How political processes shaped the IT adopted by a small make-to-order company: a case study in the insulated wire and cable industry

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Abstract

This paper explores how political processes shape the information technology (IT) systems implemented by small-medium sized firms. Systems designers, consultants and users often interpret technology in different ways. This may result in the implementation of inappropriate systems. Small business managers work on short time scales and may be more concerned with operational matters rather than strategic considerations. A case study of CableCo, a small make-to-order company, is used to explore the political processes that shaped the selection and implementation of the Company’s IT system. The incongruence between the ‘technological frames’ of the stakeholders is examined. Researchers, consultants and managers will learn that the implementation of IT is determined by the dominant ‘frame’.

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1. Introduction

In the main, research into information technology (IT) has tended to focus upon large companies. There is a dearth of empirical research focusing upon IT in small businesses [10]. Likewise in manufacturing, the literature has mainly focused upon make-to-stock (MTS) environments [16]. The limited research in make-to-order (MTO) companies has focused on strategy [25] and on planning in subcontract engineering job shops [16].

This paper describes the issues and problems of implementing an IT system in CableCo, an MTO company operating in the insulated wire and cable industry. The authors were part of a university-based research team that included three engineers and a social scientist. They were brought in by the Company to manage the transition from a manual paperwork system to an integrated computerised system. The challenge facing the Research Team was to select an appropriate IT system taking into consideration the market environment, the complexity of the products and business processes and company strategy. The paper specifies the features required for an integrated IT system.

The research project was supported by the United Kingdom Government funded Teaching Company Scheme, which funds Teaching Company Programmes. The aim of the Scheme is to strengthen
the competitiveness and wealth creation of the small business sector by providing access to the expertise of universities. Teaching Company Programmes are collaborative partnerships between small and medium-sized enterprises (SMEs) and universities. Academics receive funding to participate in industrially based projects that can enhance their research and teaching.

The proposal, which was agreed by the Company, the University and the Teaching Company Directorate, included objectives, a detailed plan and outcomes based upon an integrated IT strategy. However, as the project progressed, the Managing Director (MD) rejected the IT strategy and plan. Management requirements were fluid and the aims, objectives, plan and tasks became the subject of continuous negotiation between the research team and the Company. This made it difficult to use a formal software development methodology. The IT system that was eventually implemented was considerably different in scope to the system outlined in the original proposal, but it did satisfy the MD.

The paper seeks to understand these changes by exploring the decision-making processes and the political processes impacting upon the project. A theoretical framework is developed to examine how these political processes shaped the selection and implementation of the IT system at CableCo. This analysis explains why an initially well-defined problem with clear requirements became an unstructured problem with unclear objectives.

The paper begins with a description of the research methodology. This is followed by a review of IT strategy, requirements definition and implementation. CableCo and the Programme proposal are described next. The progress and outcomes of the project are then outlined including the development of the Functional Specification and the selection of the IT system and software package. The concept of ‘technological frames’ [33] is then used to explore how political processes shaped the technology that was eventually adopted.

The research will be helpful to IT researchers, managers and consultants engaged in implementing IT in small-medium sized enterprises. It demonstrates how the political processes shape the technology that is implemented. The research also shows that stakeholders need to understand each others’ mindsets. This work should also be of interest to those considering participating in a Teaching Company Programme.

2. Methodology

Nandhakumar and Jones have lamented the “paucity of engaged studies” [31, p. 128] in IT research. They argue that interpretive researchers need to interact with the phenomena that they are studying. This could provide researchers with a deeper understanding of the research context and its actors. The methodology adopted by the Research Team was action research, which is embedded in the interpretive philosophical framework [43]. Action research has been cited as “ideally suited to the study of technology in its human context” [3, p. 235].

The Teaching Company Programme at CableCo provided the Research Team with an opportunity to study ‘IT in action’. Fig. 1 depicts the framework that was used to explore the internal factors that shaped the formation and implementation of IT at CableCo. It is based upon ‘technological frames’ [33] and the impact of political processes on technological change [26]. From the social construction of technology perspective the characteristics and capabilities of the technology are not considered as technical matters that are resolved outside of the firm. Instead the technology is viewed as a product of the political process, which is subject to argument and dispute during and after it has been implemented.

Fig. 1 shows that the development and implementation of the IT system was the outcome of a three-phase interaction between the Managing Director and the Research Team. Phase one was the planning stage. Members of the Team held preliminary meetings with the MD to discuss the setting up of a Teaching Company Programme with the Company. A proposal was produced for submission to the Teaching Company Directorate, which included a definition of objectives and a plan of work. Phase two was the Programme initiation stage. Budgets and accounts were set-up and a Teaching Company Associate (TCA) was appointed to work on the project. Phase three was the implementation of the Programme. Information technology requirements, the system implemented and the project itself were socially shaped through the operations of the Local
Management Committee (LMC), monthly meetings of the academic and industrial supervisors with the TCA, weekly meetings of the academic supervisors with the TCA and the operations of the Business Process Improvement Teams.

