategic, tactical and operational plans for the management information services department within the organization. These three planning levels should be developed in a highly structured and organized manner. They should incorporate techniques for analyzing business functions, developing across-the-corporation views of data and using this information to design and build application systems to meet both present and future business needs.

The Strategic Information Resource Plan (SIRP)

This plan is developed by MIS management to define where MIS should be in three to five years, and to organize and control migration from the present environment to this defined goal. This strategic plan covers five phases: (1) definition of the company's business in terms of its business strategy, (2) the development of its information architecture, (3) the design of the supporting technical architecture, (4) the development of a migration strategy, and (5) the conversion of the initial projects into a set of tactical plans. On completion of the initial SIRP, this strategic plan must be periodically reviewed and kept up to date at least every half year.

Tactical Plans

The tactical plans provide the bridge between specific projects, such as developing specific application systems, or acquiring and installing hardware and software, and the strategic plan. They are similar to the plans usually prepared with specific budgets for a fiscal year.

Operational Plans

The operational plans are the specific detailed plans for each project.

1.3 STRATEGIC RESOURCE INFORMATION PLANNING AND EXECUTION (STRIPE)

The task of developing strategic, tactical and operational plans becomes much easier when a road map is available which defines specific activities to be executed. The planning and implementation become more effective when supported by simple data modeling, and application system design and development techniques. These techniques must reflect the corporate view of the organization's data and permit user participation in system prototyping. STRIPE (Strategic Resource Information Planning and Execution) is a complete methodology which has been developed as a set of techniques and procedures to encompass all three levels of planning, with emphasis on information resource management and application systems development.

Table 1.1 is a matrix which displays the STRIPE outputs. These are grouped under business, data, applications, technical environment, and type of plan in terms of strategic, tactical and operational planning.

This book describes the techniques and procedures which make STRIPE unique. These include all aspects of strategic planning, information resource management, and application system design and development. The tactical and operational activities associated with the technical environment are straightforward and hence, are not discussed.

The appendices contain the detailed case study referenced in the text. They also contain the STRIPE methodology's Table of Contents.

STRIPE is easily followed and can be applied immediately in an organization. It provides a logical sequence of activities commencing with the development of the strategic information resource plan (SIRP), the detailed design of the information architecture and implementation of information resource management, the design of the technical architecture and the development of the technical environment, and the design and development of new interactive systems directly from the data defined in the data models by using system prototyping.

The matrix approach used in the methodology makes it highly flexible. All or part of it can be used to meet users' particular needs. For example, an organization interested in information resource management only would need the business strategy (SP1), the major functions (SP2), the data architecture (SP2), function expansion (TP1) and logical data base design (TP2). Another interested in application system development would need the application architecture (SP2), the current application evaluation (SP4), physical application definition (TP3) and all the operational outputs except OP11. Needless to say, the matrix drives home the fact that the outputs defined in it make up a whole and any specific set within it must be viewed as part of that whole.

STRIPE techniques eliminate hours of labor required by conventional system planning and design methods such as the drawing of data flows and

TABLE 1.1 The Stripe Matrix

	Business	Data	Application	Technical Environment	Type of Plan
STRATEGIC PLANNING	SP1 Business Strategy: Mission Objectives and Goals Strategic Directions Critical Success Factors (CSFs) Major Information Requirements SP2 Major Functions (Processes) SP4 User and MIS Department Evaluation SP4 Proposed Organizations	SP2 Data Architecture: Primary Entities Crown E-R Diagram Subject Data Bases	SP2 Application Architecture: Business Applications SP4 Current Application Evaluation	SP3 Technical Architecture: Function Distribution Computers and Peripherals Data Distribution Communications Software (DBMS, Dictionary, Security) Office Automation SP4 Evaluation of Current Hardware/Software, Communications and Office Automation	SP4 Migration Plan: Major Projects over a 3–5 year period
TACTICAL PLANNING	TP1 Function Expansion TP1 ASDM Policy TP1 Organization Change: IRM Function Education Function Strategic Planning Function Quality Assurance	TP2 Logical Data Bases: Entity Expansion Current Files/ Documents Comparison Data Normalization Data Distribution	TP3 Physical Application Definition	TP4 Hardware/Software Commmunications/ Office Automation Specifications TP5 Selection of: Computers, etc. Communications Equipment Software Office Automation Equipment and Software	SP5 Budget Year Plan: (or similar period) Prioritized Projects scheduled and resourced OP1 Individual Project Plans
OPERATIONAL PLANNING	OP2 Business System Specifications: Activity Level Functions Output Requirements Output Design OP9 System Implementation: Manual Procedures D.P. Operations Procedures Education OP7 System Test: Testing OP10 System Review: Business Needs Operating Efficiency	OP4 Physical Data Base Design: Activity Level Data Expansion Data Volumes Data Accesses Physical Data Bases Physical DB Access Modules OP7 Testing OP9 File Conversion	OP3 Procedure Design: Event and External Action/Condition Analysis Embryonic Procedures Menu Hierarchies Input Screens and Forms OP5 Procedure Expansion: File Update Logic Output Logic OP6 System Construction: Physical Procedures OP8 Package Acquisition OP7 System Test: Testing OP9 Production Libraries	OP11 Product Implementation: Product Acquisition Product Installation Product Conversion Product Testing	

Warnier/Orr diagrams, and structure charts. Combined with effective fourth generation procedural and nonprocedural languages, data base management systems and a data dictionary/encyclopedia, they provide extremely powerful and effective planning, system design and development tools.

STRIPE techniques are described in the context of the complete methodology and associated with the particular activity to be executed. Thus, the reader is given a set of tools and is shown when, where and how to use them. The single exception to this rule is the description of the strategic information resource plan. The related activities are found in Appendix B—The STRIPE methodology Table of Contents.

