"INTEGRATING GLOBAL OPERATIONS WITH INFORMATION TECHNOLOGY: LESSONS FROM A CASE STUDY

by

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Printed at INSEAD,
Fontainebleau, France

Integrating Global Operations with Information Technology: Lessons from A Case Study

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Abstract

In the early 1980's, BP Chemicals faced challenges calling for some fundamental changes in its business strategy. The strong emphasis on production was giving way to a renewed search for new sources of competitive advantage such as enhanced customer service. In 1985, BP Chemicals embarked on an ambitious project to integrate all aspects of its international commercial activities. An information system, the Commercial System, was to form the core of this project and enable the organizational changes required for this integration. After overcoming the difficulties of implementing a large international information system, BP Chemicals is now facing the challenge of initiating major changes in its organizational structure and business processes. This paper describes the strategic planning and implementation of the Commercial System, and attempts to draw some lessons from the experience.

1. Introduction

In 1985 BP Chemicals launched the Commercial System Project (CSP) to integrate different aspects of its commercial activities and to provide a new basis for strategic business redesign to succeed in the competitive global environment. An information system, the Commercial System is at the core of this project and aims at linking and coordinating BP Chemicals' commercial activities in Europe, America, and the Far-East. Today, the Commercial System is certainly very impressive in scale: it operates in about two dozen different countries, contains more than 100 electronic links between major BP commercial centers, and processes a few hundred thousand orders annually. Due to the complexity of the endeavor and its international scope, the project has experienced a significant time and cost over-run - several times than that estimated originally. Now, after having invested more than 50M$ and 500 man-years of effort in building the Commercial System, BP Chemicals realizes that true benefits can only be realized by actively exploiting the strategic potential of the Commercial System.

This paper looks at the process of the strategic planning and implementation of the Commercial System, and highlights important lessons from the project. While the experiences of one company do not always provide a valid basis for drawing generalizations, this particular experience of BP Chemicals has valuable lessons for other multi-national companies attempting to implement global information technology projects.

The rest of the paper has four sections. Section two provides some background about the history of BP Chemicals. The following section describes the origins and strategic justifications for starting the CSP. Section four describes the process of project planning and implementation of the Commercial System. The final section concludes the paper with a summary of important lessons from the experience and an indication of the future challenges that BP Chemicals faces.

2. Company Background

The origin of BP Chemicals dates back to 1947 when BP (then known as the Anglo-Iranian Oil Company Limited) entered into a joint venture with the Distillers Company Limited. Since then, BP Chemicals has continued to expand its operations with the most important transactions being the acquisition of the bulk of Union Carbide's and Monsanto's European operations in the late 70's and early 80's. Figure 1 illustrates the change in the traditional businesses of BP Chemicals during the 1980's. By 1990, BP Chemicals (excluding associates) output around 7 million tons of product annually, and enjoyed a turnover in excess of £3 billion. Figure 2 provides details about selected financial information of BP Chemicals.

3 Strategic Planning of the CSP

This section describes the origins and strategic justifications for the birth of the Commercial System.

	1989	1978
Businesses	40	10
Manuf. Plants	25	5
Products	4,000	500
Distrib. centers	75	15
Sales offices	25	5
Countries	75	25
Customers	15,000	1000
Orders	250,000	20,000
Turnover (£Bn)	2.5	0.2

Figure 1: Growth of BP Chemicals

£M	91	90	89	88	87
Operating profit (loss)	(7)	129	548	514	227
Turnover	3064	3164	3503	3254	2760
Capital employed	2436	2081	1941	1774	1574
Capital expenditure	521	384	313	322	402

Figure 2: Some financial figures for BP Chemicals

3.1 Commercial Information Flows

"It is chaos out there. We cannot go on with a commercial system that does not allow us to provide better service to our customers.": Brian Palmer, Business Manager, Solvents Group

The complaints first started in the European Sales Managers' meeting in 1983 and then resurfaced in the same meeting the following year. BP Chemicals' sales managers were disgruntled with the level of service they were able to give to their customers. The majority of these problems were founded on two factors. First due to the rapid growth by mergers and acquisitions, different parts of BP Chemicals (in different countries) had different incompatible information systems, making information sharing difficult at best. Second, due to a policy of storing inventory at several different country locations, local customers were usually given (unfair) priority in order processing by the local BP subsidiaries.