There were two main sources of empirical data. The Research Team spent at least half a day per week at CableCo for 2 years. Meetings were held with the MD (as Industrial Supervisor) and the Associate, which provided an opportunity to discuss progress and to set targets. The Business Process Improvement Teams’ meetings were usually of 2–3 hours duration, although some lasted all day. Detailed notes were taken at all meetings. The second source of data was the Associate himself who acted as a participant observer during his 2 years with the Company. Information was passed formally to the academic supervisors in the form of reports and informally during regular meetings.

3. Information technology: strategy and implementation

It is important to ensure that IT is properly aligned with the business strategy of the company [13]. Research conducted in SMEs, however, indicates that there is little emphasis on strategic thinking amongst the management of these firms. Investment in IT is regarded as a cost [21]. The instability of the business environment confronting small firms is regarded as a major obstacle to business planning and ultimately to investment in IT [12]. SMEs have tended to focus on the selection of software packages rather than on the definition of requirements [7]. SMEs purchase IT primarily to improve the efficiency of existing processes, or to improve communications with the wider customer base, rather than to develop strategic capability [22,23]. The successful implementation of IT in small firms has been found to be strongly influenced by assumptions, expectations, knowledge, background and characteristics of the owner-manager [12,44]. Owner attributes also have a greater impact upon IT satisfaction than any business factors [29]. Manufacturing firms have the lowest levels of satisfaction [36]. Furthermore, research has indicated that only 9% of SMEs used a structured IT development methodology to identify their information needs [29].

A major criticism of structured methodologies is that they have “paid little attention to technologists’ assumptions, expectations, knowledge, and how these may differ from the frames of managers and users for whom the technology is being built” [33, p. 203]. It is important for systems designers, managers and users to recognise that IT is the product of social action [35]. Technologists and change agents need to be aware that they are intervening in the social and political systems of those companies where they are identifying systems requirements and implementing IT.

3.1. Social shaping of technology

Change agents can adopt one of three roles: top-down champion, bottom-up champion or dual role champion [9]. Although change is a team effort there is usually one individual who takes responsibility for motivating the workforce and securing commitment for change. To be successful, this individual needs to have access to adequate resources and to be fully
supported by senior management. In an SME, where power and authority may be concentrated in the hands of one or two individuals, the introduction of any new technology requires the full support of the MD, especially when the technology may have structural, operational and strategic ramifications.

From the social construction of technology perspective there is a ‘duality of technology’ [32] involving a reciprocal interaction between people and information systems. Organisations have been described as political entities [37], where the design and shaping of technology is seen as the outcome of negotiations between a multiplicity of stakeholders [47]. Change agents therefore require political expertise when engaged in technological and organisational change [5]. Orlikowski [32, p. 406] argues that “(t)echnology is the product of human action, while it also assumes structural properties. That is, technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meanings they attach to it and the various features they emphasize and use”. In other words, technology can be viewed as a “cultural product that is socially constructed . . . as the consequence of political action within the adopting context” [26, p. 19].

To understand how people interpret and interact with technology, Orlikowski and Gash [33, p. 179] developed the concept of ‘technological frames’. These encompass “people’s assumptions, expectations and knowledge about the purpose, context, importance and role of technology”. These ‘frames’ may facilitate or constrain how technological issues and problems are resolved in the new operational configuration. During periods of change, stakeholders may interpret the new technologies in different ways, leading to incongruence between their respective ‘frames’. This may inhibit learning, especially if some of the stakeholders make sense of a technology through ‘frames’ associated with an old technology. It is, however, still possible to implement a new technological system, even when there is conflict, by developing a set of common understandings which satisfy the different stakeholders. The role of the change agent, or ‘configurational intrapreneur’, is to challenge the prevailing shared belief systems and technological practices and to secure legitimacy for establishing new operational configurations [26].

However, the full extent of change and the likely outcomes cannot be anticipated a priori, because the implementation of change is subject to social shaping [34].

The case study of CableCo shows how the ‘frames’ of the stakeholders, institutional structures, attitudes to change, expertise and power shaped the IT system that was selected and implemented at the Company.

4. CableCo: markets, products and processes

In 1999, the global cable industry had annual sales of US$ 70 billion. It was a highly fragmented mature industry, producing low margin commodity products. The top 10 manufacturers cumulatively accounted for 37% of the global market [6]. Regional manufacturers accounted for a high proportion of industry sales. In 1999, industry observers estimated that imported cable satisfied approximately half of UK demand. This was predicted to increase due to the rationalisation and consolidation of the industry.

CableCo had a turnover of £5 million and employed 50 people in Northern England. The Company embarked on a £2 million expansion to double its output. Decision-making was highly centralised. The MD took responsibility for marketing, sales and finance, whilst the General Manager was responsible for manufacturing, procurement and distribution. CableCo had approximately 0.1% share of the domestic cable market. The Company’s objective was to have 55% of its business in the home market and 45% overseas. It exported cable to over 40 countries. This gave rise to complex marketing, commercial decisions and logistics. This made the early dispatch and coordination of production to meet delivery requirements particularly important.

