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Problems with Organizational Implementation of an IS as Diagnostic Information

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Executive Summary
The paper presents a case study in which the problems during the implementation of an information system are perceived as an opportunity to identify and locate more serious problems in the organization. An in-depth case study method was used to conduct a longitudinal research into a knowledge system that has been developed and implemented in a Dutch lease company. After a description of both the organizational setting and the history of the IS project, the problems are analyzed as a sort of diagnostic information of organizational problems.

The line manager was able to delay the implementation for two years by exploiting every possible technical problem and by drawing upon his network of contacts with the top management. This took place in the context of the debacle of a major IT project which resulted in an atmosphere of "non-initiative taking" by senior managers. The most visible cause was the inconsistent posture adopted by one top executive in using threat of dismissal at the time of mild business recession as a means to promote efficiency; while the company had earlier on promised no job loss as a result of using the knowledge system. An additional source of problems is the different set of priority pursued by the line manager and the automation director of the holding company.

Our research has shown that high level organizational problems have adverse consequences for the implementation of even a relatively simple system like the system we studied. We found that history of debacle or success of major IT initiative, communication, authority, culture, management style, personalities and chance all influenced the implementation process.

1. Introduction

This paper presents a case study of the implementation of a knowledge system (KS) at the maintenance department of a Dutch lease company. The authors use the problems during implementation as diagnostic information on the organization itself. By tracing problems to their organizational sources we hope to gain deeper knowledge of the organization.

The main aim of this paper is to study the problems during implementation as an occasion for organizational learning. We agree with Walsham (1993) that "resistance to a (proposed) new computer-based IS should not be enacted as something to be overcome, but rather as an opportunity for exploration and learning."

The case study has been conducted over a 2-year period covering the development and implementation stages, using in-depth case study to gain information. A series of interviews was held with various stakeholders and all documents related to the KS were studied.

When the KS project started in 1991, the circumstances were favourable. It was the first time the Holding Company directly joined forces with one of its subsidiaries in an IS project. Everybody involved was enthusiastic and no problems were foreseen. The debacle of a major IS project then started influencing the KS. Relations deteriorated and implementation failure seemed imminent. An unfortunate mixture of technical problems and managerial failure, politics between the Holding and subsidiary, gaps between user expectations and IS developers' abilities, and poor communication are all factors that caused the enormous delay.

Our findings suggest that success or failure of major IS projects has effects on organizations' and employees' attitudes, especially towards risk taking. Other problems can be attributed to a lack of clear

agreement about the rights of the Holding to use an IS developed by a subsidiary, management style, fear of job-losses, diffuse responsibilities, and authority. Two more factors, chance (bad luck) and personal differences (dislikes) are also important.

We provide a short description of the organization, the department using the system and the KS in the next section. The third section gives a detailed description of the development and implementation process and a discussion, wherein we use various theories to explain our observations. The conclusion summarizes our findings.

2. Background

2.1 The Organization

The KS that is the subject of this research, was developed for the maintenance department of Lease-NL, one of the Dutch subsidiaries of a holding company, called Lease Holding (all names in this paper are fictive). The Holding owns a number of lease companies in Europe, America and Australia. Its main functions are financial control and coordination of international activities. These activities vary from starting up new businesses in foreign countries to coordinating international IT activities. The latter task is taken care of by International Coordination of Information Technology (ICIT).

Control by the Holding is by means of treating each subsidiary as a profit centre and subsidiaries are very autonomous in their decision making. This autonomy is a characteristic of Lease-NL from its early days.

2.2 The Maintenance Department

This department at Lease-NL processes all incoming requests for car maintenance and subsequent invoices. The process is as follows. A driver turns to his dealer for servicing. If the total costs exceed a certain amount, the dealer contacts the maintenance department to ask for permission. When a maintenance expert at Lease-NL receives a request he checks the car's maintenance history. Based on preagreed norms he approves or disapproves the request. This method may sound cumbersome, but in Lease-NL's 'open-calculation' philosophy, every expenditure has to be checked to guarantee the lowest possible (maintenance) costs.