These two factors so complicated the processing in BP Chemicals' Commercial Department that it was unable to respond to customer orders in a timely fashion. The impact of the above two factors can be seen by reviewing the old procedure for placing an order. It was as follows: First, the customer determined which item(s) to order. For each item desired, it was necessary for the customer to place an order with the BP sales office which could sell the product. Thus, if several products were desired, it was possible that the customer would have to place an order at multiple offices. Second, at the sales office, a sales correspondent would receive the phone call and hand write all order information on a pre-formatted card. Third, a delivery date, based mainly on when the sales correspondent thought BP Chemicals would be able to deliver the order, was then agreed upon with the customer. Finally, when the sales correspondent had some free time, the order would be entered into the subsidiary's computer system.

Moreover, in 1984, approximately 50% of all orders had to be filled from stock located in another country. Consequently, the order had to be transmitted by phone or telex to a remote office where the inventory was stored. The remote office was then responsible for entering the order into its computer system. This procedure had to be reversed after the item was shipped to allow the original (local) sales office to invoice the customer. Although rare, in several instances it was necessary to type the customer order into as many as 4 different computer systems (leading to keying errors).

Furthermore, and probably the most detrimental to BP Chemicals' reputation was their inability to give up-to-date information regarding the status of an order. This was especially true for orders maintained on remote computer systems. A final problem faced by BP Chemicals was the inability to obtain up-to-date sales history data. All history was current to the end of the previous month making it difficult for the sales offices to determine the viability of their current price/volume policies. One sales manager summed up the situation by saying: "*Businesses are known to have abandoned price increases which had been successful, in the belief that the contrary was the case.*"

3.2 Problem Determination

"It started as an amorphous idea but it focused very quickly on the fact that what [we] needed was a computer system.": Bruce Ballantine, General Manager, Commercial Department.

In mid-1984, a committee was formed to address the concerns voiced in the sales managers' meeting. The committee quickly came to the conclusion that a properly networked information system could solve most of their problems. In order to more fully understand the ramifications of this plan, it was suggested that Brian Palmer, a Senior Business Manager from the solvents group, be responsible for researching the idea.

In late 1984 a project team was formalized. Key members of the team included Peter Emberson, a Business Manager from the solvents area and Geoffrey Lockett, a professor at the Manchester Business School. To address the technical aspects of the project, Brian was faced with the decision either to use the internal data processing department or to seek assistance from outside. Lacking faith in the abilities of the internal group, he elected the latter and commissioned the assistance of a software consulting firm, Scicon. Scicon, which was a wholly owned subsidiary of BP (the parent company), was also made responsible for aiding in the preparation of the functional and technical specifications of the new computer system.

3.3 The Birth of The Commercial System

"*It is a BP Chemicals corporate policy to emphasize service in order to avoid competing on price alone.*": Briefing Note for the Executive Committee meeting, June 19, 1985

Before reviewing their own systems, Brian and a small group from BP Chemicals visited several chemical companies (such as ICI, Esso Chemicals, Dupont, Monsanto, Shell Chemicals, and Hoechst) and examined their computer systems. From these visits, the BP Chemicals team gained two invaluable insights. First, none of their rivals possessed a fully integrated information system. Second, it appeared that companies which coupled a mainframe solution with a strong country orientation were at a strong disadvantage - particularly for addressing a European constituency. As a result, they were suffering from the need for national stocks and the inability to take advantage of price and distribution cost variations between countries. Of one company, Brian later remarked, "*They were in the same position as us, not able to deliver the improvements in customer service that they wished ... because of what they described as a wall. In this same way, we have a wall; the [multiple computer] systems in our company prevent us from improving our service...*"

With this in mind the combined BP Chemicals/Scicon project team completed a thorough review of all BP Chemicals' computer systems. During the review, they encountered not only a variety of disparate computer systems but also a lack of internal mechanisms to foster cooperation between the individual, country-based information systems groups. Professor Lockett summarized their findings by saying [2]: "*It was quickly apparent that we had to face a major problem in dealing with different cultures, hardware, software and abilities, not to mention currencies, taxes and languages.*"

The team concluded that networking the existing systems would be prohibitively expensive and technically difficult. In addition, because of potential culture clashes (across different European countries) and the technical limitations inherent in these systems, the project team was unwilling to designate one as a standard around which to design a new system. The only feasible option remaining was to install a new, fully networked computer system in all BP Chemicals locations. Thus, the Commercial System project (CSP) was born. The system would be designed to automate all aspects of the sales, order processing, invoicing, and distribution activities.