4.1. The CableCo Teaching Company Programme

The Company used manual systems throughout its business. Management saw IT as a means of enhancing customer service, reducing lead-times and improving operational efficiency and control. This would lead to increased productivity, lower costs and enhanced flexibility [41]. CableCo allocated a budget of £110,000 to cover staffing, hardware, software, implementation and training, which equated to 2% of turnover. IT
investment levels are generally in the range 1–3% [46].

The Research Team in consultation with CableCo and the Teaching Company Consultant (appointed by the Teaching Company Directorate) completed a grant application form. CableCo and the University signed a formal contract the ‘joint commitment statement’ that included a detailed work plan. Under the terms of the contract, the Company would receive IT consultancy whilst the academics would have an opportunity to investigate the IT requirements of an MTO company.

The development of the Programme plan progressed smoothly. The academics had experience of working on previous programmes with similar objectives. The proposed plan was based upon this experience and was formally agreed with the Company. Although the MD did not fully understand the work outlined in the plan, he fully supported the Programme.

When the grant had been awarded, a selection panel comprising the academics, the MD and the General Manager recruited a Teaching Company Associate. The LMC took overall responsibility for the management of the Programme and met on a quarterly basis. The Committee’s membership comprised the MD and the General Manager from CableCo, the TCA, the Teaching Company Consultant, and the academics. The role of the LMC was to monitor the progress of the project, to approve expenditure and to ensure that the budgets were properly managed. The LMC also had the power to make changes to the plan that had been agreed. In addition, the academic and industrial supervisors met with the TCA for half a day per week to enable the transfer of knowledge and skills into the Company. They also held monthly meetings to review progress, plan future work, coordinate the project and resolve any issues or difficulties. The Research Team viewed these monthly meetings with management as an opportunity for ‘perspective taking’ [28]. In other words, it would allow the academics and management to understand and appreciate each other’s knowledge, values, meanings, assumptions and beliefs.

At the planning stage the academics were in a powerful position. They had expertise that CableCo required and were a route to Government subsidy. After the grant had been awarded, the power balance shifted in favour of the Company. The TCA’s contract of employment was with the University, but he worked at CableCo and reported to the MD on a daily basis. This gave the MD a strong influence over the tasks carried out by the TCA. All aspects of the Programme became the subject of negotiation at the monthly meetings and at the LMC. This had an impact on priorities, objectives, tasks performed, the allocation of resources, the IT development methodology that was adopted and the technology that was implemented.

It became clear during the regular monthly meetings that it was CableCo’s major shareholders who were the driving force behind the investment in IT. They saw this investment as essential to protect the Company’s market position. The MD and the General Manager, on the other hand, had little understanding of the capabilities of the technology. To them IT offered operational improvements. Increasing the productivity of the clerical staff by 20% would allow a significant expansion of the business without the need for more staff. Furthermore, it was anticipated that the proportion of enquiries converted to firm orders would increase by 5% due to the faster processing of enquiries and improved delivery performance.

4.2. Business strategy

CableCo had radically different business and manufacturing strategies to its competitors. For its size, the Company had a complex supply network because it exported cable all over the world. The large cable manufacturers were able to reap economies of scale by producing cable in high volumes. CableCo suffered a cost disadvantage as it produced cable in lower volumes. Customers’ switching costs were low. Price and delivery were paramount. CableCo achieved competitive advantage through flexibility and customer intimacy [45].

4.3. Manufacturing strategy

CableCo manufactured its products on an MTO basis as a means of minimising inventory and working capital. This was in contrast to its larger competitors who operated predominantly on an MTS basis, which minimised set-up activities and maximised resource utilisation. The decision whether to operate on an MTO or MTS basis was a strategic issue as it had a direct effect on costs, inventory, flexibility and delivery [25].
The drawback of the MTO strategy was that it increased operational complexity and reduced the utilisation of manufacturing resources due to the requirement for a large number of set-ups; this also increased scrap rates. The Research Team suggested that the Company should consider manufacturing high volume standard items on an MTS basis to improve resource utilisation and delivery performance.

The MTO strategy had major consequences for manufacturing planning and control and therefore on the features required from a software package. It linked items of inventory to specific orders; it exposed customers to the whole cumulative lead-time, which meant that information on the production status was required to answer customer enquiries. Non-value adding changeovers reduced resource utilisation and made production scheduling complex. The need to coordinate the manufacture of different products within an order caused further complexity. The MD had difficulty appreciating that appropriate software selection was contingent upon these factors.

