Information Systems Mis-Development: The Case of Star*Doc

The IS literature is replete with success stories. Rarely do we read about information systems that failed. Here unfolds the story of a failure case. A shipping information system was developed for a joint venture of two highly successful companies that use top-of-the-line systems for their own shipping businesses. The article follows the system's development, highlights major mistakes in various steps of the process and draws lessons to be learned by both general managers and IS professionals.

Effy Oz

An information system (IS) is considered a failure when it does not fulfill the majority of its purported functions, or does not meet its major purpose. The information systems literature is replete with cases of successful systems. There are few reports of IS that failed. That is despite estimates that about 50% of all IS fail (Lyttynrn and Hirschheim, 1987). According to one survey, an astonishing 75% of all system development undertaken is either never completed or the resulting systems are not used (Gladden, 1982). Obviously, organizations are quick to declare success, but failures are orphans. Unless the planning of a new IS was reported in the media or some other outlet and later failed, it is unlikely the organization will ever provide details about the event. The IS practitioner and academic community could learn immensely from failure cases. What-not-to-do can often teach us more than what-to-do.

The Star*Doc system may serve as a model of a faulty systems analysis

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and design process that culminated in a failed IS. Two companies, one a leader in the shipping industry in the U.S. and the other a leader in that industry in Japan, are the parents of a joint venture. Since we were requested not to mention their names, we will call them Company X and Company Y. In an effort to make document processing more efficient, the Chief Operating Officers of both companies decided to purchase and customize a new document processing system for their joint venture, which we will call here XY Air Cargo. After the establishment of the joint venture in 1990, Company X was in charge of, and paid all costs for, the new system, Star*Doc. Star*Doc was to be purchased and modified by XY Air Cargo Business Systems (XYBS). After two years of design, and a $3.3 million investment by Company X, the system did not live up to the expectations of XY's management and end-users. The purpose of this article is to (1) portray the environment in which the system was contemplated and implemented: the organizational culture, goals, and the business problems that the system was supposed to solve; and (2) to analyze the reasons for its failure.

A Framework for Analyzing Information Systems Failure

Naturally, organizations prefer to report success, not failure. The IS literature is replete with reports of successful IS, but frugal in regard to failure. When we do read about a failed system, the information usually transpires through news stories. Usually, a consulting firm is involved in the development effort and fails to achieve what it promised in a contract (e.g., the CONFIRM case). The case then gains publicity because it is prosecuted in court. We seldom have the opportunity to look into the failed systems whose development is a totally internal affair. XY is a tale of such a system.

Lyytinen and Hirschheim (1987) cite that about half of all information systems fail. The larger and more complex the IS the greater the risk that it will fail. In an extensive survey and classification of the empirical literature on IS failure they contend there are four major categories of failure:

(1) corresponding failure;
(2) process failure;
(3) interaction failure;
(4) expectation failure;

The main premise of correspondence failure is that the system failed if the design objectives, stated in advance, were not met. The system does not correspond to its objectives. Correspondence failure usually expresses management's view of the failure (Alter and Ginzberg, 1978; Cooper and Swanson, 1979).

The Star*Doc system may serve as a model of a faulty systems analysis and design process that culminated in a failed IS.

Often, the IS is not developed and implemented within preset time and money constraints. This is referred to as "process failure" (Brooks, 1974; Gladden, 1982; Turner, 1982). The failure may be that the IS simply was produced, but is no longer economically justified because of cost and time overruns.

The frequency of interaction between the users and the system is also an indication of the system's success. If the level of interaction is low, then the system is considered a failure.

If the aggregate expectation of stakeholders from the IS is not met, the organization is facing an expectation failure. Lyytinen and Hirschheim claim: "In many cases these expectations are vaguely expressed, and are never rationalized or verbalized as real concerns because of: the great number of stakeholders; stakeholders' inability to voice their expectations because of organizational barriers, dominating ideology, lack of time or interest; or simply the unclear content of the expectation."

In the following sections we detail the development of Star*Doc and analyze its failure within the framework of these four failure types.

The Organization

XY Air Cargo, a joint venture of Company X and Company Y, provides international air freight forwarding to any destination in the world. As Company X is one of the world's largest integrated carriers and as Company Y is one of Japan's largest package delivery companies and a leading international freight forwarder, XY has the best resources of both domains. XY was established in 1990 as a result of 20 years of business cooperation between Company X and Company Y. The managements of the parent firms said: "Flexibility and hands-on attention of a freight forwarder and the unparalleled economies of scale and reliability of established integrated carriers give XY an advantage over its competitors. XY represents a new generation of freight forwarding services on a global basis."