The strategic information resource plan (SIRP) is discussed in terms of its content and how the outputs may be obtained rather than as a set of activities. This is done as it is important that the SIRP be viewed as a set of strategies rather than as a set of activities. Once the concepts have been understood, the STRIPE activities can be easily planned and executed.

1.4 BENEFITS OF USING STRIPE

Why use STRIPE? It provides:

- a matrix approach to strategic, tactical and operational planning in terms of the business, data, applications, the technical environment and the type of plan. This matrix points to the procedures used to provide required outputs. The independence of each procedure is preserved;
- the basis for establishing a strategic information resource plan for the MIS organization;
- simple techniques to build corporate data models and subject data bases which mirror an organization's business;
- a mechanism to map data bases to application systems which simplifies and reduces the work and time involved in system development and maintenance;
- a natural, evolutionary process for doing system prototyping to increase the understanding of an organization's functions and data;
- a planned technical environment to support the entire organization and its information architecture.

REFERENCES

1. Cross System Product (CSP) software marketed by IBM, order numbers SBOF–1023 and SBOF–1024.

2. MANTIS software marketed by Cincom, 2300 Montana Avenue, Cincinnati, OH 45211.
3. IDEAL software marketed by Applied Data Research, Inc., Route 206 and Orchard Road, CN-5, Princeton, NJ 08540.
4. NATURAL software marketed by Software AG of North America, Inc., Reston International Center, 11800 Sunrise Valley Drive, Reston, VA 22091.
5. NETRON/CAP software marketed by Netron Inc., 99 St. Regis Cresent North, Downsview, Ontario M3J 1Y9, Canada.

2
Management of the STRIPE Process

STRIPE includes the development, implementation and maintenance of the MIS strategic plan (SIRP), and the tactical and operational plans. These plans describe the development and maintenance of the information architecture, the technical architecture and application systems. The planning activities are usually done by a temporary group initially and by permanent groups over the longer term.

After completing the original strategic information resource planning (SIRP) project, MIS functions which may be introduced include planning, information resource management, the information center and quality assurance. The current functions which may change are discrete planning of application systems, hardware, software and communication networks, the data administration function, and application systems development and maintenance. Let's discuss the new functions.

2.1 PLANNING

The concept of strategic planning for MIS is different from the annual planning of application systems based on user requests for enhancements to existing systems and new systems, and the resulting need to increase pro-

cessing and storage capacities, set up additional communication networks and acquire more sophisticated software. Annual planning is generally done only for the budget year. Strategic planning extends over several years and is based on the organization's business strategy for the same period. It also includes the monitoring and replanning of projects defined in the strategic plan.

The SIRP scope defines the limits of the strategic planning project. This could include the entire organization, the corporate level only, a division level or a function level. In very large organizations, it may be worthwhile developing the SIRP at two levels at least, the first plan at the corporate level and the second at a division or function level. The corporate level SIRP would provide an umbrella for the lower level strategic plans.

Both the initial strategic planning project, the ongoing planning function and the review of all projects should be directed and controlled by a subcommittee of company vice-presidents called a steering or review committee. This committee should ensure that the MIS strategic plan is in line with the company's business strategy. Direct control of planning and implementation should be by one of the vice-presidents on the steering committee. Should the SIRP not be at the corporate level, then the steering committee should be drawn from the senior-most levels of management within the area to be studied.

The original SIRP project team should be relatively small and not exceed six members who should be drawn from the user, the data administration and the system development staff. The small team size will provide a close working relationship between the members and reduce the administrative overhead that comes with large teams. Additional expertise and support in specific areas during the SIRP project may be obtained from permanent staff.

The success of the SIRP project is dependent on the project team's knowledge and understanding of the planning requirements and the processes to be used. Prior experience in strategic information planning would be an asset. Before the SIRP project is started, all the team members should be familiar with all aspects of STRIPE. In particular, the detailed process to be followed during strategic planning should be well understood.

The SIRP project should be planned as a major project with costs, schedules, activities and tasks identified. Planning and review sessions with the review committee should be scheduled at the beginning and end of each phase.

Table 2.1 is a sample project work plan for the SIRP. The table column headings are the STRIPE activity number; the day number commencing from the first working day of the project; the resources planned to be used in person days for each team member such as a senior consultant, a consultant, users 1 & 2, a senior systems analyst, and any other staff involved; and a comments column with such information as the group responsible for the

TABLE 2.1 PROJECT WORK PLAN
CALENDAR SCHEDULE AND COMPONENT WORK LOAD

Activity	Day No. From	Day No. To	Resources in Person Days: Senior Consultant	Consultant	User #1	User #2	Senior Systems Analyst	Other Staff	Comments
Start-up Phase									
SUP. 1	1	1	0.5	0.5	0.5	0.5	0.5	4.5	Review Board
SUP. 2	1	1	0.5	0.5	0.5	0.5	0.5	2	Systems Coordinator
SUP. 3	2	2	1	1	1	1	1	9	Review Board
SUP. 4	3	7	5	5	5	5	5	?	Project Team Selected DP Staff Users
Subtotal			7	7	7	7	7	?	
PHASE 1	The Business Strategy								
SP1. A	8	8	1	1	1	1	1		
SP1. B	9	9	1	1	1	1	1	4	Systems Coordinator
SP1. .1	10	14	5	5	5	5	5	?	Senior Staff as Required
SP1. X	15	17	2	2	3	3	3	4	Systems Coordinator
SP1. Y	22	22	1	1	1	1	1	9	Review Board
SP1. Z	24	25	1		1				
Subtotal			11	10	12	11	11	?	