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Output-driven information system planning: a case study

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Abstract

Information system (IS) plans can vary in length and detail. One must, therefore, be able to tailor the existing planning methodologies to produce the desirable outputs. This article proposes a framework of demand-centric adaptive IS planning process and applies it to a case study that demonstrates how to adapt the methodology to produce an IS plan for a small commercial bank. Following the output-driven adaptive approach, the project was completed on time with expected quality. The project document provides the bank's management with guidelines for allocating their information resources to meet the current and future needs of business. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

The information system (IS) has become the life-blood of a business. It has been used successfully by many companies to increase their competitive advantages [6,7]. Most of these companies are large in size and leaders in technology usage. Their systems are too resource-demanding to be affordable for small businesses [26,30]. Studies have revealed that IS planning has been consistently a major issue facing IS community [2,4,5,9,14,24] and that linking IS planning to business strategy has been the key to IS efficacy [8,12,31,36]. The essence of an effective IS planning is to make sure that the growth of IS [25] follows the

business goals prescribed by company management. The output of the planning process should contain the direction, strategies, and actions for acquiring, managing, and utilizing the information resources (i.e. data, technologies, facilities, and personnel) and for performing the IS functions (such as collecting, sorting, retrieving, processing, and managing information).

Many methodologies for IS planning have been described in the literature, but none is perfect. For example, *Business Systems Planning* [15] and *Information Engineering* [20] are quite complete and complex; either methodology may take a three-person team 2 or 3 months (or longer) to complete the IS planning process for a small company. In contrast, *Critical Success Factors* [28] and *Strategy Set Transformation* [17] are easy to implement and can be completed within a few weeks, though they lack sufficient guidelines for developing an effective IS plan. Therefore, the planning process must combine good aspects of several methodologies in order to achieve good results [19] and different methodologies

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must be properly selected and tailored to serve the needs of different phases in IS planning process [3,10]. This leads us to the frequently-asked questions: “Which IS planning methodology should we use?” and “Will it work for our company?” Furthermore, commercial pre-packaged planning methods typically produce voluminous output documents. Small companies must pay a high price for these documents, even though most of them are not what they need. The question is then: “How can we make the planning method give us exactly what we need?”

2. The output-driven customizing process

Developing an effective and complete IS plan is a complex process. Several comprehensive and structured planning methodologies are commercially available to facilitate the process (e.g. [1,21,32]). These methodologies generally adopt a top-down approach that begins with analyzing the opportunities and needs and ends with a set of programs and plans for managing the IS function [27]. The approach strings together various activities in the planning process and ensures congruency between business and IS strategies. Notwithstanding, it takes a long time and results in a large volume of documentation. Under today’s fast-changing business environment and technological advancement, a complex IS plan is probably obsolete or shelved as soon as it is produced [11,13,33]. Therefore, we need a flexible method that produces an IS plan in a timely manner and at a desirable level of detail.

There are various possible outputs of the planning process. These may be classified into three categories: “organization”, “management”, and “abstraction”. Each category may be further divided into three levels. The levels of organization are: “entire organization”, “group of divisions”, or “major operating division”. For example, an IS plan for a product division of a manufacturing company falls at the “major operating division” level, while a multi-product manufacturing plant falls at the “group of divisions”. The levels of management include “strategic; long-term”, “tactical; medium-term”, and “technical; short-term” management. For example, an architecture definition for the enterprise is at the “strategic-level”, while a project plan is at the “tactical-level” and a project

schedule is at the “technical-level”. Finally, the levels of abstraction include “coarse-grained (overall; rough)”, “mixed-grained”, and “fine-grained (specific; detailed)”. For example, an enterprise data model [22] is “coarse-grained” while a normalized database table is “fine-grained”. A “mixed-grained” output would contain both types. One may determine the scope of the intended planning outputs by selecting a level from each of the categories.

Fig. 1 depicts the framework of an output-driven approach to customizing the IS planning process. The planning process is initiated by decision needs raised by business or IS managers. They should identify what information they need to make their decisions. A planning team then maps out the planning outputs containing the required information. Based on these, the team identifies the appropriate planning methods. An optimal planning process containing the schedule and milestones is then produced. Finally, the planning process is followed to produce the outputs requested by the managers.

The entire planning process is initiated, executed, and evaluated according to the decision factors considered by business and IS managers. These may include claimants, competitors, prospects, economies, environment, internal conditions, etc. The claimants are of two kinds: *internal* (including employees and management) and *external* (including customers, suppliers, creditors, stockholders, governments, and the public). The proposed framework is demand-centric and adaptive. It makes the planning process flexible enough to produce planning documents for a company of any size and with any needs.

