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Analysing the Impact of Enterprise Resource Planning Systems Roll-outs in Multi-National Companies

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Abstract: Large organisations, in particular multi-national corporations, have been at the forefront of the ERP movement since its origins. They have used these highly integrated systems as a way to achieve greater levels of standardisation of business processes across sites and greater centralisation of IT resources. The most common scenario for an ERP implementation in a large multi-national firm is the phased roll-out, whereby the modules of the application are implemented in all the sites in a series of waves. A standard implementation, as designed by Headquarters, is replicated in each site. This standard implementation uses a base configuration, sometimes referred to as a template or blueprint, which cannot be deviated from in any of the sites. These monolithic implementations can be quite traumatic for individual sites where local practices, sometimes quite well established and rich in organizational learning, must be abandoned. This may lead to large scale organisational problems, which must be ironed out if the full potential of the enterprise-wide system is to be obtained.

In an attempt to tease out the issues in the global implementation of ERP systems, we carried out a number of case studies at Irish manufacturing sites of multinational firms where management sought ways to defend their hard won local reputation for excellence and efficiency in the face of changes to the organisation due to a corporate ERP implementation. Our study indicates that local managers are given too little scope and time to adequately adapt the template to their site and that the risk of productivity loss is quite high, at least in the short term. We conclude that mechanisms must be put in place to better understand how to accommodate local specificities whilst enforcing the required level of standardisation.

Keywords: ERP, Multi-national firms, IT strategy, Roll-out, IS implementation.

1. Introduction

There are two schools of thought concerning the origins of ERP software (Adam and Sammon, 2004). One route to ERP came from engineering and the desire to control inventory, the other from finance and the desire to control expenditure. Closer attention to excess inventory and efficient use of raw materials led to the Material Requirements Planning (MRP) approach to planning, promoted strongly by the American Production and Inventory Control Society (APICS) during the 70's. Orlicky (1975) has described how managers and researchers came to realise that a computer enabled the detailed application of the MRP technique by actors on the factory floor. MRP software was developed as a computerised approach for the planning of materials acquisition and production. As the use of these applications became more widespread, the software was extended allow the planning module to be updated with feedback from the execution cycle (closed loop MRP). So closed loop MRP, together with some financial modules, developed into an integrated approach to the management of manufacturing resources, termed Manufacturing Resource Planning (MRP II).

In parallel, companies had been looking at methods to standardise and consolidate

financial information to produce monthly operating statements and balance sheets. The reason that Finance is considered as the "first point of entry" for information systems is that this function is already standardised in terms of its data collection and analysis methods (Muller, 1992).

Indeed, Besson (1999) discusses how ERP implementations affect the value system in an organisation such that industrial experience, such as product knowledge, manufacturing know-how etc. is usurped by the obsession with low-level operational cost data required by "Finance's Trojan Horse".

2. ERP systems defined

From a technical point of view, ERP systems are based on a client / server architecture providing support to integrated business processes across organisational functions. Stefanou (2000) defines ERP software as a set of customisable and highly integrative real time business application software modules sharing a common database, which support core business, production and administrative functions, such as logistics, manufacturing, sales, distribution, finance and accounting. Another definition was proposed by Sammon and Adam (2000) who have said:

"ERP systems are integrated enterprise-wide software packages that use a modular structure to support a broad spectrum of key operational areas of the organization".

ERPs provide a transactional backbone to the organization that allows the capture of basic cost and revenue related movements of inventory. In so doing, ERP systems afford better access to management information concerning business activity, showing actual sales and cost of sales in a real-time fashion. Kalakota and Robinson (1999) stress that the popularity of ERP systems has stemmed from the fact that they appear to solve the challenges posed by portfolios of "disconnected, uncoordinated applications that have outlived their usefulness". Holland *et al.* (1999a) agree, stating that one of the major reasons for the shift towards ERP packages is the need to deal with legacy systems.