At the end of the 1980's the number of experts rose to 17, the maximum size at which it could be headed by one person. Further growth would mean extra overhead costs. Another factor was that incoming requests tended to come in bulk. Telephone lines were jammed, especially during morning, making it harder and harder for dealers to get their requests through. The rule that no approval was required for maintenance below | 250,- had been made in an attempt to resolve this problem, but it did not fit Lease-NL's philosophy.

2.3 The Dealer Network

In 1989 ICIT examined the possibilities of using expert systems at Lease-NL, and maintenance was named as one of the possible sites that could benefit from the use of knowledge technology. One Board member of the Holding established a contact between ICIT and maintenance.

In 1990 the company built a dealer network (DN), through which dealers could use Videotex to send in their requests. These are collected into a mail box situated on an AS/400 at Lease-NL. A unique coding system was developed to define all makes, models, parts and maintenance items. One recommendation of the research was to make use of the fact that these codified electronic requests could be processed automatically using some form of knowledge technology.

Normally the development of the DN and the KS would have been done by Lease-NL's own automation department. But in 1989 a large migration project of all computer systems from a Bull DPS7/7000 to IBM AS/400's, called Info-'90, had started and the automation department had no spare capacity. For the first time in its history ICIT directly joined forces with a department at Lease-NL. A project team was formed and a start was made at building the DN in August 1990. No major problems occurred and currently the DN is a big success. It was at the end of 1991 that a software house was first contacted to build a KS. The constructive cooperation in the DN project and the fact that Info-'90 was still running prompted prolongation of ICIT's involvement. This situation can be seen as a window of opportunity (Tyre and Orlikowski 1994); maintenance was ready and willing to explore new technologies.

2.4 The Knowledge System

The KS is designed to operate alongside the maintenance experts. It is estimated that 80% of all incoming requests can be processed by the system. These are direct approvals for simple requests, and dismissals in case the car is unknown to Lease-NL. Requests which the system cannot answer are sent through to the experts, together with an explanation from the system.

The KS itself was built using ADS, a PC-based expert system shell. The main reason for this PC-system was the lack of a proven KS-shell for the AS/400.

In the current situation, however, the PC on which the KS is situated is located at the maintenance department. In this setup there are two other hardware platforms to be considered. The maintenance requests are collected on an AS/400, whilst the maintenance history is situated on a Bull DPS7 mainframe.

At the start of the KS project it was estimated that by the time the KS would begin functioning in an organizational setting, all Bull applications would have been transferred to AS/400's. This would mean that only a communication link between the PC and AS/400 would be required. No problems were foreseen in establishing this link, as it had been a proven concept. Early 1993, however, problems with the Info-'90 project arose and technical problems started affecting the pace of implementation. A description of the implementation process is given next.

3. The Main Story

3.1 The Info-'90 Project

Prior to the DN/KS project, an IT vision was laid out by ICIT in 1988, in which the AS/400 was seen as a powerful communication tool. All Lease Holding subsidiaries were required to buy it and link it to IBM's International Network (IBMIN). Furthermore, in 1993, it was stated that 90% of all incoming and outgoing messages would become electronic in the near future. The KS project fitted this idea well.

Feeling forced into a system that posed problems for them, people at Lease-NL started questioning the use of the AS/400. The Holding took a firm stance and told people to 'shut up or leave'. This was one of the first signs of a new Holding policy, taking tighter control.

The Info-'90 project was launched in 1989 to transfer all Lease-NL's systems to the AS/400. The project depended heavily on formalities and required tremendous efforts. After more than four years it was eventually cancelled. Several high ranking Lease-NL managers were fired during the course of the project. This has led to a situation in which at this moment managers at Lease-NL are afraid to take responsibility for large projects and the outdated Bull systems are still in use.

The case of Info-'90 suggests that success or failure of a major IS project has long-term and widespread ramifications. The failure of Info-'90 tends to push people to being over-cautious and shun responsibilities of big projects. This implies that a company's history deserves attention in IS risk assessment. This view is supported by Sauer (1993) and Wilcocks and Margetts (1994).