XY's services range from lightweight express parcel products to heavyweight air freight. Delivery options are also available: door-to-airport, airport-to-airport, door-to-broker, and door-to-door. Through XY, all shipments entering the U.S. and Japan are cleared in advance through the parent companies' customs broker. However, at the request of the client, a designated broker is also designated for transport from Company X's worldwide network of customs brokers.

The Market

XY Air Cargo is an international airfreight forwarder. The charge of an air cargo company is to move large shipments. This differs from the purpose of companies like Company X, which is a package freight company, imposing a limit of 70 pounds for its packages. XY's customers are predominantly manufacturing companies and van lines. Eighty percent of XY's customers are automotive manufacturers, and its number one customer is North American Van Lines. XY competes with thirty to forty other international freight forwarders. About 60% of these companies are owned by foreign companies, mainly European and Japanese.

The Organizational Culture

In the U.S., XY is practically managed by Company X out of its regional

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office in Chicago. Company X uses a bureaucratic style of management. It is a large organization operating in a complex environment. The cost and time constrains inherent in the carrier industry require tight controls to remain efficient and effective.

In contrast, XY uses a very relaxed form of management. Its employees dress casually and work in open space offices, and there is free interaction and communication among the employees. The atmosphere reflects the business environment, which requires flexibility and versatility to customize each shipment for packaging and find the optimal combination of air and land transportation to meet customer needs.

In April 1992, XYBS held a demonstration of the pilot Star*Doc system in Chicago, one of five regional offices. During the demonstration, XYBS representatives failed to make the system operate properly. Nonetheless, the system was entered into its productive phase.

Organizational Goals

XY has two goals. One goal is to increase market share and revenue. Although current profit margins are acceptable, managers feel that it is possible to lower costs. The other goal is to provide 50% of total services to Japanese businesses while increasing business to Europe and South America by 15%. Although the Japanese market provides XY with the highest profit, the company is striving to augment its operations in Europe and South America.

Business Instruments

XY processes a high volume of House Airway Bills and Master Airway Bills. A House Airway Bill (HAWB) is used for shipments from outside the U.S. into the country. This is the main document used by the firm, and the information that is recorded on it represents the major business function of the company. The major elements of a HAWB are:

- Master Airway Bill number
- House Airway Bill number
- Shipment Size (and unit of measure
- Shipment Weight (and unit of measure)
- Destination
- Commodity Description
- Customs Information
- Accounting Information

The Master Airway Bill number is presented to the customer and represents the integration of all services provided to the customer on one bill. The number is needed on the House Airway Bill so that all HAWBs associated with the Master Airway Bill can be tracked for accounting purposes.

The House Airway Bill number uniquely identifies a particular shipment and is used to track the shipment to its destination. The HAWB is an internal document used solely by XY for the company's own tracking purposes.

The Commodity Description shows the value of the shipment in dollars, the duties payable, the receiving company, and the actual description of the commodity itself. The accounting information shows payables to:

- airline companies
- cartage agents
- trucking companies
- packaging companies

There may be more than one airline involved in the transportation of the cargo. Also, several trucking companies may be involved in moving the cargo from its source to destination. The XY offices around the country send a "pouch" of these HAWBs to their respective regional offices. It normally takes four days for a pouch to reach the regional office through the mail. The Airway Bills were prepared manually before the introduction of the Star*Doc system. A data flow diagram of the operations is presented in Figure 1.

Business Problems

The Star*Doc information system was intended to solve the following business problems:

- Increasing number of HAWBs
- Four day pouch travel time
- High document handling costs
- Decrease in ability to track shipments
- Decrease in the ability to respond quickly to changes in freight bills
- High error rates
- Data redundancy

The increasing volume of HAWBs presented a problem to XY because of the personnel required to manually fill out the HAWB forms. Also, these forms had to be transferred in pouches to each respective regional office. The transfer of pouches to each regional office took an average of four days. The pouches contain the House Airway Bills, which provide vital accounting information.

The practice of using pouches involved high costs. Once a week, pouches were transferred to each regional office from all over the country. In addition, the cost to process a document manually is higher than processing done by a computer. This is because employee labor costs more than computer time.

The decrease in the ability to respond quickly to inquiries about freight bills takes away from the tracking services that the company should be able to easily perform. For XY to reply to customer inquiries about the status of the customer's shipment, paper documents had to be sorted through to obtain information about a shipment.

Any changes in shipments also need to be recorded on the HAWB and the MAWB. These changes made to the freight bills had to be done manually, and required sorting through paper documents. The company experienced high error rates due to the manual processing of documents. The manual work also contributed to extensive redundant data.