3.4 Strategic Opportunities

"*There now exists an opportunity to establish a unified commercial system fully up to the best standards of the industry and to lay a foundation for future excellence capable of delivering a distinct competitive advantage to BP Chemicals.*": Minutes of the Executive Committee meeting, December 6, 1985.

Throughout this process it became increasingly apparent to Brian that the Commercial System was an opportunity to directly alter the manner in which BP Chemicals and possibly the chemical industry conducted its business. The potential ramifications of improved communications and information flows on BP Chemicals' ability to compete globally were overwhelming, especially in the area of customer service. It was decided that the system should be developed to address the needs of BP Chemicals over the next 10 years and should include all routines and procedures, manual and automatic, between receipt of an order and completion of the transaction when payment is made. Particular emphasis was to be laid on integrating BP Chemicals commercial operations across countries, specially in Europe. To obtain benefits quickly, it was proposed that, with the help of an external consultant, the project team should generate and cost out a detailed system specification within the next 6 months and that the Commercial System should be completely installed in all "major" European locations "within 12 months of authorization".

3.5 Initial Board Approval

"*The availability of a system of order handling and the wide availability of operating information will allow a significant change to occur in the way the day-to-day business of the company is conducted.*": Minutes of the Executive Committee meeting, June 15, 1985

The Executive Committee received their first formal briefing regarding CSP in June 1985. In order to justify their request for £7.9 million to be spread over 1.5 years, the project team spent several hours elaborating on the need for an integrated international information system, and closed the briefing with a discussion of the proposed benefits.

Among these benefits were an anticipated increase in sales (due to the reduced lead times) and cost reductions (from a reduction in selected personnel costs and the maintenance costs of existing computer systems). However, the team was unable to "*establish that Figure 5 accurately, [and didn't know] how to identify the areas in which reductions should occur nor how to monitor that they do occur.*" Brian also forcefully sold the committee on the strategic potential of the system and its ability to act as a vehicle to introduce changes in BP Chemicals and increase the effectiveness of internal business processes, specifically those related to customer service on a pan-European basis. The ability of the CSP to act as the appropriate vehicle to integrate the diverse country-specific cultures within BP Chemicals was also noted.

The briefing concluded with an authorization to proceed with the project and a final suggestion from the board. Because the benefits to be realized from CSP would be greater the sooner the project was implemented, the Executive Committee suggested that the completion date be moved forward to January 1986 (one year earlier than scheduled). Regarding the financing, the Executive Committee decided that the cost would be borne out of a "central pot". However, where local systems and software needed tailoring to fit with CSP, the local account would be responsible for absorbing the cost of that customization.

4. Implementation of the CSP

This section describes the process of implementing the Commercial System.

4.1 Designing the System

In mid-1985, the design of the Commercial System was launched. To generate the functional specifications (a description of the operating procedures required in the new system), the project team interviewed key users about the features and functions which should be available in CSP. After four weeks of intensive interviewing, a preliminary design began to take shape. However, while reviewing the design, it quickly became apparent that the users were merely requesting the capabilities present in the existing system. They were unable to think laterally - to suggest creative new ways of accomplishing their tasks with less effort or in a shorter time span. As a result, the project teams were disbanded, and Brian Palmer and Peter Emberson completed the design of all the application software - a process which required 5 months.

As the project progressed, it was proposed that the system be some type of a distributed network with a centralized core. The core, or central mainframe, would be responsible for controlling all communication and network security and would serve as the repository for the data common to all subsidiaries. Although this option would require all subsidiaries to have compatible computer systems (a major expense), it was still believed that this configuration would be cheaper in the long run and would allow for maximum flexibility. Moreover, it was believed that networking technology would improve and value-added services would be more readily available in the future. A description of the activities occurring within the configuration is given in Figure 3.