3.2 The Early Stages

Early 1992 a software house, Expert-Tech, was hired to conduct preliminary research into the KS project. Based on their findings the decision was made to continue building an expert system to process incoming maintenance requests. The DN project team remained unchanged and the KS project was started as a logical continuation of the DN. Just as the DN project, the early phases of the KS project were marked by an informal structure. The knowledge acquisition phase started and all seemed well. The maintenance manager supplied about 80-90% of all knowledge. Though not seen as a problem at that time, his claim of ownership later was causing difficulty.

Another point is a remark of the maintenance manager that knowledge acquisition was done by a person who 'by the way, had a degree in social-psychology'. This might indicate some doubts about the competence of the knowledge engineer, as psychologists are not very highly thought of there.

The performance requirements were not clearly defined in this first phase, as many uncertainties existed as to what hardware settings the KS had to operate in. Based on a PC, it was anticipated that by the time the KS was to be tested the Info-'90 project would be finished, and nobody foresaw any problems in communication between the PC and AS/400. Terms like 'good' and 'as fast as possible' were used in describing the performance requirements, and with hindsight it can be said that this gave those resisting the KS implementation a perfect tool.

3.3 The Second Year

The first sign of problems surfaced when the software house delivered the system for testing at the end of 1992. Pressured by the maintenance manager they had worked overtime, only to learn that testing was being postponed in January 1993. As the database containing the maintenance history was still located on the Bull, and migration to the AS/400 was expected to take months, it was not possible to test the system in an operational setting. Considering all activities linked to the KS as a disruption to his daily routine, the maintenance manager was not eager to spend much time testing the system manually.

Although ICIT had foreseen the failure of Info-'90 for some time, ordering a search for a PC-Bull communication link would have meant openly saying so. A search for alternative solution thus. Hardware experts advised using a screen-scraper. It is a software device that (virtually) scans the screen of the Bull machine and transfers the characters to a different operating system. This technically inferior solution was finished in May 1993. It was presented as a temporary measure, as Info-'90 should be finished within three or four months.

At a deeper level this problem can be related to the prototyping approach used by ICIT, as opposed to the structured approach normally used at Lease-NL. The ICIT manager feels that prototyping leads to better systems, whereas the maintenance manager has a 'let's do it right the first time' approach. Keen (1981) uses this as a sample of Bardach's (1977) 'Pile On' implementation game, whereby adding demands during implementation is seen as a deliberate counter-implementation tactic. In this case it should, however, be seen as a difference in implementation view, which has proved to be a complicating factor.

Another major source of problems is the different set of priority between the maintenance manager and the automation director of the holding company. While the former's mind is set on smooth operational activities, the latter is more interested to promote quality improvement among all the subsidiaries, based on the experiences gained in this project.

Keen presents a tactical model to deal with counterimplementers, of which the third issue reads: rely on face-to-face contacts. Poor communication between ICIT and maintenance has clearly not helped in reconciling their differences. Highlighting the disruptive effects of poor communication in organizational life, Handy (1985) observes that "Communications are symptoms. Good communications imply a well-designed healthy organization."

Although the installation of the screen-scraper solution made it possible to test the KS with data from the Bull, maintenance still was reluctant to do so. This is the point where poor requirements definition took its toll. Due to the fact that the technical settings of the KS were unclear at the start of the project, only terms as 'good' and 'as fast as possible' were used. This made it easy to say: 'The system is not up to our standards, we will not start testing'. As ICIT had no formal authority over maintenance, this situation lasted for some months.

When an acceptable performance was not reached, it was thought that the PC-based KS just could not work, and feelings arose that ICIT was not working hard enough or was even incapable of getting the KS functioning. Tyre and Orlikowski (1994) argue that the process of technological adaptation is not gradual and continuous, but instead is highly discontinuous. Only a relatively short period of time after initial implementation of a new technology the window of opportunity exists. To use their terminology, we could say that by this time the window had closed.

Late in 1993 it became clear that Info-'90 had failed, and it was eventually cancelled in early 1994. Not only was it the biggest and most expensive failure ever at Lease-NL, it also meant that an alternative for the screen-scraper had to be found.