3. A case study

3.1. Background

The ABC Bank opened its door in the southwestern US in the early 1990s with assets of \$50 million. It was staffed by experienced professionals. The President, Peter, worked his way up through the ranks over 20 years at a bank that was the holding company of ABC. The senior Vice-President and cashier, John, was equally experienced; his past accomplishments included the start-up of several banks in California and Arizona. John was a cashier, personnel director,

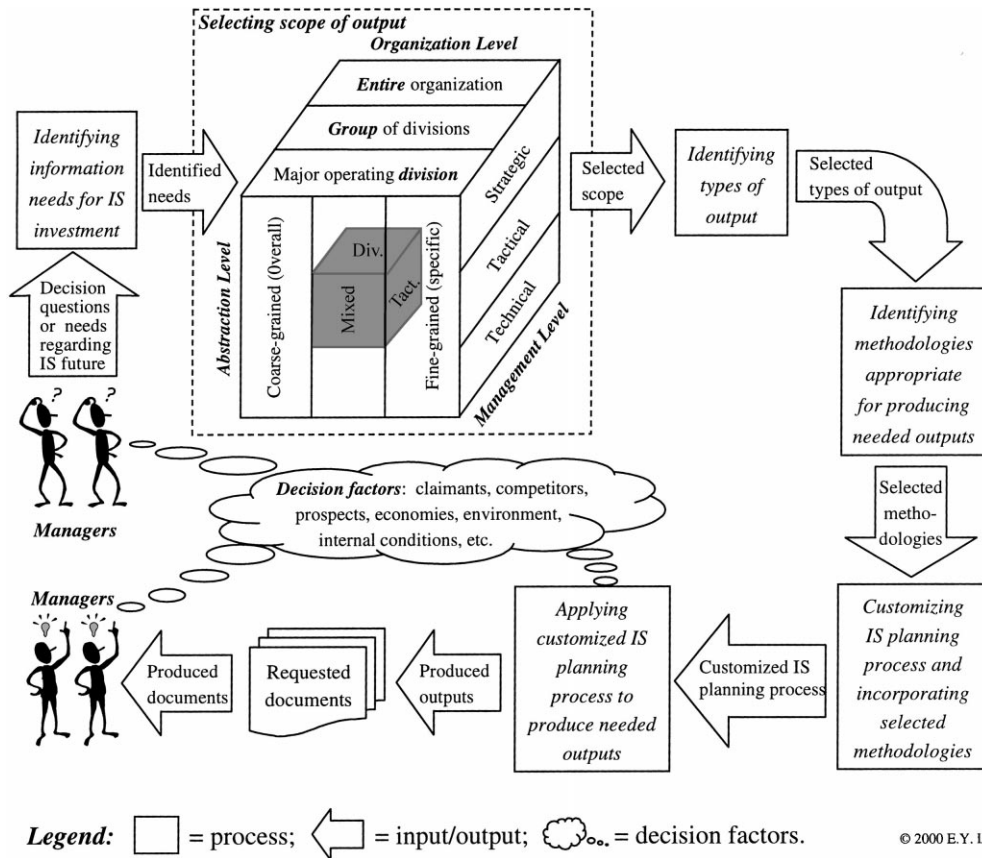


Fig. 1. A framework of Output-Driven IS planning process.

and marketing director. He was also responsible for the bank’s IS functions and overseeing one part-time programmer. The hardware included a high-end IBM personal computer, a laser printer, a high-speed dot-matrix printer, and a communications device connecting the PC and several terminals to another bank in Los Angeles which provided general ledger services. The bank’s software included a spreadsheet processor, a word processor, and several other packages marketed by a banking services provider. The latter software packages had been producing report forms required by the Federal Bank regulators. As a senior IS executive, John had no experience in any IS planning. He consequently invited the authors to conduct planning sessions after the bank had been in operations for 5 months. The scope of the project was the development of an IS plan that would be consistent with the bank’s strategic direction.

3.2. Customizing the IS planning process for the ABC Bank

Before the project began, we met with the bank’s top management to discuss their information needs and the possible actions and outputs of the IS planning process. They indicated that they wanted to answer three questions: “Where are we?”, “Where do we want to go?”, and “What should we do next?”. Therefore, the scope of the output fell into the class of “entire organization”, “strategic”, and “mixed-grained”. After considering the limited duration of this project, as well as the bank’s needs, four outputs were identified: 1) the required business processes and their corresponding IS applications, 2) a risk assessment of each potential application project, 3) the required database files and the business processes they support, and 4) the structures of the required database

files. This selection might seem unusual, but ABC Bank's management wanted to take one step at a time. Typically, small businesses do not have IS plans and many of those who have plans do not fully implement them because of resource limitations. Therefore, they often need to consider a shorter time frame than their large counterparts. In fact, managers in small businesses tend to watch their front-line workers perform their duties. Therefore, managers at the ABC Bank probably knew what their employees needed and only wanted to have a second opinion from us.

We went ahead to identify the actions needed by reviewing six methodologies: Application Portfolio [23], Business Systems Planning, Critical Success Factors (CSFs), Strategy Set Transformation, Information Engineering, and Strategic Planning for Information Resources [18]. Then, we identified six planning steps for ABC. Fig. 2 shows the flow and time estimate of the recommended IS planning process. The time estimate was based on using one full-time planner working exclusively on the project. The process was approved by the management of ABC Bank. Following this process, we were able to complete the project on time and with expected quality. Specifically, the project took two-person months to complete — a three-person team spent about 12 to 14 h per person per week for 2 months.

3.3. Implementing the planning process

3.3.1. Step 1: Gain organizational commitment

Before the planning project began, we had to gain the commitment of the entire bank staff. Since the project was initiated by the bank's senior V.P., we already had strong top management support. We therefore met with all employees in the bank to solicit their cooperation. For this purpose, John wrote a memorandum announcing the project and its purposes. He also appointed his executive assistant, who had been using computers to produce reports, as the user representative. The project team included, therefore, the executive assistant, the part-time programmer, and the senior author. The team decided to report progress every other week to the entire bank staff to retain enthusiasm. We also responded to any suggestions from employees; this gave them a sense of involvement.