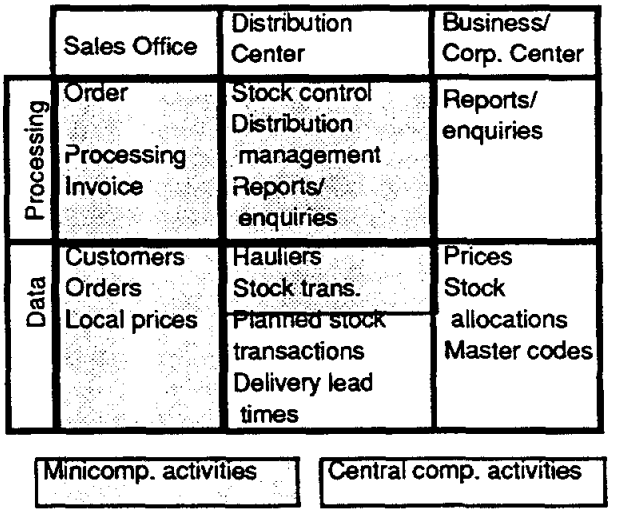

Figure 3: Activities in the Commerical System

The project (divided into 5 areas: hardware, software, training, communications, and databases) was put out to tender. Proposals from 21 companies were reviewed, and a tie-up between 5 large and small companies were selected, with each responsible for one of the five areas. While the major software houses lacked experience in developing distributed systems, the smaller companies had innovative ideas but lacked the resources to carry them out.

Due to Scicon's familiarity with BP Chemicals' operations, the project team selected Scicon to

develop the software. Reservations were expressed, though, because the work was to be billed on a time and materials basis - a potentially costly arrangement. These fears, however, were quelled after it was noted that since Scicon was a subsidiary of the BP Group, considerable pressure could be brought to bear if necessary. Though expensive, IBM was selected for providing the hardware due to its perceived stability in the long run.

4.2 The Resource Project

"The resource project will impinge on areas not covered by CSP and has far reaching ramifications.": Minutes of Coordinating Committee meeting, September 11, 1985.

As part of the training project, a sub-project was created to identify the skills needed for, and the human resources made redundant by CSP. However, shortly after its inception, the resource sub-project expanded to include all types of organizational issues raised by the installation of the Commercial System.

Benefit	Customer	Sales	Distribution	Business
Improved customer service	X	X	X	X
On-line information	X	X	X	X
Enhanced communication	X	X	X	X
Common systems		X	X	X
Reduction in duplication		X	X	X
Improved control of working capital		X	X	X
Improved control & monitoring		X	X	X
Vehicle for change		X	X	X
Improved quality of business	X			X

Figure 4: Benefits of the CSP

In the initial design of the system, it was realized that the CSP would have a major impact on the way BP Chemicals ran its business (see Figure 4). This was summarized in a memo to the executive committee as follows: *"A major function of the business center today is the collection of operating information (by phone and telex) in order to make day to day decisions. Many of those decisions (e.g. stock replenishment) are routine and could be delegated within business guidelines to the functions at the sharp end. The business center would then be able to concentrate on policy. A monitoring role and the need for an umpire say between affiliates competing for the same parcel will unavoidably remain. The center of gravity even of the speciality businesses could move towards the functional axis. The factories could become responsible for stock control once they have access to the forward order position and to sales forecasts...Staff changes and retraining may be necessary as roles change particularly at the order desk the importance of which will increase."*

A specific example of the opportunities to alter the structure of the organization through the delegation of authority involves the clerk who receives the order from the customer [2]: *"[In the new system] the order clerk would be shown the credit position on the screen but would take his or her own decision on whether or not to take the order within the corporation's guidelines. This would imply a change of control in many countries and allow decision-making to be distributed..."*

Furthermore, the opportunity to re-focus the business towards the marketing arena was explored in the executive committee meetings: *"The development of a modern commercial system provides a more efficient interface with the customer. The potential to develop an increased market orientation through the establishment of a dedicated marketing function, separately acccuntable at the Director level, is suggested. This function would be responsible for the enhancement of current systems expertise through the creation of a skills center. Further developments towards increased customer orientation would involve the creation of a corporate marketing plan and customer relations and research functions."*

By the end of October 1985, the first estimates for the staffing level reductions had been compiled. It was suggested that the Commercial System would enable a reduction of 90 person-years within BP Chemicals. As details about the job redundancies spread through BP Chemicals, people began raising concerns over who would lose their job, and antagonism towards the system mounted. Numerous meetings were held to explain that these changes would materialize gradually over the next several years, that some of the redundancies would simply be resolved through attrition, and that provisions were being made to assist those affected in the most suitable way possible (e.g. retraining, assistance in locating other employment...). Nonetheless, the fear and animosity remained.