Enhancing the maintenance manager's doubts about the KS, and creating an even bigger problem, it was rumoured at the end of 1993 that the Holding would let another Dutch subsidiary use the KS. The threat of their knowledge being transferred to another subsidiary (a competitor in the Dutch lease market) created ill feelings at the maintenance department. Again, poor communication can be blamed. The intentions of the Holding to implement the KS at other subsidiaries had never been stated openly at the start of the KS project.

The Holding treats Lease-NL as a profit centre. Cooperation between Lease subsidiaries in different countries is not a problem, but subsidiaries within the same country view themselves as competitors. This, according to Lease-NL, denies the Holding every right to aim for cost saving exercises within the Dutch subsidiaries at the expense of Lease-NL. The result of this controversy was that the maintenance manager claimed ownership of the KS and refused to cooperate any further with ICIT.

In order to assess the relation between the Holding and Lease-NL, we should consider that it was Lease-NL that formed the basis for the entire Lease Holding. Two of the current of the Board members of the Holding are former Lease-NL directors. Reluctance to act against Lease-NL is especially strong with one of these members. The maintenance manager has made good use of an informal network stretching from his direct superior all the way through to this particular executive. This lobbying ultimately led to Lease-NL's taking over of the implementation, which is discussed in the next section.

3.4 Starting All Over Again

In March 1994 one Lease-NL's top executive proposed to separate the cooperation and have both parties go their own ways. Jin and Franz (1986) suggest that it is important to create a collaborative problem solving atmosphere based on trust and mutual respect. Clearly the atmosphere surrounding the KS did not fit this requirement. The Holding approved the proposal, and implementation was taken over by Lease-NL's own automation department. The cancellation of Info-'90 made it possible for the department to actively participate in the KS-project.

The first act was to find out whether or not the system was a true KS. The reasons for building the KS on a PC were to be able to use an ES-shell and that PC's were (and certainly would become) powerful and reliable enough. Vrakking (1993) gives an example of opponents searching for new external specialists who will once again attack the starting points on which the decision was based. The starting point of using a PC-based ES shell was attacked by questioning the nature of the system, using Lease-NL's automation department as 'external' specialist. Conclusions were that it was not a KS, that it was a simple, rule-based application, and that it could thus be written in a normal programming language on the AS/400.

By then the maintenance manager seemed convinced that a complete rebuild of the KS onto the AS/400 would solve all his problems. Without consulting his superiors he hired Triple-X, the software house that built the DN, to research into the possibilities of building the KS on the AS/400 using a standard programming language. Triple-X produced a report claiming that the PC-based system could only function if approximately 50 coupled PC's were used. This report was rejected by Lease-NL's automation director as groundless. It did, however, reinforce the maintenance manager's ideas that the PC-based KS just could not work. The differences between the maintenance manager and ICIT are described the term technological frames, coined by Orlikowski and Gash (1994) to describe individuals' interpretations of technology. They also defined the notion of frame incongruence, whereby technological frames differ between groups, which could lead to difficulties around technological use and change.

The maintenance manager has never been informed as to why the KS should be PC-based. Again, a case of poor communication. The decision was based on three considerations. First, there was no ES-shell available for the AS/400 in 1992. Second, ICIT manager's view of the quality and importance of PC's in the near future. And third, the possibilities of storing historic car maintenance data on chip-cards. Combined with PC's containing the KS at the garages themselves, the majority of requests could then be processed without contacting the maintenance department.

Meanwhile a new link had been found by ICIT to connect the KS to the Bull via the AS/400, whereby a program-to-program bridge had to be built between the Bull and AS/400. This concept was handed over to Lease-NL in February 1994, but it turned out to be more complex to build than was anticipated. Only by August it was clear that it could function, and it could be finished not earlier than December.

In September 1994 a project was drawn up to get the KS functioning. Named Temporary Solution Maintenance (TSM), it was estimated that the KS would be operating in a production setting between March and May of 1995. By December some more technical problems pushed the date of delivery to early May, and with a moderate delay the system was finally delivered for acceptation testing at the end of May. After about a year of testing and improving the system, it was fully operational in April 1996. As a happy outcome, no maintenance expert lost his job. The extra manpower released has been assigned to other tasks.