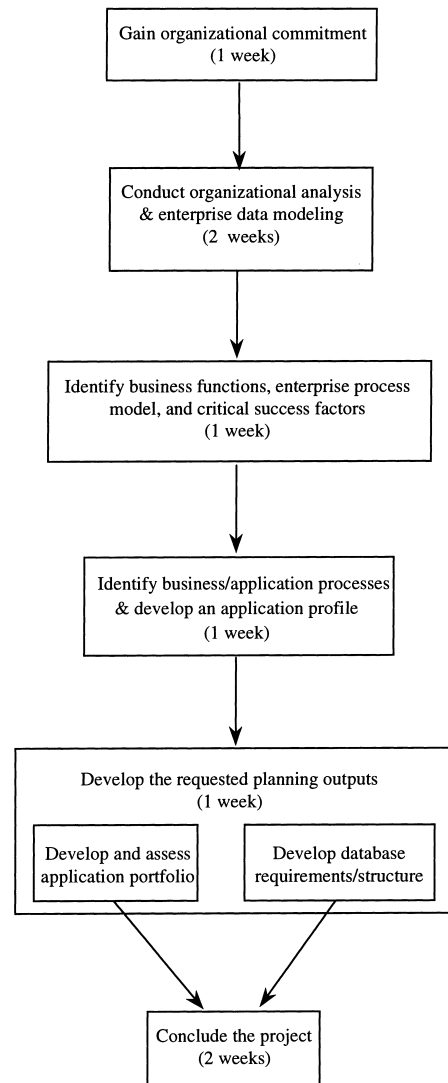
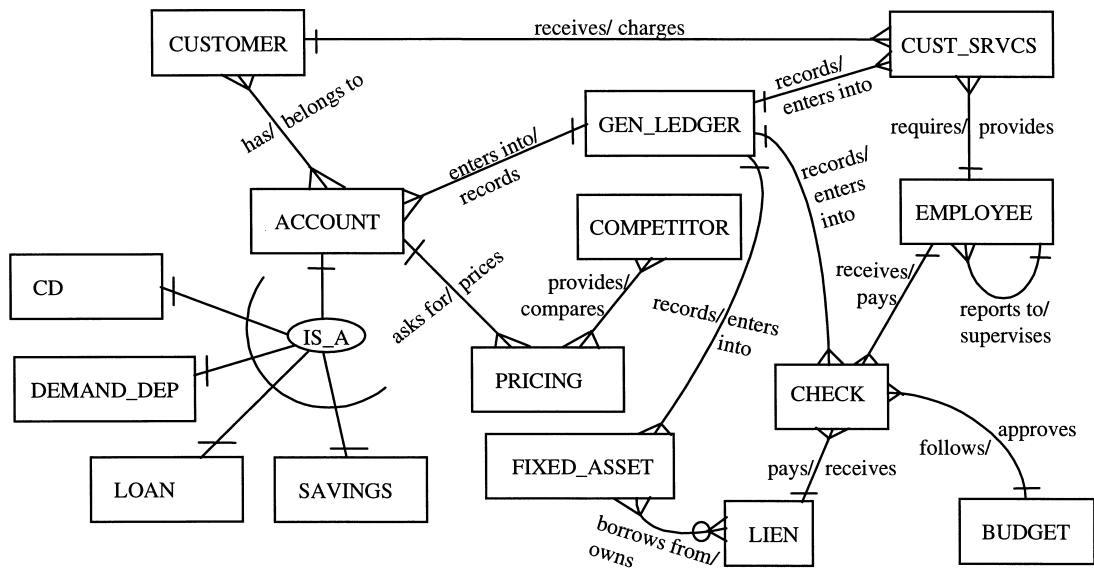


Fig. 2. A customized IS planning process for the ABC Bank.

3.3.2. Step 2: Conduct organizational analysis and enterprise data modeling

This step involved personal interviews with the bank's executives and careful observations of the bank's operations. The purpose was to understand the bank's infrastructure, operations, and competitive environment and, in turn, to develop an enterprise data model and identify the organizational strategy set. The enterprise data model was developed in an entity–relationship diagram as shown in Fig. 3, following the information engineering approach. It was the basis for



Note: This diagram was created with the diagramming standards of information engineering approach [22].

Fig. 3. The enterprise data model of the ABC Bank.

designing database processing requirements and file structures for the bank.

3.3.2.1. Enterprise data model. The enterprise data model as shown in Fig. 3 indicates there are 15 high-level entities at the ABC Bank. Each customer has one or more accounts and each account belongs to one or more customers (such as a joint account). There are four types of account: certificate of deposit (CD), demand deposit (i.e. checking account), loan, and savings. A customer may have one or more services provided by bank employee and each service is charged to a customer. Each employee receives one or more payroll checks and each check is issued to an employee. Each check is recorded once on the general ledger (GL), which may contain one or more check entries. The bank controls several fixed assets (such as land, plants, equipment, and buildings); each has zero to several liens and each lien finances one or more assets. An installment check is issued to a lien and each lien may receive one or more checks. The check issued must match one of the line item in the bank's budget and there may be more than one check per line item. The purchase of a fixed asset must enter into the GL, which may contain one or more purchases. The

pricing entity surveys the prices (e.g. interest rate) offered by competitors and sets a price on a customer's account.