In January 1986, the Executive Committee concluded that it would not be advisable for BP

Chemicals to undergo a major organizational change at the same time as the introduction of a new computer system. The committee "*emphasized that implementation and user training is so important that a concurrent attempt to re-structure the commercial function is premature and should be considered only when the commissioning phase of the project has been successfully completed in 1987.*"

4.3 Project Planning/Implementation

"*The Committee, in agreeing to give its full support to the project, noted that it is probably the most important single development being undertaken in the Stream over the next two years.*": Minutes of the Executive Committee meeting, 22 January 1986.

Immediately after the selection process was completed, the development work began, and Scicon straightaway replaced their existing team at BP Chemicals with new people - a move that was questioned by BP Chemicals but allowed to fall by the wayside. Scicon assured them that they knew what they were doing.

Whereas the hardware, training, and network design projects appeared to be progressing nicely, problems soon began to materialize with the software project. Subsidiaries in certain countries and certain departments were voicing major misgivings about their functional specifications and asking for expensive software redesign. The effect was an increase in the design effort from 791 to 2,111 person-days resulting in an estimated slippage of 3 -7 months.

In order to minimize the impact to the schedule, it was decided to phase the introduction of CSP giving rise to the concept of Version 1 and Version 2. Version 1, which included the order handling and invoicing software and the networking capabilities, would be implemented according to schedule. Version 2, which included the stock control and distribution software, would be installed at a later date. Although the final completion date would be greatly delayed, this plan enabled the team to start installing software when promised and to take the time to build in the necessary functionality.

"*Given the international nature of the project, the tight timescales and the pioneering nature of some of the work, high quality project management will be vital for success.*": Memo from the BP Information Systems Administration, 28 Nov.1985.

As the project progressed, it became increasingly evident that Scicon did not possess the skills necessary to manage a job of this size; unfortunately, these skills were also lacking in the BP Chemicals project team. Generating schedules and target dates had deteriorated to an exercise in frustration. Regardless of the amount of effort and planning, there were always forgotten details and unanticipated tasks cropping up. Every task was given top priority; no change request was ignored. Needless to say, this had a debilitating effect on not only the project team but also on the users and eventually on upper - level management. Morale plummeted. Without a tangible product and with results long overdue, frustrations mounted.

The Audit team was emphatic - the planning process had to be tamed. First, quantifiable milestones had to be identified and prioritized for both the internal and contracted work. Second, the availability of sufficient resources (skilled personnel and money) had to be guaranteed. Third, the definition of all management roles had to be updated. Lines of responsibility and coordination had to be clearly and immediately delineated. It was not going to be easy.

As the recommendations of the Audit team were implemented, results slowly began to emerge. By May 1986, the completion date for Version 1 had been fixed at March 1987, and progress was evident in the installation of the network and in the preparation of the training materials. However, because the users had very little exposure to the design of CSP before seeing trial versions, they requested significant changes to the software. These changes, in combination with the corrections the programmers were making, completely inundated the project team with unplanned modifications. Finally, in November 86, the project team froze the design. No more changes were allowed, and the outstanding change requests were then reviewed for applicability, prioritized, and scheduled. By now the estimated completion date had slipped to the end of 1987.

In September 1986, the project team finally achieved their first milestone. The electronic mail network was installed in the Wimbledon office, and the remaining installations followed soon there after. This accomplishment marked a significant turning point in the life of the project. Now that they had something tangible, users' attitudes about CSP began to steadily improve.

As the CSP continued to progress, another sub-project emerged. Interfaces between the existing systems and the new system (e.g. between purchasing and inventory control) had to be created. In addressing this issue, the project team ran up against a series of problems. First and foremost, the vast majority of sites in different countries did not

fully understand the scope and functionality of their current computer systems and much less understand how their current system should interface with the new system. In addition, they had insufficient resources to adequately evaluate their current system and had a plethora of CSP-like systems which created/used data not available from CSP.

With the installation of the partial system in sight the training program commenced in full earnest. An explanatory video was filmed, and a roadshow was created to instruct the users on the nature and functioning of CSP. However, as delays continued to besiege the project, the frustrations again began to climb. The users were unable to apply any of the acquired knowledge, and the training sessions hampered their ability to complete their normal tasks. Furthermore, by the time CSP was finally installed most of the users had forgotten what they had been taught.