ERPs are designed for multi-site, multi-national companies, which require the ability to integrate business information, manage resources, accommodate diverse business practices and processes across the entire organization. Wood and Caldas (1999) found in their survey of 40 organisations having implemented ERP that the main reason to implement ERP was the need to *"integrate the organizations processes and information"*.

Davenport (1998) stated that large companies collect, generate and store vast quantities of data which is *"spread across dozens or even hundreds of separate computer systems, each housed in an individual function, business unit, region, factory or office"*. These localized legacy systems have a huge impact on business productivity due to the workload of re-keying, reformatting, updating, debugging, etc. When management is relying on information from incompatible systems to make decisions, instinct becomes more important than sound business rationale.

More generally, the growth in popularity of ERP systems can also be linked to an increasing business trend towards globalization, mergers and acquisitions. To be successful, a global company must be able to control and co-ordinate their various remote operating units. Accurate, real-time information provided by an ERP system has the ability to integrate the more remote subsidiaries into corporate practice because an ERP system allows the sharing of information in standard format across departments, currencies, languages and national borders. Thus, ERP

systems can be used to provide a "common language" between units (Bingi *et al.*, 1999; Horwitt, 1998).

Some of the benefits achieved by companies looking to harness the tight global co-ordination afforded by ERP systems are :

- Streamlining global financial and administrative processes
- Global lean production model
- Rapid shifting of sourcing, manufacturing, and distribution functions worldwide in response to changing patterns in supply and demand or to changing local cost bases
- Minimise excess manufacturing capacity
- Reduce component and finished goods inventory

Davenport (1998) describes how Owens Corning, for example, adopted ES to replace 211 legacy systems. For the company to grow internationally, it was critical to co-ordinate order-management, financial reporting, and supply chain processes across the world. Having implemented the system and established a new global procurement organisation, the company is now able to enter into larger more advantageous international contracts for supplies. Finished goods inventory can be tracked daily, both in company warehouses and in the distribution channel, and spare parts inventory has been reduced by 50%. The company expects to save \$65 million as a result of the adoption of these globally coordinated processes.

3. Difficulties in implementing ERP

In order to achieve the integration of all the basic units of the business transaction, ERP systems rely on large central relational databases. This architecture represents a return to the centralised control model of the 60's and 70's, where access to computing resources and data was very much controlled by centralised IT departments. Therefore, ERP implementations are an inherent part of a general phenomenon of centralisation of control of large businesses back to a central corporate focal point.

The resulting standardisation in business processes allows companies to treat demand and supply from a global perspective, consolidate corporate information resources under one roof, shorten execution time, lower costs in supply chains, reduce stock levels, improve on-time delivery and improve visibility

of product assortment with respect to customer demand.

The technical risk associated with the ERP implementation is lower than that experienced in the development of bespoke systems (Holland *et al.*, 1999b; Martin, 1998), but critical business-related difficulties remain (Davenport, 1998). The main implementation risks associated with ERP projects are related to change management and the business reengineering that results from switching to the ERP software's underlying business model (Holland *et al.*, 1999b). Unsurprisingly, the main benefits of ERP implementation are derived from solving these business problems.

Thus, although sometimes seen as large information systems projects, ERP projects are in fact change management projects where basic business practice will change to align with the "best practice" as defined in the ERP business processes. Staehr, Shanks & Seddon (2004) highlight the danger of not critically examining existing business processes, quoting a logistics manager involved in a SAP implementation as saying *"if the process was wrong, all that SAP enabled us to do is do the wrong things quicker"*.

On the other hand, adapting business processes to a global template does not necessarily yield the same benefits across the local subsidiaries of a multinational. Butler (2004) quotes a case where the global visibility of demand as afforded by a single instance ERP system does not take into account fluctuations in local demand (eg. high levels of inventory maintained due to local agreement with customers). Hence some plants might not compare favourably with others serving different customer groupings.