4.4. Business Process Improvement Teams

The TCA established, trained and led cross-functional Business Process Improvement Teams. Their objective was to examine the business processes and to identify IT requirements. As a ‘bottom-up champion’ [9], he was responsible for convincing staff of the need for change as well as directing, managing and delivering the project. The members of the Business Process Improvement Teams were very cooperative because they welcomed the participative approach of the research team. These employees had knowledge and information that was not readily available to management [15]. They understood the need for a new IT system and they were very constructive in discussing the operation of the existing systems, identifying shortcomings and making suggestions on possible improvements. Formal reports were produced that described the sales order processing, despatch, stock control and quality control processes.

The academics and the TCA acted as facilitators at these business process meetings [30]. The MD attended some of the earlier meetings but took a passive role. He made it clear at the monthly meetings with the academics that he was becoming increasingly frustrated. He could not understand why the existing systems were being analysed. He also had strong reservations about employees being involved in discussions relating to system requirements. The academics spent a considerable amount of time reminding the MD of the partnership nature of the project and the importance of sticking to the plan. His approach appeared to be opportunist rather than strategic [29]. He could see little reason for taking a systematic approach to IT planning and software selection, although he had previously agreed to this in the plan. He thought that any off-the-shelf ‘industry standard package’ would suffice. The thrust of his argument was that the IT used by competitors would be equally suitable for his business. He did not appear to appreciate the complexity of the Company’s operations relative to its competitors, which was due to the MTO strategy and the need to coordinate the production of different products within orders.

The researchers stressed that a strategic view on software package selection, including an assessment of the technical capability of the system, was essential [7]. Software packages should effectively support business processes and contribute to competitiveness [38]. Due to their limited expertise, technical know-how and financial resources small firms often select software packages ad-hoc, rather than in terms of clearly defined requirements [7]. This can significantly increase risk, because the precise system requirements and limitations of the software may not become clear until the IT system is implemented. At this stage, customisation of the software may be expensive. Companies can become victims of the ‘technology productivity paradox’, in which inappropriate IT systems waste resources and produce little or no benefit [24].

The academics advocated a structured software selection procedure based upon an analysis of requirements, which would be formally documented. Potential solutions were to be assessed through demonstrations by vendors and visits to other companies using the software. The aim was to identify a package that met CableCo’s requirements with minimum modification. However, the objections of the MD made it impossible for the TCA to fully apply a structured methodology to analyse the business processes. This was because the MD was not prepared to allow him the necessary time to learn about structured methods. Instead, he had to use flow diagrams (which he was already familiar with) to analyse the processes.
4.5. Development of a Functional Specification

Based upon the business process analysis exercise and subsequent meetings with the Business Process Improvement Teams and management, a Functional Specification was produced that defined the Company’s IT requirements. The particular requirements for the various subsystems will now be considered.

The procurement function was relatively simple and straightforward requiring no special features. The purchasing of copper was a task performed by the General Manager because it constituted a large proportion of cost (50% for a single core cable) and the price fluctuated on a daily basis. He required information on the copper price, current stock levels and anticipated demand.

The requirements for manufacturing planning and control were different from the features provided in a standard MRPII system [19]. Firstly, the product structure of each order was random, reflecting the pattern of individual customer requirements at a given time. The MTO strategy ensured that gross and net requirements were usually similar. Manufacturing, therefore, had to respond directly to the product volume and mix within the order book. This made production scheduling a difficult and particularly important activity. Common objectives were to maximise resource utilisation and productivity, whilst coordinating the supply of different products to satisfy complete orders by their due dates. These requirements were frequently in conflict and needed to be resolved by management, who required access to data on production and order book status, priorities, due dates and current and planned resource availability. A computerised manufacturing planning system could schedule production using a finite loading approach, with periodic regeneration. Cyclical scheduling, where items were produced on a regular periodic basis, would simplify scheduling and allow customers to know when particular product types were to be produced.

The minimum run lengths and consequent stock levels for products were determined by their usage patterns, cash flow forecasts as well as set-up and stock holding costs. Cost models were developed to enable trade-offs to be evaluated. Cable in high demand could be produced in longer runs to reduce the disruption associated with excessive set-ups. This would entail shifting towards an MTS policy for products in high demand, with management specifying the maximum stock levels for each item. Cables with infrequent demand would continue to be manufactured on an MTO basis. This approach would increase the importance of stock control, simplify production scheduling, and increase resource utilisation and productivity. It was surprising to find that the stock turn ratio for the Company was 6, compared with the industry average of 9.2 [42], which included MTS companies. This suggests that CableCo’s MTO strategy had significant shortcomings, and that the Company was holding unexpectedly high levels of stock, some of it possibly obsolete.