Finally, in March 1987, Version 1 was installed at Carshalton. (The first order was processed in July 1987.) Over the next year, 10 additional sites also received a copy of Version 1 and were networked together. The installation of Version 2 began in February 1989 and was fully functional at 11 sites by December 1990.

4.4 The CSP Project-Buy In

"*The message from the top was very forceful throughout; people did not have the option to opt out, they were in.*": Peter Emberson, Manager, Commercial System Project

Although the need for the CSP was widely recognized, concerns had been raised about the new, technically complex environment this would create, the disruption to the current business it would cause, and the cost of the project. Leading the efforts to obtain organizational commitment to the CSP were the four project champions-Brian Palmer and Peter Emberson at the operational level, and Julian Vear, General Manager, Accounts and Management Systems Division and Steve Ahearne, Deputy Managing Director, at the executive level. While Julian sold the Executive Committee, Brian and Peter held meetings with the users to advise them of the project and to explain why their assistance was mandatory. Support from the business level (middle management), however, lacked a champion and was for the bulk of the project completely ignored. Figure 5 depicts the perceived commitment of various interest groups to the CSP over the duration of the project.

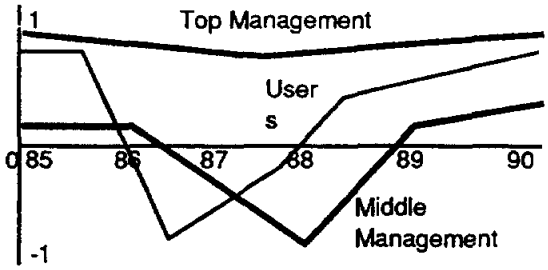

Figure 5: Perceived satisfaction with CSP

In October 1987, after the commissioning of Version 1, a survey [1] was conducted to identify users' reactions to the new system. Accordingly, a group of 23 managers representing most of the operating functions at BP Chemicals were interviewed. The following are some excerpts. When asked to discuss the meaning and concept underlying the system, users showed some confusion and little appreciation for the potential competitive advantages the system offered; instead, they believed the system was necessary to sustain their current market position. Their comments included, CSP is:

"...primarily an accounting system, for better control";
"...primarily a facility for writing reports";
"An enhanced order processing system";
"A sales monitoring system";
"...having information we have never had before".

The users did, however, realize benefits through improvements in the ability to communicate and make decisions...

"We should be able to get immediate information on the health of the business... sales, netback and so on";
"There will be a move away from emotionally-based to factually-based decisions".

When asked to view the system in terms of its impact on BP Chemicals' ability to compete, users' comments included the following:

"When it comes to impact on competitors, we hope there'll be none at all. We already have a high market share and so we don't want to have any impact."
"[The commercial system should be able to help my business to] keep up with the traders who can already give immediate information to customers on price, availability and delivery."

The survey also documented the concerns the users had with the system. All appear to stem from a general confusion regarding the fit between the system and the organization.

"We're all told that we're going to have more information, but we don't know anything about using it as a resource."
"[CSP] won't fail, but it may not succeed."
"Technology can rule the way you work. I will stop this from happening ... for example, by blocking direct access to stock information."
"There is a contradiction in that we are told the Commercial System will release time for people to do the more important aspect of their jobs well, but at the same time you are looking to reduce people... This is going to put pressure on us all."

5 Lessons and Challenges

This section draws important lessons from the experience of BP Chemicals and describes some future challenges for the company.

5.1 Lessons from the CSP

It may be surprising to note that BP Chemicals continued with the project after 1987 when it was clear that the project was going to incur a significant cost and time overrun. It is our impression that this was the case due to two important reasons. First, due to extensive prior merger and acquisition activities, BP Chemicals of the early 1980's was more a collection of different "companies" than one company. Most country subsidiaries had significantly different business processes and these differences were accentuated by the cultural differences existing across countries. The corporate office in the U.K. had realized the futility of trying to impose their own ("British") work processes upon the French, Germans, and other Europeans. The CSP represented a real opportunity to unify the businesses processes of different country subsidiaries without appearing to blatantly impose the work style of any one country. Second, top management had realized that the capabilities provided by the Commercial System were absolutely critical for staying in business in the long run. The only choice was to either go ahead with the Commercial System or to scrap the CSP and try another approach to obtaining a Commercial System-like system. Given the investment already made in the Commercial System, BP Chemicals' management chose to continue with the CSP.