3.5 Discussion

The maintenance manager's reluctance to start testing the KS was facilitated by the lack of clarity in the performance requirements. This fuzziness was tolerated because the successful cooperation during the DN-project blinded ICIT to the possible difficulties the KS could encounter. At a deeper level it can be attributed to a lack of understanding by ICIT of maintenance's priorities. All hours spent on the KS were seen by maintenance as a disruption to their daily routine.

As ICIT had no formal authority over maintenance, they could not force them into taking certain action. The independent attitude exhibited by the maintenance department, mirrors the relationship that exists between the Holding and Lease-NL. The anti-Holding atmosphere at the maintenance department originated at Lease-NL top management. A serious power struggle is currently going on. The Holding Board of Directors wants to take greater control over its subsidiaries, but is frustrated by the executive who protects Lease-NL.

The current management style at Lease-NL can be described as bureaucratic and harsh. Employees are dismissed with much less consideration than previously. When confronted with these observations, one top executive reacted that there was nothing wrong with that. This fear of dismissal is used intentionally by the top management of Lease-NL. In the situation of relatively high unemployment (in 1994/95), it might be an effective way to improve efficiency. Unfortunately it has a poisonous sting in the tail. It erodes the culture of trust between the management and employees, and it has resulted in resistance of the maintenance manager and the *angst* of the experts.

With its intentions of selling the KS to other Dutch subsidiaries, the Holding should have realized the strong emotions this could evoke. Rumours resulted in a very hostile atmosphere, making further involvement by ICIT impossible. The tense situation that already existed between the Holding and Lease-NL worsened.

One of the biggest problems was the continuous questioning of the platform the KS should be based on. The 'Temporary' part of the TSM project's name was derived from the separation proposal, in which the term meant that a solution had to be found to get the KS working between then and the time a Bull-AS/400 migration will finally be completed. Depending on its functioning in this period a reevaluation of the system will then be made. It is clear, however, from TSM-memos and recent statements, that the maintenance manager still believes the final version of the KS will be on the AS/400. On this point he cannot be faulted as he has never been informed about why it is better for the KS to be PC-based. When ICIT was in charge of the technical implementation, the question was never openly raised. After Lease-NL's automation department took over, and rumours about rebuilding the system on the AS/400 became stronger, ICIT's manager stepped in and explained his vision to Lease-NL top management as well as to the automation director. Both parties agreed that a rebuild was out of the question, but the maintenance manager was never informed about this decision. This tallies well in the findings Jin and Franz (1986) that obstacles to implementation do not necessarily arise from overt resistance as discussed by Keen (1981), but may result from poor communication between the two groups.

From the taking over of the KS implementation by Lease-NL to the current state of testing, the whole situation has been considered a technical issue. Although the executive who drew up the separation proposal took responsibility, the implementation process has taken another 16 months. Management

support is often cited as one of the most important factors in implementation success. The empirical study by Yoon *et al.* (1995) state 4 components of management support; understanding potential ES benefits; management encouragement to use ES; necessary help/resources; and management interest in end-user satisfaction. The first and third requirement are satisfied. On the second and fourth some remarks can be made. Management encouragement to use the KS is not necessary, as it is an autonomous system. In setting the norms, the percentage of approval by the system can be raised. As the executive is focused on cost saving aspects, he has indicated that he aims for 90% of KS-approvals, instead of the 80% mentioned from the beginning of the project. He sees benefits in a trade-off between higher maintenance costs and lower personnel costs. Not only is this a bad signal towards the maintenance department, it also is a violation of Lease-NL's philosophy. Management interest in end-user satisfaction can also be doubted. The particular executive is not too popular with his personnel, and in interviews expressed some harsh opinions, as well on specific individuals as on the Holding. Having problems with all Holding interference, and even its existence, it may be that instead of providing the necessary support (or pressure, in this case), he sent the message that it was alright to doubt ICIT's competence.