Sales and order processing was a two stage process. The first was the quotation stage where the price and sometimes the delivery date were specified. Prices were obtained from standard price lists, although in some cases management was prepared to negotiate special terms for preferred customers. The capability to adjust the price of individual products, subject to achieving a satisfactory margin for the whole order, was a particular feature that was required. Data on past payment records were needed to determine the commercial basis of the quotation. Quoting delivery dates was often problematic since there could be many ‘floating’ quotations awaiting a response from customers. The actual demand and factory load in future periods was therefore unknown. Hierarchical backlog methods have been developed for controlling manufacturing lead-times in MTO manufacturing [16]. The second stage was order acceptance, which required that the price and delivery date quoted were confirmed and the customer’s current credit status was checked. The system must provide information on prices, the production schedule and resource availability as well as accounting information relating to the customer.

The marketing function required breakdowns of past turnover and profit by market, customers, type of customer, period and products. An analysis of demand patterns was also important as it provided a basis for making contact with customers and forecasting aggregate demand. The establishment of a web site was considered a crucial part of management strategy to increase exports. The Team were, however, concerned that the marketing strategy should be aligned with the manufacturing strategy. A pure MTO strategy could constrain CableCo’s ability to fulfil the expected
increase in orders. Furthermore, a strategic approach was urged to ensure that capacity constraints did not undermine the Company’s ability to secure high margin orders.

The accounting module required standard financial accounting capabilities, although the Company was considering applying Activity Based Costing [17] as a means of improving the accuracy of cost estimates. The major cost drivers were identified as labour, order processing, machine set-ups, materials and energy consumption.

4.6. Package selection

The MD was advised that adopting a customised software solution for the business was too costly, would take too long and was not feasible. A multi-phased methodology [20] was therefore adopted for identifying and implementing an off-the-shelf software package. The discrete phases in this approach included definition of requirements and purchase of software, installation, and modification of internal procedures, conversion of data, training and documentation.

A list of 30 potentially suitable software packages was obtained from the Computer Users’ Yearbook [8]. All the potential suppliers were supplied with a summary of the requirements documented in the Functional Specification, and they were invited to complete a survey form that identified software functionality, features, implementation details, costs and support arrangements. Copies of each software vendors’ accounts were also obtained and analysed to establish their commercial strength and financial viability. A preliminary short list was drawn up and the vendors were then contacted by telephone to obtain further details and to clarify requirements. Six software suppliers were then invited to visit the Company to demonstrate their software. These suppliers were provided with appropriate test data, so that the demonstrations could be directly relevant and easy to compare. This was followed by two site visits to investigate the application of the preferred system in a company with similar characteristics to CableCo.

In the meantime, the MD became more preoccupied with the plans to extend the factory. The aim was to double the output of cable. The strategic and operational factors driving this expansion strategy were not entirely clear from the perspective of the Research Team. The integrity of the plan and the partnership nature of the scheme were again called into question when the MD started to allocate the TCA tasks associated with the factory expansion. The academics were concerned that this would put the IT project behind schedule. Moreover, it raised a fundamental question about whom the TCA reported to, and who was responsible for determining the work that he was allocated. The Local Management Committee, which was chaired by the MD, never really addressed this issue.

There was a delay of several months whilst the MD reconsidered the position. Some of the potential software had little scope for customisation, whilst other alternatives were very flexible and could be configured with ease. There appeared to be a fundamental choice. Either the Company could adopt rigid software and then try and change its business processes to suit, or it could tailor flexible software to meet the exact requirements laid down in the Functional Specification. The academics clearly had a preference for the latter approach and recommended Platsoft as the most appropriate software. The MD was not at ease with either approach and he had still not accepted the need to match the software solutions to the business processes. He took the radical step of reviewing his requirements and decided to purchase Impact Encore software for the accounting and sales order processing functions. The software did not support the other business functions and had not been originally short-listed. The MD identified the software through his network of personal contacts, which is a common approach in small companies [18]. It was selected mainly on the basis of cost rather than functionality. The package did not support export sales, which made it necessary for the TCA to develop a bespoke database. The resultant system comprised manual systems, the Impact Encore software and a bespoke database.

There were many positive outcomes from the project. Firstly, computer hardware, software and networking were installed in a company that had virtually no IT at the outset. There was extensive training of staff in general IT (word processing, spreadsheets and databases) as well as specific training relating to the use of the selected package. The introduction of e-mail enhanced internal and external communications. This, together with the web site, proved very significant,
given the international nature of the Company’s markets. The IT system also increased the efficiency of the administrative functions. It supported a 36% increase in turnover arising from the factory extension with the same number of administrative staff. However, the other business functions, including manufacturing did not benefit from the implementation of IT as intended.

The Research Team and the MD had different perspectives towards IT. From the MD’s perspective, the project was a considerable success. He had achieved his objective of implementing an IT system, as requested by his shareholders. To the academics, it was a qualified success; more could have been achieved. The next section explores the ‘technological frames’ of the MD and the Research Team. The aim is to show how the ‘frames’ of the two parties helped to shape the technology that was adopted.