The CSP can be compared to any large software project, but for the fact that it carries the additional burden of catering to a set of international stakeholders. The complications caused by the international nature of the Commercial System are evident both in the design of the system and its implementation strategy. First, the CSP was born precisely because the project team realized that it would be culturally impossible to impose the existing system of any one country upon another country: *"Why would the Germans accept the information system of the Italians, when they believe that they already have a good, if not the best, system?"*. Second, the project team received several change requests from different country subsidiaries after the functional design had been completed and the Commercial System implementation had started. Each country subsidiary had its own special business process and wanted its own peculiarities to be included in the Commercial System. As noted below, these change requests were mismanaged and had disastrous consequences on the implementation of the Commercial System. Third, the CSP was complicated by the fact that it had to be implemented in different international locations. Each location had its own (poorly understood) work processes and systems and several complications arose in interfacing them to the Commercial System. Finally, the organizational changes needed to fully exploit the potentials of the Commercial System are far more difficult to implement due to the entrenched cultural differences between different European country subsidiaries. This is the reason why BP Chemicals is still today grappling with the issue of organizational changes related to the Commercial System, and is yet to complete this task.

In hindsight, the CSP has rich lessons for BP Chemicals and any other company embarking on an ambitious international information technology project. Some major lessons are described below. These lessons may seem familiar (as they are similar to those resulting from a large software project), but they become more complex and relevant in an international information system.

5.1.1 Top Management Commitment

Without the unwavering support of top management, the CSP would have never succeeded. BP top management not only realized the importance of the Commercial System in increasing the level of service offered to its customers on a pan-European basis, but also saw the Commercial System as a vehicle for organizational change and for introducing a common company culture. The latter benefit was particularly important given the diverse cultures existing in different international locations. Thus information technology was seen as integrating more than simply customer related information. An international information technology project of the scope and impact of the Commercial System could never have been implemented without the unwavering support of top management.

5.1.2 Project Team Composition

It is crucial to have a strong mix of business and technical skills from different international locations in the project team for a project of the size and scope of the Commercial System. The CSP project team was business dominated with weak technological skills and a predominant British influence. This helped to sell the CSP to top management, but left them exposed on the technological front to external consultants and development teams (a weakness which cost BP Chemicals dearly) and with a poor knowledge of the business processes existing in BP subsidiaries outside the UK. In an international information technology project like the Commercial System, the business leaders of the project team should understand the international business processes (for e.g., the relationships between the stocking practices followed by BP Chemicals locations in different countries) and the technology leaders should have the capability to objectively evaluate the strengths and benefits of technological systems in different international locations. The project team leaders did not fully understand the international business processes of BP Chemicals and this lead to numerous change requests at a later stage. Also, due to an even stronger lack of technological skills, the CSP project team mis-managed the technological implementation of the Commercial System and had to later bear the major costs of interfacing the local systems to the Commercial System.

5.1.3 Project Management

High quality project management is necessary for all IT projects. However the risks of IT projects getting delayed and running over budget are much higher for large international IT projects due to the magnification of the various co-ordination and implementation risks caused by the international dimension. Note that the CSP was delayed by several years and ran several times over its initial budget. Tie-ups between a host of different vendors (possibly from different countries) is a high source of risk (and BP Chemicals paid a price for this in the CSP). Large international IT projects should be subjected to a rigorous pre-implementation risk evaluation and to strict controls and schedules during implementation. The risk evaluation should focus on the implementation risks caused by the international nature of the project (an activity which was not done for the CSP). Even more than conventional software projects, tight cost controls are essential for international information systems. The Commercial System project team erred in giving Scicon ample scope for exceeding budget (partly due to an inappropriate billing choice).