3.3.2.2. Organizational strategy set. The organizational strategy set included the goals, objectives, and strategies, as well as strategic organizational attributes (i.e. the strengths, the weaknesses, and the resource constraints of the bank). Fortunately, ABC Bank had not only a written business plan but also a comprehensive *Policy and Procedures Manual*. These two documents provided the goals, objectives, and strategies of the bank.

There were three unique organizational attributes of ABC Bank. First, the bank's executives wanted the planning project completed as soon as possible and they only wanted to have a rough idea of their future IS. Second, almost all IS users (except the part-time programmer) were not computer literate and they were inexperienced in the use of any programming language. Third, the number of ABC's customers was growing rapidly and the amount of paper work had increased dramatically. These unique attributes confirmed the underlying factors affecting John's choice of planning outputs. The strategic IS plan, therefore,

had to be free of technical jargon and details, and provide a rough idea of potential applications and database files. Since none of the bank's employee was capable of implementing an IS project, the plan would serve as a road map for any IS developer to be hired later.

Meanwhile ABC Bank had five goals: maximizing profit, minimizing costs, steady growth, maintaining employee satisfaction, and excellence in customer relations. As a newly established bank, its top management wished to attract and retain more customers through competitive pricing and friendly services. They were eager to use computers to increase operational efficiency and effectiveness and, in turn, improve customer services. These goals, objectives, and strategies were reflected by the bank's mission statement:

ABC Bank is a locally owned bank whose mission is to promote business and commerce by providing financial resources and expertise for long-term customer and community growth. The bank will provide a profitable long-term return to its shareholders by being responsive to present and future needs of its customers. This will be accomplished by creating an environment that provides for the motivation and development of employees dedicated to excellence in customer services.

3.3.3. Step 3: Identify Business functions, enterprise process model, and CSFs

3.3.3.1. Business functions. Production/Operations: ABC Bank's Production/Operations function entailed not only the management of the customers' accounts and their deposited funds but also the subsequent lending or investing of those funds. Its critical success factor (CSF) was to maintain a profitable net interest margin. Thus, the income from investing and lending must generally exceed the variable cost of acquiring those funds plus the fixed costs of operating the bank. The primary way to accomplish this CSF is through good pricing policies. The bank was using a computer to perform sensitivity analysis of interest rate to analyze its effect on the net interest margin.

Finance: The Finance function was closely tied to the Production/Operations function. It concerned the

rate of return on the bank's assets and the associated risks of each loan and investment. One CSF was that the bank's decision makers, particularly the Board of Directors, assign appropriate interest rate requirements for different levels of investment risk. These rates were based on the formula:

$$\text{Loan Interest Rate} = \left\{ \frac{(1 + \text{Desired Growth Rate})}{(1 - \text{Risk of Default})} \right\} - 1$$

But, how should the bank determine the risk of default? A term called "the three C's" was used to represent the risk of a customer — *character, capacity, and collateral*. While a customer's character would be subjectively judged by the loan officer, capacity refers to the resources owned by or available to the customer, and collateral refers to the specific assets pledged against the loan. In addition to the loan customer analysis software used by the bank, there were software packages available for bond portfolio analysis. These helped in determining which bonds were suitable for the bank's portfolio.

Marketing/Sales: Another factor critical to the bank's success was its ability to attract and retain depositors and qualified borrowers. Besides convenient hours and friendly services, pricing is probably the most significant marketing tool. If a customer wants to buy a certificate of deposit (CD) and ABC Bank offers him or her only 7% while another bank offers a 9% return, it is obvious that ABC Bank will lose business.

There are two variables that management can bring into play to adjust prices effectively in order to attract and retain customers. First, the bank must know the pricing structures of its competitors, including any bank, savings and loan, mortgage company, or brokerage house in the surrounding area with similar services. The tracking and recording of the competitors' pricing structures is not an attempt to set prices or guidelines for the bank; it is used to forecast the flow and distribution of customers. If it is apparent that other major banks are not strongly competing in certain areas, ABC Bank may be able to penetrate them.

The second variable for marketing strategy concerns: 1) the budgeted targets for the volume and average price (or interest rate) of deposits on the liability side of the balance sheet, and 2) the volume and average price of commercial, real estate, and consumer loans on the asset side. For example, if

the bank is below its target volume of CDs, it may be able to offer a higher interest rate to attract more CD purchasers, etc. The supply and demand mechanism works the same way for the loans, except in reverse. As the volume approaches target, prices will begin shifting upward until an equilibrium is reached. There were, therefore, two CSFs concerning marketing of ABC. One was that the bank be aware of its competitors' activities, the other was that the bank monitor the actual deposits and loans so that their prices could be adjusted towards budgeted volumes.

Personnel: Personnel management is undoubtedly a CSF to any organization. A plausible approach is to provide the employees with good fringe benefits, a healthy work environment, reasonable workload, and an appropriate career path. In a relatively small organization, it is not cost effective to computerize personnel management because management knows all the employees; and each employee knows his/her next position on the career ladder. As would be expected, another CSF of the bank was that all positions be occupied by qualified employees.