5. Technological frames of the Research Team and the Managing Director

Table 1 describes the ‘technological frames’ of the Research Team and the Managing Director. It comprises the type of partnership plus three core domains: nature of technology, technology structure and technology in use [33]. The type of partnership includes the interpretation and attitudes of the two parties to the management of the Programme. The first core domain refers to people’s understanding of the capabilities and functionality of the technology. The second comprises the reasons why the technology was acquired and implemented, including its likely value to the firm. The third refers to how the technology was to be used and any associated consequences of this use. These domains can be used to understand the type of incongruence that existed between the research team and the MD.

5.1. Type of partnership

It became apparent during the progress of the project that the Research Team and the MD had fundamental differences in their interpretation of ‘partnership’. To the Research Team, the Teaching Company Programme was an equal partnership between the Company, the academics and the TCA. It was underpinned by a binding contract, but it also relied heavily on

<table>
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<tr>
<th>Type of partnership</th>
<th>Managing Director</th>
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<tbody>
<tr>
<td>Equal partnership between Company, academics and TCA</td>
<td>Company is customer</td>
</tr>
<tr>
<td>Agreed proposal part of binding contract</td>
<td>All aspects of proposal open to negotiation</td>
</tr>
<tr>
<td>Programme changes need to be agreed</td>
<td>Programme determined by Company</td>
</tr>
<tr>
<td>TCA reports to LMC</td>
<td>TCA reports to MD</td>
</tr>
<tr>
<td>Academics transfer knowledge</td>
<td>Academics paid for time</td>
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<table>
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<tr>
<th>Nature of technology</th>
<th>Managing Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding business processes is important</td>
<td>No systems perspective</td>
</tr>
<tr>
<td>Business processes should be integrated</td>
<td>Integration not necessary</td>
</tr>
<tr>
<td>IT requirements should be carefully defined</td>
<td>No real understanding of IT</td>
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<table>
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<tr>
<th>Technology strategy</th>
<th>Managing Director</th>
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<tr>
<td>IT should support business and manufacturing strategy</td>
<td>Limited strategic perspective</td>
</tr>
<tr>
<td>Strategic supply chain management</td>
<td>Responsive to customer orders and requirements</td>
</tr>
<tr>
<td>Combined MTS/MTO strategy</td>
<td>MTO strategy</td>
</tr>
<tr>
<td>Software package to meet Company requirements</td>
<td>‘General industry’ package</td>
</tr>
<tr>
<td>Staged implementation</td>
<td>Install as quickly as possible</td>
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<tr>
<th>Technology in use</th>
<th>Managing Director</th>
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</thead>
<tbody>
<tr>
<td>Training very important</td>
<td>Training very important</td>
</tr>
<tr>
<td>Enrich or change work of employees</td>
<td>Control work of employees</td>
</tr>
<tr>
<td>Relatively open access to data</td>
<td>Carefully restrict access to data</td>
</tr>
<tr>
<td>Provide strategic information to management for decision-making</td>
<td>Preference for soft information provided by customers and suppliers</td>
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‘goodwill trust’ [39]. As such, any changes to the Programme had to be agreed between the academic and industrial supervisors. The academics were prepared to be flexible and accommodating. They saw their role as three-fold: transferring knowledge to CableCo, developing the competencies of the TCA and conducting IT research.

The MD viewed the Company as a customer rather than as a partner and a recipient of knowledge. The academics were no different to any other supplier, though he respected the knowledge that they had. He kept a keen watch to ensure that they spent the required time in the Company, as specified in the contract. He did not see the project proposal as a binding contract; it was open to challenge and negotiation. The MD also regarded the Associate as an employee since he worked in the Company. He believed, therefore, that it was his prerogative to direct the work of the Associate.

5.2. Nature of technology

The Research Team envisaged that CableCo would be transformed from a company with a couple of computers to one with IT integrated into its business processes. The focus was upon providing information for strategic decision-making as well as improving the operational efficiency of the Company. This would enhance the flexibility of CableCo, increase the utilisation of resources, reduce costs and contribute to competitive advantage.

The two managers had considerable experience of the cable industry. They recognised that the manual system could no longer cope with the wider customer base. The only solution to remain competitive was to switch to a computerised system. The managers did not, however, appreciate the potential of IT. This could be partly explained by the fact that they were middle-aged businessmen with limited exposure to new technologies [29]. To the MD, it was simply a case of taking the manual system out and sloting the IT system in its place. The outcome was that the MD continuously questioned the need to systematically analyse and plan the Company’s IT requirements.

The MD’s dominant ‘frame’ was strongly influenced by Taylorist beliefs on how to organise production. Decision-making was highly centralised. The MD saw the IT as supporting, or reinforcing the existing configuration of technological, organisational and human resources. He certainly did not envisage these processes being transformed by the work of the ‘configurational intrapreneurs’. The monthly meetings failed in their objective of encouraging ‘perspective taking’ between the researchers and the MD. Perhaps, if the General Manager had attended these meetings the limitations of the production strategy may have been given more consideration. He could have confirmed the shortcomings of the MTO strategy. However, given the hierarchical nature of CableCo and the dominant position of the MD, it is doubtful whether the outcome would have been different.