5.1.4 System Development Methodology

Due to the size and complexity of international IT projects, it is beneficial to adopt prototyping, decompose the project into sub-parts, and adopt an evolutionary approach to system building. The CSP ignored prototyping and attempted to adopt a more traditional approach to system building. Prototyping introduces greater flexibility in the process of generating functional specifications and helps to reduce the problem of change requests at a later stage of development (as faced in the CSP). Traditional, linear system development methods (as adopted in the CSP) are not desirable for such projects. The above recommendations are important because it is often very difficult to accurately identify the size, scope, and complexity of large international IT projects. This problem was clearly seen in the case of the CSP. The project team had no realistic handle on the size and complexity of the Commercial System and thus initially estimated the time to completion to be (merely) 18 months. The executive committee went one step further and asked that the system be installed in 12 months, a request whose feasibility the Commercial System project team could not evaluate accurately.

5.1.5 Managing Interest Groups

It is very important to clearly identify the stakeholders in an international information system prior to implementation because conflicts between interest groups are more acute in an international setting. As a BP manager remarked: "*Simple rationality may be insufficient to explain the many reasons why the French (BP Chemicals) subsidiary may decide to not follow recommendations or instructions from the UK office*". As noted earlier, an important reason for the project team deciding in favor of implementing the Commercial System from scratch was that they felt that cultural clashes would invariably prevent the successful implementation of the information system of one country in another country. Management, both business and technical, at all international locations should be actively involved in adopting and internally selling the system to the concerned stakeholders. The Commercial System implementation was hampered by the fact that the Commercial System project team had ignored middle management for most the project (Figure 5). This caused various groups at certain international locations to oppose the implementation of the Commercial System.

5.1.6 Managing Expectations

Projects which run over several years (as was the case in the CSP) between conception and fulfillment run the risk of losing touch with users and management. Consistent expectations have to be generated and periodically renewed in the various interest groups. In retrospect, the Commercial System project team (lead by project champion Brian Palmer) oversold the Commercial System to top management and evoked mixed impressions from the users. The strategic potential of the system was strongly impressed on top management and this created high expectations about the system. Though the top management remained commited to the project over the years, there was a sense of disappointment towards the end that the touted strategic benefits had not materialized. Certain users were impressed by the benefits of the Commercial System, while others were confused by its aims and its impact on staffing levels (section 4.4). Users were very disappointed when the initial implementations of the Commercial System had many technological bugs. This points to the importance of clear and consistent communication with interest groups and the need for establishing site support groups to assess the level of desired user assistance.

5.1.7 Managing Change

Information technology projects, specially those which span organizational and international boundaries (as is the case for the CSP) create the foundations for new organizational structures and processes by impacting what individuals do and how they do it. The performance of the CSP in terms of anticipating and planning the long term organizational changes is poor. Most of the time, the CSP seemed to be bogged down in technical details. Thus, there was a greatly diminished feeling of achievement and benefits when the Commercial System was finaly implemented. Changes in working structures and practices should be researched and agreed upon early in the project and top management support should be enlisted in implementing the recommended organizational changes. This is specially important given the diversity of business practices and cultures usually existing in an international setting. BP Chemicals is only now studying these issues and it is not clear what changes they are going to make and when they are going to happen.

5.2 The Future Challenges

"*IT is not an escapable cost; it's not discretionary in any way whatsoever.*": Jim Taylor, General Manager, Accounts and Management Systems Division.

Despite many teething problems, the Commercial System is operational in Europe today, and the focus of the CSP has shifted from development to operations management and the assessment of future possibilities, both technological and organizational. Some of BP Chemicals' competitors have offered to buy the Commercial System, but the executive committee has declined to entertain such offers currently. The CSP project team is actively looking into extensions of the Commercial System to North America and the Far East.

On the technological front, the opportunities for changing and expanding the capabilities of the Commercial System seem limitless. Viable options include changing the computer configuration (to reflect the enhanced capabilities of mini-computers), building electronic data interchange (EDI) links between internal computers and customer computer systems, and using expert systems (and other artificial intelligence applications) for daily commercial operations.

A major challenge has been identified in the area of organizational change. BP Chemicals recognizes the need to not only electronically link the organization and further automate the order processing procedures, but also to suitably change the structure of the organization and redesign business processes. As part of the resource project, an initiative named the Phoenix Papers, had been started to identify such changes. However, due to the extensive impact these changes would have had, the Executive committee had decided to suspend the project midway (in late 1986). In mid-91, the Phoenix Papers project was re-started with Peter Emberson in the lead. The results of this project are not yet in.

Acknowledgement

The authors gratefully acknowledge the help of Nancy Valentine, INSEAD MBA participant (89-90) for valuable research assistance in this study.

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