Accounting/Administration: Implicit in the bank's Mission Statement was the Accounting/Administration function, without which there could be very little managerial control. In particular, it was a CSF of the bank that accounting information be quickly relayed to top management. As John put it, "a small bank must react quickly or go under, because there is very little cushion to support mistakes".

At the center of the bank's Accounting function was the general ledger system. Daily transactions were transmitted to the mainframe at the services bank in Los Angeles, where the general ledger was maintained. Then a hard-copy report was sent back to ABC via courier. This report gave management a detailed account of the bank's position on a daily basis. The contents of the report included daily figures, monthly and quarterly averages, and percentages. Downloading the report onto a floppy disk was possible but unused; it was neither cost effective nor necessary at that time.

Federal Bank regulators also required accounting information. A Call Report was produced every quarter by a software package on an IBM personal computer. An audit confirmation report was also required on a periodic basis. The other administrative processes included payroll processing, office supplies manage-

ment, fixed assets management, budget planning and control, etc.

Customer services: There was no doubt that competitive pricing without good customer service could not guarantee the bank's success. Therefore, excellence in customer services was not only a major goal but also a CSF. Such a goal required the bank's employees, regardless of their position levels, to respect and be friendly with customers. New employees were trained to act in this way.

3.3.3.2. Enterprise process model. A Business function received, processed, and sent information to and from various entities as well as the other Business functions. These flows of information constituted the enterprise process model [34] of the bank. This is also called a "business model" [16]. Fig. 4 shows the model as a data flow diagram.

3.3.3.2.1. Information flows within the Business functions. The Production/Operations function handled the customer's transactions and provided customers with timely account information. To facilitate the operation, the manager set up the goal (and/or guidelines) and was properly informed about the bank's operations. In addition, the function monitored the progress of the bank's investment plan on a regular basis.

In compliance with regulations, the Accounting/Administration function processed customer account information. The Finance function evaluated the customer's profiles and market's performance and developed the investment plan. The risk assessment and report were frequently communicated to the customer.

The marketplace was, of course, the source of benchmarks for quality attributes. The Marketing/Sales function took this information, combined with customer's requirements, government's regulations, and the bank's goals, into the design of a market plan. Management was informed of how the bank is performing.

The employees provided the bank's Personnel function with information about the bank's operations and recommended improvements. These information items impacted one goal, bank competitiveness, and affected the planning activity. In return, the employees received training to improve their operations.

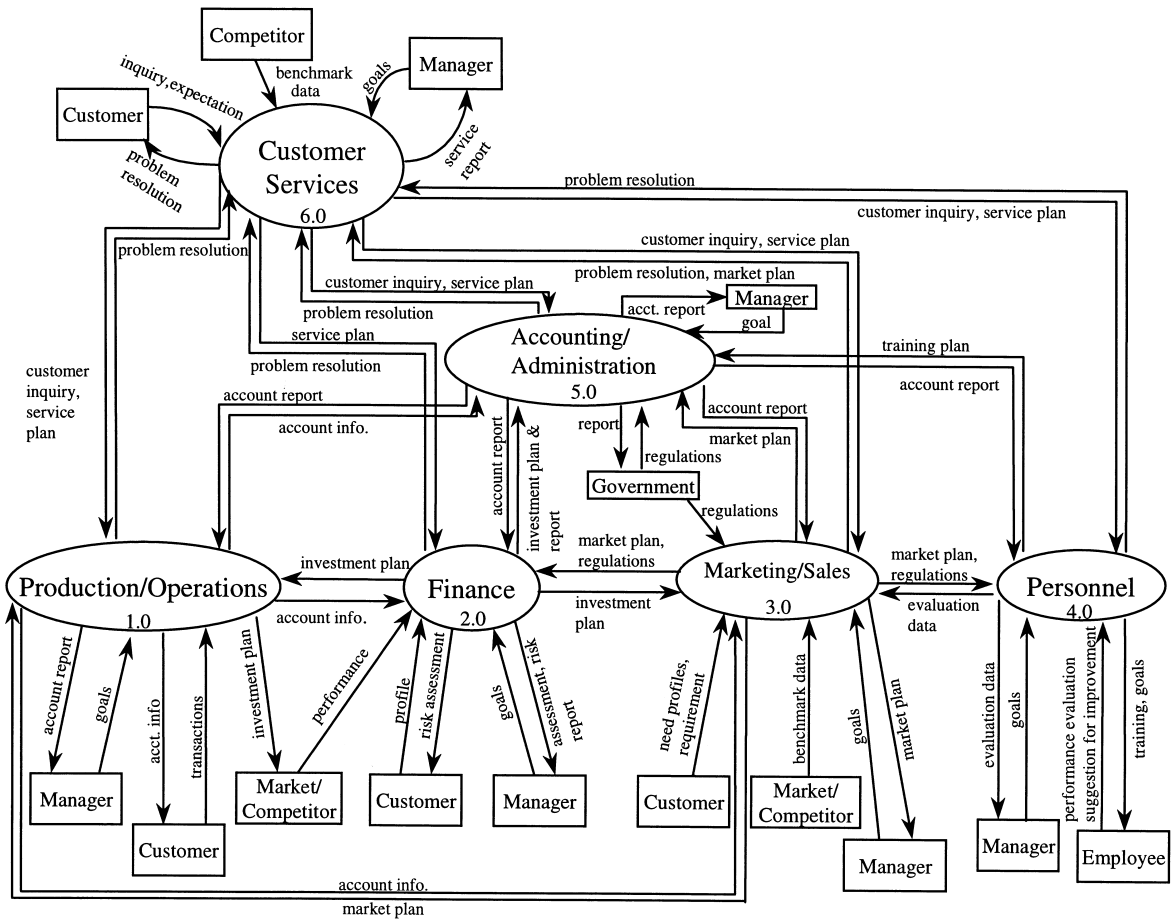


Fig. 4. The enterprise process model of the ABC Bank.