The employees welcomed the implementation of the IT system. They had gained an appreciation of the benefits through the workings of the Business Process Improvement Teams. To them, the technology presented an opportunity to increase their skills, as well as protecting their jobs in a very competitive industry.

5.3. Technology strategy

The IT requirements for a company pursuing an MTO strategy are different to that of an MTS company. The Research Team advocated that CableCo should adopt an MTS strategy for frequently ordered cable. This would allow CableCo to adopt longer production runs, thereby adding more value by reducing the number of set-ups. It would also reduce internal and external complexity in the business processes. This is because the preparation and dispatching of orders are time consuming, costly and prone to error. Delays can have a major impact on production and sales performance. An effective IT system integrated into the business processes could reduce the amount of paperwork, reduce administrative costs and improve cycle times.

The Team saw the technology as transforming the operational and strategic capability of CableCo. The IT would allow more information to be shared internally with and between employees and externally with customers and suppliers. CableCo would be able to reduce its costs, increase productivity and expand its customer base. The Team were also aware that these changes would impact on jobs, work practices and the culture of the organisation. Decision-making
responsibility would need to be formally delegated to employees lower down in the organisation. The Team were aware that the MD was not keen on this proposal.

Acting against the Research Team’s advice, the MD decided that a less ambitious strategy was appropriate. He decided to purchase a software package to manage sales order processing and accounting. His objective was to improve the existing operations for which he was directly responsible [22]. This had the effect of reinforcing managerial control by restricting ad-hoc decision-making and the amount of information available to employees. Crucially, the application of computer aided production management systems (CAPM) was excluded. The MD was not interested in collecting data for strategic planning. This is evidence that in many SMEs IT systems are developed incrementally [14]. It also explains why SMEs have incompatible systems that are difficult to network [1].

The Research Team were concerned that the MD had rejected CAPM and an MTS policy for frequently ordered cable. Surprisingly, the Company’s stock turn ratio was lower than the sector average, which included many MTS companies. The MTO strategy: (i) exposed customers to cumulative lead-times; (ii) involved many changeover operations which significantly reduced operational efficiency; (iii) made planning and control complex and difficult because inventory was linked to specific customer orders. This led to missed delivery dates and partial shipments. The absence of a manufacturing planning and control system made it necessary for status enquiries to be dealt with manually. Cost was more important to the MD than functionality. CableCo had already committed funds to expand its premises. A limited IT system was considered prudent during a period of high expenditure.

5.4. Technology in use

The Research Team reluctantly complied with the MD’s request. He wanted the system up and running as soon as possible. A computer system was installed into a company that had virtually no IT. Employees were trained in word-processing, spreadsheets, databases, email and Impact Encore.

The Research Team recommended employee empowerment as a means of remaining competitive [4]. The MD regarded this as impinging on managerial authority. He was suspicious of a technology that could provide employees with relatively open access to data. His preference was to minimise the amount of information available to the workforce. This had a strong influence on the IT system that was installed. Further, it prevented the management team from having access to more strategic data. The preference of the MD was to rely upon ‘soft’ information from customers and suppliers [27].

Many companies fail to appreciate the full cost of their investment in IT. In many cases, ‘instinct’ [2] or ‘intuition’ [11] are often used to assess the value and expected benefits to be derived from the system. The MD commented that “the direct financial benefits to the Company were difficult to quantify, although the perceived benefits were high. CableCo now had a web site that had raised the marketing profile of the Company. It was now possible to take orders by email. As CableCo had a large export market these developments were significant”.

CableCo had invested in an extension to the factory in order to expand its business. The IT had provided the infrastructure necessary to support the increase in volume of orders (sales increased by 36%) with the same level of administrative staff. This represents a considerable increase in value added compared to the previous manual systems. The IT system provided up-to-date records of customer requirements and their credit positions. This improved the level of service provided to customers whilst minimising the financial exposure, which previously occurred when credit limits were accidentally exceeded.

The Research Team stated that the system implemented fell far short of what had been originally agreed. However, the MD was satisfied. The academics were concerned that instead of building on the work of the Business Process Improvement Teams, the ‘technological frame’ of the MD would restrict the acquisition and dissemination of information. This could limit the ability of the Company to learn causing a negative impact on potential performance [40].

5.5. Discussion

In their role as ‘configurational intrapreneurs’, the ability of the Team to bring about change was
constrained because the belief system of the MD’s dominant ‘frame’ was entrenched. It was not open to alternative interpretations that advocated major changes to existing socio-technical configurations. Nevertheless, the Business Process Improvement Teams were highly successful. Employees became more favourably disposed to change. This was due to the hard work of the politically astute TCA who was very adept at working within and around the constraints imposed by the conflicting ‘frames’.