The Star*Doc Project

XY operations are highly struc-

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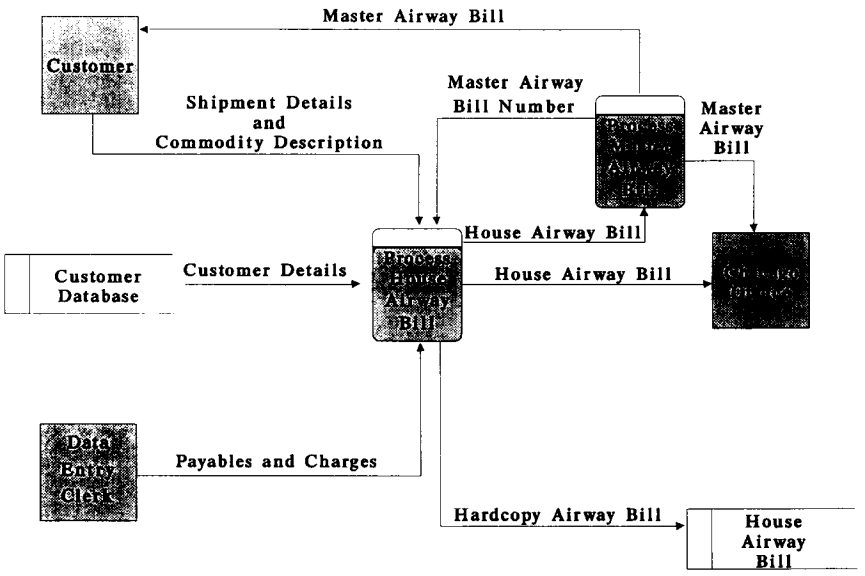
Figure 1: Star*Doc Data Flow Diagram



tured. Therefore, management believed a computer-based IS would provide accurate and timely data. The CEOs of both Company X and Company Y decided to develop a new system for document generation. The initial result of the decision was the establishment of XYBS (XY Business Systems), an organizational unit whose assignment was to develop information systems for the joint venture. The executive who was nominated to head XYBS recruited twenty professionals from Company X, from other organizations, and from colleges to build the new system.

The Star*Doc system took eighteen months and $3.3 million to develop. The development team tailored the system to meet the specifications of the parent company, Company X. The specifications addressed only packaging. The system was designed by XYBS at Company X headquarters. No prospective user was involved in the project at any phase before its introduction to the users in their place of operations. XY's management was aware of the development effort, but was not involved in the project. Nor did it have a clear idea about the system's purpose in terms of specific operations.

In April 1992, XYBS held a demonstration of the pilot Star*Doc system in Chicago, one of five regional offices. During the demonstration, XYBS representatives failed to make the system operate properly. Nonetheless, the system was entered into its productive phase. The Chicago office was the first to receive and use Star*Doc. Input from users was used to change several features. Gradually, the system was installed in XY's other six locations. The system is now installed in Los Angeles, San Francisco, Chicago, Detroit, Atlanta, New York, and Boston.

Users may request changes in the system. The managers of the local offices have to formally apply to XYBS. XYBS decides, at its discretion, whether to make the change or not. If and when a change is made, a bulletin announces the change throughout the organization.

End-User Opinion

We received permission to interview employees of the Detroit office about Star*Doc. The interviewees included the office's top manager. In general, the system was condemned much more than praised. Here are the major complaints:

- The system does nothing to support the creation of the Master Airway Bill
- The system does not incorporate order tracking capabilities
- The system lacks report-generating features
- The system does not provide accounting applications
- The system does not support managerial decision making
- The system locks up and frequently disconnects unexpectedly
- All transactions must be performed on-line
- The system cannot support additional terminals
- The screen format is not user-friendly

The most important factor for success in the air cargo and freight forwarding industry is accurate and timely communication between the customer and the expediters, and between the expediters and airline companies. The general feeling among the managers and other personnel was that the system did not fulfill this essential business mission.

Although the House Airway Bills provide much of the data to build the Master Airway Bill, Star*Doc cannot produce it, and the document must still be hand-typed. Nor does the system allow freight shipment to be tracked on-line; Airway Bill numbers must be read from the hard copy documents as in the old manual system.

XY managers hoped the system would allow them to print out a Pre-Alert report which informs the customer that a shipment is on its way with an estimated date of arrival. Much of the data is already in the system, so retyping it causes not only unnecessary work but also data redundancy. An additional, almost nominal effort could make the system provide accounting information.

Due to the system's inability to handle accounting functions, the Chicago office was allowed to purchase an accounting software package. But packaged accounting software does not fit XY's line of business, and the managers already expressed dissatisfaction with the purchase.