The Customer services function played a major role in assessing the effect of service design and measuring the bank’s success through a customer satisfaction survey. Benchmark data was then integrated with customer expectations to provide a basis for the design of a service plan.

3.3.3.2.2. *Information flows between the Business functions.* Each Business function received, processed, and sent information to and from the other Business functions. For example, Marketing/Sales and Customer services functions processed and dispersed customer complaints to the Production/Operations function. The latter function distributed account information to Accounting/Administration, Finance, and Marketing/Sales functions and received infor-

mation about account report, investment plan, and market plan, etc.

3.3.3.3. *Critical success factors.* After analyzing the Business functions and information flows, 12 CSFs were identified for ABC Bank (see Table 1). These were consistent with the bank’s business strategies and used to formulate IS strategies.

3.3.4. *Step 4: Identify Business/Application processes and develop an application profile*

Once the Business functions had been identified, we could break them down into processes. Ideally, each should be supported by a computerized application system. Therefore, identifying business processes is equivalent to identifying potential computer

Table 1
The Business functions and critical success factors of the ABC Bank

Function	Critical success factor
Production/Operations	1. Maintain a profitable net interest margin by competitive pricing
Finance	2. Assign appropriate interest rate requirements for different levels of investment risk
Marketing/Sales	3. Know the competitors' activities in order to identify potential areas for aggressive penetration 4. Attract and retain depositors and qualified borrowers 5. Monitor actual deposits and loans so that prices can be adjusted towards budgeted volumes
Personnel	6. Establish and maintain an effective personnel management system 7. Gain employee satisfaction by providing the employees with good fringe benefits, a healthy work environment, reasonable workload, and appropriate career path 8. Staff all positions with highly qualified employees
Accounting/Administration	9. Provide timely accounting information to top management 10. Provide top management with a detailed account of the bank's position on a daily basis 11. Ensure a timely delivery of the reports required by Federal Bank regulators
Customer services	12. Create and maintain a high level of customer satisfaction by providing excellent customer services

applications needed to support the processes, each with estimates of its costs, benefits, and timetable. Moreover, it should include risk assessment of any failure to meet expectations. Just as a financial manager needs to know both the return and the risk of a certain investment, an IS manager should know the benefits and associated risks of a proposed project. The portfolio approach to an IS plan identifies project risks to allow IS management to select potential projects based on the trade-off between the risks and the benefits. In this approach, three dimensions of individual project risk must be measured — *project size*, *experience with technology*, and *project structure*. Project size is indicated by the budgeted cost, the expected length of project life cycle, and the number of departments affected by the project.

The technology risk takes into account a project team's experience with the hardware (CPUs and peripherals) and software (operating systems, database management, programming languages, and data communications) for the proposed system. It also considers whether the team has previously developed a similar system and if the end users have experience using a similar system. A project with a high technology risk can reduce that risk by using outside consultants with appropriate experience.

Project structure risk is measured by how well the end product is defined and how much the organization will be impacted. A low-structure project is one whose

are subject to change, while requirements of a high-structure project are fixed and known at the beginning. The structure risk also considers the relationship between the intended system and the organization. Will the intended system cause procedural or organizational changes? And, how committed is top management?

In the case of ABC Bank, there were many potential processes or applications to be computerized. For example, the bank were charging service fees for some of its services (such as the safe deposit). It was, therefore, necessary to develop and use a billing system for service charges. Billing was at that time done manually, but it was expected that increasing demand would soon cause it to be automated. Other customer services, such as trust management and contract collections, might be implemented when there was sufficient demand. Table 2 shows the profile of the bank's existing and potential Business/Application processes. The processes recommended for computer assistance are the potential IS projects in the bank's IS plan (i.e. the *application portfolio*).

3.3.5. Step 5: Develop the requested planning outputs

3.3.5.1. *Application portfolio*. Assessing the risks of each project in the application portfolio provides a risk profile for IS management. However, the risk profile

Table 2
The application profile of the ABC Bank^a

ID	Function	Business/Application process
1.0	Production/Operations	Deposit account management Loan management Investment management
		Demand deposits (O) Savings (O) Certificates of deposit (O) Commercial account management (O) Consumer account management (O) Real estate account management (M) Loan processing (M) Bond portfolio (M) Money market portfolio (M) Federal funds portfolio (M)
2.0	Finance	Asset/liability management Reserve management (M)
3.0	Marketing/Sales	Account setup (M) Account analysis (X) Competitor analysis (M) Pricing (M) Forecasting deposits (M)
4.0	Personnel	Recruitment (M) Scheduling (M) Manpower planning (M) Compensation policy (M) Performance appraisal (M)
5.0	Accounting/Administration	General ledger maintenance (O) Payroll (C) Check reconciliation/monthly statement (O) Government reporting (C) Audit confirmation & reporting (O) Office supplies management (M) Fixed assets management (M) Accounts payable (M) Budget planning (M) Board-of-Directors report (M)
6.0	Customer services	Safe deposit (M) A/R discounting (X) Trust management (X) Contract collections (X) Bank by phone service (X)