There are several lessons that can be drawn from this case study. It is important to identify the common assumptions, expectations and knowledge of the various stakeholders [33]. This would help to identify any incongruity between stakeholders’ ‘frames’, and any internal inconsistencies within ‘frames’. However, the interaction between stakeholders is a dynamic process. It is not possible to predict all of the internal and external factors that may impact upon the relationship. During this period the cable industry was undergoing retrenchment, as the large companies divested their operations in the UK. The Research Team found it difficult to comprehend CableCo’s expansion strategy, which concentrated on producing low margin cable. The MD, however, did not consider Company strategy to be part of the remit of the project; it was not a subject for discussion.

The MD had little understanding of the capabilities of IT and the opportunities that the technology offered to CableCo. There was incongruence between the Research Team and management in all four domains. This did not prevent the Company from purchasing an IT system. The outcome was that the system that was acquired corresponded to the dominant ‘frame’ of the MD. His objectives were to reduce costs and increase management control.

There were inconsistencies within the ‘frame’ of the MD. His marketing strategy required a £2 million expansion of the factory to produce high volume cable. This investment was high risk for a company with a turnover of £5 million, in an industry undergoing rationalisation. An MTS manufacturing strategy for cable in high demand would minimise changeover costs; but he rejected it. The MTO strategy increased costs and undermined the financial feasibility of the factory expansion. The failure to align the marketing and manufacturing strategies caused a dramatic deterioration in CableCo’s overall financial performance.

The planned investment in IT of £110,000 was small in comparison with the factory expansion, which was taking place at the same time. This explains the MD’s relative priorities. Furthermore, as the building work progressed there were cash flow difficulties, which dominated the MD’s thinking. His desire to reduce costs influenced the decision to purchase the Impact Encore software rather than implement an integrated solution.

6. Conclusions

The Teaching Company Programme at CableCo provided the Research Team with an opportunity to work in partnership with a small MTO company requiring expertise to identify its IT requirements. A contract was signed to implement an integrated system to support all of the business processes. The IT strategy proposed by the academics (and originally agreed by the Managing Director) satisfied the Teaching Company Directorate, which requires ambitious ‘strategic business projects’ that lead to major improvements in company performance. Make-to-order companies benefit from integrated systems because: (i) individual items of inventory are linked to customer orders; (ii) it is necessary to coordinate the production of items within customer orders; (iii) customer enquiries may require information on the status of production; (iv) production scheduling and inventory management are often complex.

The Managing Director, however, became frustrated at the length of time required to analyse the business processes in order to identify the Company’s IT requirements. He was also concerned that the proposed system might empower the workforce and challenge managerial prerogatives. The implementation of the IT system was taking place in parallel with a significant expansion of manufacturing capacity. This was to enable the production of high volume, low margin cable required by the marketing strategy. The Research Team, however, had difficulty comprehending this strategy in an industry undergoing rationalisation and consolidation. It was high risk. In comparison, the investment in IT was less strategically important to the MD. His objective was
to expand the business without increasing administrative costs. As a consequence, the financial difficulties that occurred during the factory expansion predisposed the MD to limit the scope of the IT system to reduce costs. He ignored the careful planning advocated by the Research Team and purchased a standalone accounting and order-processing system recommended to him by a personal contact. It is unlikely, however, that the Teaching Company Directorate would have funded a proposal based upon such limited objectives.

A framework was developed to explore the difficulties that the Research Team experienced working with CableCo. This framework explains how political processes shaped the technology that was adopted. The primary problems were not technical, but were due to internal political factors. The incongruence between the ‘technological frames’ of the Research Team and the MD were analysed in terms of four domains (type of partnership, nature of technology, technology structure and technology in use). The IT system that was implemented met the requirements of order processing and accounting, but did not support manufacturing, which retained manual systems. This bias reflected the dominant ‘frame’ of the MD who took personal responsibility for these functions as well as marketing. It also explains the inconsistencies between the marketing and manufacturing strategies, which undermined the viability of the factory expansion. The profitable production of low margin, high volume products required costs to be minimised. However, the make-to-order manufacturing strategy, increased costs and exposed customers to the cumulative lead-time. The lack of IT support for manufacturing led to suboptimum capacity utilisation, poor delivery performance and made partial shipments common.

This case study describes the issues that the Research Team faced trying to create the necessary legitimacy to suggest an alternative to the established configuration of technological, organisational and human resources. The framework shows that the formation and implementation of IT should result from a process of ‘mutual adaptation’ [32]. However, the study confirms that where incongruent ‘technological frames’ exist, ‘configurational intrapreneurs’ will experience considerable difficulties and conflict developing and implementing an IT system. In these circumstances, the type of system that is implemented is likely to be determined by the dominant ‘frame’. This is because technologies are social artefacts that embody the objectives, values and interests of the designer and the purchaser. In the case of management, this includes decision-making authority, how processes should be organised, what the division of labour should be, and how much autonomy employees should have [33]. IT consultants should recognise that they are not just implementing a technology; they are engaging in political processes.

References


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