Seemingly convinced from early 1994 that rebuilding the KS on the AS/400 was the only option, the maintenance manager spent much time on researching this possibility. As project leader he could dictate the speed of the TSM-project. It was only after some mild pressure from Lease-NL's executives that progress was made. The use of force to coerce the maintenance manager was hindered by his successful use of his informal network. The social process of IS implementation depends heavily on human actors. We need to consider not only their formal roles, but also their informal networks, hidden objectives and personalities.

The threat of possible job losses at his department was firmly denied from the early beginning of the KS implementation, but it had never been put on paper. A Business Process Redesign project at another department cut jobs there, and Lease-NL was no longer seen as a life-long employer. The original idea was to free experts' time to perform fleet analysis. It was clear that the current Lease-NL system does not provide the necessary capabilities to perform these functions. The whole AS/400 plan could be an attempt to stall the KS until a new maintenance system was completed, preventing job losses. Giving the system a more appropriate name might have helped. For example, American Express uses an ES similar to the maintenance KS for credit authorization, and called it the Authorizer's Assistant (Leonard-Barton and Sviokla 1986).

Jin and Franz (1986) present a positive obstacle coping approach, which resembles the period after the takeover by Lease-NL's own automation department. In this period three steps can be distinguished: diagnosis, confrontation and resolution. After the director of automation was given the task of getting the KS to work, he started by diagnosing the situation as it was by then. In a next step he had some arguments with the maintenance manager about the AS/400 plans, this can be called the confrontation step. Starting the TSM project can be seen as the resolution step, in which both parties agreed to get the KS functioning according to commonly agreed plans.

It may not have been a swift process, but it has resulted in a workable situation. ICIT staff's opinion is that far too much time was taken to get the system functioning by Lease-NL automation. The automation manager replied that it was ICIT which allowed the implementation pace to drop. He stated that the KS project should not take more than 9 months. Coincidentally, this is exactly the same amount of time his department has taken to complete the system. This case study can also be viewed as an informal evaluation process. Stake (1975) makes a distinction between a preordinate and a responsive approach. This latter approach emphasizes the usefulness of the findings of the evaluation research to the people concerned with the programme. Although there are no intentions to use the findings of this research in improving the relations between the Holding and Lease-NL, the Holding has considered learning as a specific goal. With possible future implementations in mind, this first one can be seen as a learning-by-doing experience.

4. Conclusions

User involvement and user acceptance are often mentioned as success factors in IS implementation. In this case study it was not the intended users (the maintenance experts) who stalled implementation, but it

was their manager. Using every possible technical problem as an excuse, he successfully delayed the implementation by two years. In the process he displayed great competence in exploiting his network of contacts with some members of the top management as well as the state of "non-initiative" of the senior managers which resulted from the history of a failed major IT project.

From an organizational perspective the delay is an upshot of the inconsistent postures of the top management concerning the use of the KS. At the beginning of the project, it was stated that no jobs would be lost, but this was not guaranteed. In the background of mild business recession, KS implementation worries those whose jobs and associated status are being threatened by it. Worse still the fear of dismissal was intentionally used by one top executive as a means to gain efficiency in the company. The result was a continued unrest at the maintenance department. Putting job guarantees in writing can reassure the experts. The biggest challenge for management is to remove those fears. Not responding to fears may have adverse consequences for the knowledge acquisition phase. In the worst case the experts may falsify knowledge and thereby sabotage the system. Even if the experts cannot be used at the maintenance department any longer, Lease-NL has sufficient room of manoeuvre to employ them at other departments.

Another major source of problems is the different set of priority between the maintenance manager and the automation director of the holding company. While the former's mind is set on smooth operational activities, the latter is more interested to promote quality improvement among all the subsidiaries, based on the experiences gained in this project. In this sense, the research has enhanced a better appreciation of the range of issues that may arise in similar projects in other subsidiaries.
Our research has shown that high level organizational problems have adverse consequences for the implementation of even a relatively simple system like the KS we studied. We found that history of debacle or success of major IT initiative, communication, authority, culture, management style, personalities and chance all influenced the implementation process. Organizations can benefit from diagnosing their own ISs to reveal higher level sources of problems and gain deeper knowledge of their own functioning.

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