^a (C): Currently a computerized process; (M): currently a manual process; (O): currently is an outsourcing computerized process; (X): currently the process does not exist; **Bold typeface**: recommended for future computerization.

of the selected projects should balance between high- and low-risk conditions. Having no high-risk projects could cause a bank to be vulnerable to competitors. On the other hand, a project risk profile with too many high-risk projects could jeopardize the survival of a

business if the projects are not completed on time or as expected. Table 3 shows the results of a risk assessment for the bank's application portfolio. The higher the total score of a proposed project, the higher its risk. For example, Board-of-Directors report,

Table 3
The risk profile of the bank's application portfolio

Potential system project	Size	Experience	Structure	Total
<i>Production/Operations</i>				
Real estate loan account management	2	0	1	3 ^a
Loan processing	2	0	1	3
Bond portfolio	2	1	2	5
Money market portfolio	2	1	2	5
Federal funds portfolio	2	1	2	5
<i>Finance</i>				
Interest margin analysis	1	0	1	2
Key performance ratio	1	0	1	2
Reserve management	3	1	2	6
<i>Marketing/Sales</i>				
Account analysis	2	1	1	4
Competitor analysis	1	0	1	2
Forecasting deposits	3	1	2	6
<i>Personnel</i>				
Scheduling	1	1	1	3
Manpower planning	3	1	3	7
Compensation policy	2	1	3	6
<i>Accounting/Administration</i>				
Fixed assets management	1	1	1	3
Accounts payable	2	0	1	3
Budget planning	2	0	2	4
Board-of-Directors report	3	0	3	6
<i>Customer services</i>				
Safe deposit	1	0	1	2
A/R discounting	2	1	1	4
Trust management	3	1	3	7
Contract collections	2	1	1	4
Bank-by-phone service	3	1	1	5

^a The total score ranges from 2 to 7. The larger the total score, the higher the project risk; Size: 1: small, 2: medium, 3: large; Experience: 0: yes, 1: no; Structure: 1: high, 2: moderate, 3: low.

budget planning, and safe deposit have risk scores of 6, 4, and 2, respectively. Therefore, the risk of implementing board-of-director report is higher than budget planning, while safe deposit has the lowest risk. The project team did not make any recommendation but assisted top management in prioritizing and initiating the projects they deemed most critical. After prioritizing the potential projects, the result was recorded in the planning document.

3.3.5.2. *Database requirements and structure.* While the business processes were being identified, the forms, documents, or reports related to the

enterprise data model were also found. Similarly, while the risks of the application portfolio were being assessed, the required database files for the entire bank were also incorporated in the enterprise data model. These database files were then mapped with the bank's business processes to indicate the required processing (see Table 4). Moreover, the structures of these database files were developed from the enterprise data model according to the scheme mapping process [29] and the relational database design approach. Table 5 shows the resulting structures of the database files required by ABC Bank.

Table 4
Mapping the bank's processes against the database files^a

Functions	Business/Application processes	Database files														
		Account	CD	Demand-Dep	Loan	Savings	Customer	Customer services	General ledger	Employee	Fixed asset	Lien	Pricing	Competitor	Budget	Check
Productions/ Operations	Demand deposit account management	r		C			u		u			r				r
	Savings account management	r				C	u		u			r				
	CD account management	r	C				u		u			r				
	Commercial loan account management	r			u		u		u			r				
	Consumer loan account management	r			u		u		u			r				
	Real estate loan account management	r			u		u		u			r				
	Loan processing	u			C		u					r				
	Bond portfolio management	r			r				r						r	
	Money market portfolio management	r			r				r						r	
Federal funds management	r			r				r						r		
Finance	Rate sensitivity analysis	r			r				r						r	
	Interest margin analysis	r							r						r	
	Key performance ratio analysis	r							r						r	
	Reserve management	r							r						r	
Marketing/S	Account setup	C	C	C	C	C	C									
	Account analysis	r	r	r	r	r	r									
	Competitor analysis	r	r	r	r	r	r	r					C	r	r	
	Pricing	r	r	r	r	r	r					C	r	r	r	
	Forecasting deposits	r	r	r	r	r	r			r					r	
Personnel	Recruitment									r					r	
	Scheduling									r						
	Manpower planning									r					r	
	Compensation policy									r					r	
	Performance appraisal							r		r						
Accounts/ Administration	General ledger		r	r	r	r				C		u				r
	Payroll									u	C					C
	Check reconciliation			r												r
	Government reporting	r							r				r			
	Audit confirmation & reporting	r	r	r	r	r	r		r		r	r				
	Office supplies management									u					r	
	Fixed assets management									u		C	r		r	
	Accounts payable	r								u	r	r	r		r	r
	Budget planning		r	r		r			r	r	r	r	r	r	C	
	Board-of-Directors report		r	r		r			r	r	r	r	r	r	r	
Customer services (safe deposit)			u			u	C	u	r		r					

^a C: create/read/update/delete; u: update only; r: read only.