Practically, Star*Doc fulfills just one purpose: to produce the House Airway Bill, locally. It has no mechanisms to support corporate decision-making. Since the raw data are fed into the system anyway, all that is needed to support decision-making is a component that would produce summaries and totals, and simple procedures that would provide sensitivity analysis on demand.

The database that holds all the data that's entered by the local offices flows to, and resides only in, the Chicago office. During peak hours this creates a bottleneck as workers scramble to access the database for producing the Airway Bill while a single terminal serves them. Chicago's front-end communication processor is limited to the current number of terminals. Exacerbating this difficulty is

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the fact that the system disconnects up to four times daily. These mishaps are unpredictable, and frustrate the workers.

Screen forms are dissimilar to the paper forms the users are familiar with. The fields do not appear in practical sequential order. In addition, the workers have complained the screen cursor moves too slowly.

Managers in the local offices have complained bitterly about the system. Competitors, e.g., Circle Air Freight, managed to build information systems that provide decision-support, accounting, flexible reporting, and querying. An XY manager commented on Circle Air Freight's system: "Great system. It does what it should for the business." The IS of another competitor, Air Express International, received envious comments: "A lot of database work can be done there. They have the necessary data and applications *available to them.*"

Conclusion

Three facts distinguish this case from other cases of systems failure. One would expect the facts to guarantee a successful IS because: (1) XY is a joint venture of two of the world's largest and most sophisticated packaging and shipping companies. Both companies enjoy the services of the most advanced information systems one could find in the industry; (2) a special organizational unit, XYBS, comprising twenty qualified professionals, was established especially for the development and maintenance of the new system; and (3) the developers were not faced with funding problems: the sum of $3.3 million was allocated for the effort.

Yet, the system has failed. Looking back at the framework mentioned above, let us analyze the failure along the categories outlined:

Corresponding Failure

It is almost impossible to speak of corresponding failure here because the system did not have clear objectives to correspond to. This was the first, and crucial, mistake of both top management and the development team. XY's management should have insisted that it be the overseer of the development effort, not Company X. It should have ensured that the developers conduct a thorough investigation among managers and users to determine the new system's requirements.

To the users this is a corresponding failure, because they had certain hopes for the system. To them, the system failed to deliver even the simplest functions.

Process Failure

Process failure refers to time and money overruns. Clearly, this was not the problem in this case. The development team did not need more time to complete its mission (although the "mission" was unclear). It enjoyed generous funding from Company X, and never reported it needed more money to complete the assignment.

Interaction Failure

Certainly, Star*Doc is suffering an interaction failure. Due to corporate directives, the employees must use the system, but they would prefer not to. IS usually fail because of too little insight into the real needs of the end-users. That was the correspondence failure. The correspondence failure inevitably caused the interaction failure. Had the developers involved the users in the effort, two important objectives could be achieved: the developers would have a clear idea of the system's requirements, and the users would be committed to the new IS. Since this did not happen, the users loath their new "aide."

Expectation Failure

Star*Doc has met few expectations. Again, due to lack of a true requirement analysis, the system's objectives were unclear. The users had some expectations, most of which were not satisfied. Even a feature that is so commonplace in the industry as electronic mail has not been incorporated into the system. From our analysis it is also unclear what the managements of Company X and XY expected of the new system. However, it is doubtful they are satisfied with the results.

Organizations can learn several important lessons from this case. First, let the particular business unit that will use the system declare its information needs. In this particular case, one of the parent companies, Company X, initiated the effort and funded it, and paid little attention to what XY had to say. Second, do not even try the Santa Claus approach ("Have I got a system for you!") The potential users know better than any IS professional what their daily business needs are. Involve them in the project early on. Their satisfaction with the system largely depends on their involvement and commitment. Third, be sure to adopt the appropriate systems development approach. XYBS bought a canned software package and tried to adapt it for XY's needs. This is a strange hybrid of two approaches: purchased software and prototyping. Experience shows that prototyping should be avoided when dealing with a structured business environment like the shipping business. In this case, a thorough SDLC (systems development life cycle) approach should have been heeded.

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Dr. Effy Oz

is an assistant professor of Management Information Systems and the coordinator of the MIS program at Wayne State University's School of Business Administration. His work has been published in *MIS Quarterly, Communications of the ACM, Decision Sciences, Information & Management, Journal of Systems Management,* and other journals. He recently published two books: *Ethics for the Information Age*, and *Ethics for the Information Age: Cases*. Dr. Oz's current research and consulting interests are strategic information systems and computer ethics. He is a frequent speaker before professional groups.

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