Table 5
Proposed database structure for the ABC Bank^a

Database file	Fields
Account	<i>Account_no</i> Account_name
CD	<i>Account_no</i> Starting_date Length_of_term Interest_rate Principle
Demand_dep	<i>Account_no</i> <i>Date_n_time</i> Check_no Debit Credit Balance
Loan	<i>Account_no</i> Principle Interest_rate Last_pymt_date Next_pymt_date
Savings	<i>Account_no</i> Balance Interest_type Interest_rate Interest_year
Customer	<i>Customer_no</i> Name Address Phone
Customer_acct ^b	<i>Customer_no</i> <i>Account_no</i>
General_ledger	<i>Account_no</i> <i>Date_n_time</i> Debit_g Credit_g
Budget	<i>Line_item_no</i> Time_period Amount
Employee	<i>Employee_no</i> Name Address Position Supervisor_ID Salary Hours Withheld_tax Accr_vacation
Fixed_asset	<i>Asset_no</i> Asset_name Date_of_purchase Amount_of_purchase PO_no Lien_no
Lien	<i>Lien_no</i> Lien_name

Table 5
Proposed database structure for the ABC Bank^a

Database file	Fields
	Lien_address Lien_phone_no Balance_debt
Pricing	<i>Account_name</i> <i>Competitor_name</i> Price_avg (extended) Price_min (extended) Price_max (extended)
Competitor	<i>Competitor_name</i> Account_name Price
Check	<i>Account_no</i> <i>Check_no</i> Date Payee Amount
Customer_services	<i>Customer_no</i> <i>Service_type</i> <i>Service_date</i> Service_charge Employee_no
FA_LIEN ^b	<i>Asset_no</i> <i>Lien_no</i>

^a *Italic bold typeface*: primary key.^b Indicates an associative entity created during normalization.

3.3.6. Step 6: Conclude the project

The final step was to prepare an IS planning document. As requested by the top management of ABC Bank, the project team did not go into other details, such as data communication requirements [35], information architecture [15], and internet banking. The table of contents of the resulting planning document is exhibited in Table 6. The team made a formal oral and visual presentation to the bank's President and Vice President. They were asked to decide which parts of the planning document should be promptly released to all the employees and which parts should be kept confidential; some parts could have affected the competitive edge of the bank. The two executives agreed to initiate the development of three application systems — Board-of-Directors reporting, budget planning, and safe deposit service. These three projects, respectively, had the risk scores of 6, 4, and 2, indicating a balance of the project risk levels. The Board-of-Directors reporting system was a decision support system (DSS) that would facilitate the Board-of-Directors

Table 6
The contents of the output-driven IS planning document

Table of contents

Executive summary

Glossary & Index

1. *Introduction* (Answer to “Where are we? Where do we want to go? Why do we go there? Who are in the planning task force?” And, identify the scope of the planning document.)
 2. *The planning process* (Answer to “How do we get there?” Propose a process of IS planning and explain the process steps based on Fig. 2.)
 3. *Time table* (Answer to “When do we get there?” Use a Gantt chart to show overlapping activities and a flowchart as shown in Fig. 2 to show the overall process flow.)
 4. *Actions & outputs* (Describe the actions taken and the progression of these actions. Identify and explain the outputs of these actions at each planning step, as shown in Figs. 3 and 4, and Tables 1 to 5.)
 5. *Conclusion & recommendations* (Based on the planning output, answer to “How much will it cost? How much could we spend? What should we spend on first?” Recommend the future actions.)
 6. *Comments & feedback* (Discuss the problems to be avoided and the issues to be pursued in the next planning cycle.)
-

in analyzing financial ratios and making strategic decisions. The budget planning system was another DSS that could help bank management in allocating resources. The safe-deposit service system would maintain safe-deposit renters’ accounts and might help the bank attract more customers. These three systems were successfully put in place by an outside programming team 3 months after conclusion of the project.

4. Conclusion and recommendation

Under today’s complex business environment, it is essential for a company to plan for its IS investment. Though the investment may not be paid back during the first few years of IS installation, it should improve a company’s profitability and cash flow in the longer run. As the global market becomes increasingly competitive, small companies today, for the sake of survival, must learn how to develop IS plans which help them apportion their IS investment.

Generally speaking, small companies are extremely sensitive to changes in their cash flow. For a small company, the planning document must be concise, easy to change, and independent of any particular information technology so that it can be timely evaluated and updated, at least once a year. Furthermore, a small company usually is looking for a rough-cut IS plan to give their top managers an overall direction of their future computer applications. The demand-centric adoptive approach described herein suggests that an IS planner should identify a set of planning outputs

critically needed by top managers and lay out the necessary planning activities and process based on these outputs.

The planning document delivered by this project provided the bank’s management with some guidelines for selecting critical applications for implementation. It also served as a basis for allocating IS resources to current and future computer applications and for expanding the scope of the document in the next IS planning cycle. Our follow-up interview revealed that the three essential application systems selected for outsourcing based on the resulted IS plan were implemented successfully. The users, both managers and staff, have been very satisfied with the implemented systems. The systems have improved not only the processes of top management’s decision making and resource allocation but also the quality of customer services.

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