ERP systems are also frequently vaunted by over-zealous vendors for contributing to competitive advantage, company performance and even shareholder value. Fundamentally however, ERP systems are simply the tools for recording and managing all costs and revenue items within the enterprise, be they associated with product, people or cash. With a structure in place to record this level of detail for an enterprise, ERP systems when implemented are notoriously weak in providing reporting adapted to the needs of the business managers. This is frequently due to the fact that the huge effort required in implementing the basic functionality left little room to look at the post go-live reporting requirements. Also, although the core system contains all the

transactional information required to manage the business activity, managers can't run reports off the live system as they impact on core system performance and therefore slow down response times for other users. Secondly, information hungry ERP systems require more data than non-integrated legacy applications, therefore extra resource is required to manage data (a process engineer complained that there was no IS support available 18 months after go-live because they were occupied with data maintenance tasks).

So business managers, having implemented an ERP system to help understand the company's cost base, margins and profitability, are still short on reports and information that will help them to measure and interpret company value. In short, they have the tools in place to manage the data generated by the different tasks and processes that make up organisational activity. This is a pre-requisite for being able to answer the question "are we doing things efficiently". What ERP systems cannot answer, however, is "are we doing things effectively". One of the fundamental questions in this research is whether changing the organisation to incorporate "best practice" as epitomised in ERP processes does actually impact the effectiveness or value of the business.

Thus, for many organisations, the real challenge of ERP implementations is not the introduction of new systems, but the fact that they imply "instilling discipline into undisciplined organisations" (Ross, 1998). In that study, one of the firm's Vice Presidents is quoted as saying:

It is very hard for people to change from things they know well and are good at. We find that people who were most effective in the old environment were those who knew how to "beat the system". With SAP beating the system is not good; what's good now is discipline. These people have a lot of unlearning to do and it's painful.

Because they are modular, ERP systems allow some degree of customization (ie. selection of modules best suited to the business's activities). However the system's complexity makes major modifications impracticable. The very integration afforded by the interdependencies of data within the different modules of the system mean that changes in configuration can have huge knock-on effects

throughout the system. Vendors would insist that the more customized an enterprise system becomes, apart from the time and cost impact to the project, the less able it will be to communicate seamlessly with the systems of suppliers and customers.

A configuration table enables a company to tailor a particular aspect of the system to the way it chooses to do business. An organization can select, for example, the functional currency for a particular operating unit or whether it wants to recognize product revenue by geographic unit, product line or distribution channel. SAP's R/3, for example, has more than 3,000 configuration tables. The set-up of the Accounts Receivable module of Oracle involves over 50 configuration screens. This complexity often results in extravagant costs in making any modification to the software, however minor the change may seem.

4. Impacts of ERP on the organisation

Much of today's research in the area of organisational learning and knowledge management deals with the difficulties of creating and harnessing the value inherent in employees know-how and ways of doing business. This begs the question as to why so many companies are willing to throw out what they have learned in favour of practices they know nothing about. And, when they do so, what evidence is there to suggest that companies do achieve their stated aims of improved efficiency by adopting these industry best practices? Indeed, no organisation plans to "brutalise" its personnel by implementing a Big Brother style control systems that don't let a single expenditure go unnoticed. However, it is clear that there is little to prepare employees for the changes in the organisation of their day to day work and sources of support.

Davenport (1998) showed the paradoxical impact of ERP on companies' organisation and culture. On the one hand, by providing universal, real-time access to operating and financial data, ERPs allow companies to streamline their management structures, creating flatter, more flexible, and more democratic organisations. On the other hand they also involve the centralisation of control over information and the standardisation of processes, which are qualities more consistent with hierarchical, command and control organisations with uniform cultures.

From a business perspective, information that was tracked manually or not at all will now have to be recorded religiously in the system in order for automatic triggers to process transactions and move on to the next stage in the process. A de-humanising element is present where information demands now come from the system rather than a colleague. The give and take of corporate relationships is replaced by the all ungrateful and information hungry system.

Davenport (1998) asks, for a multinational, how much uniformity should exist in the way it does business in different regions or countries? For most companies, differences in regional markets remain so profound that strict process uniformity may actually be counterproductive. Companies must remain flexible and allow regional units to tailor their operations to local customer requirements and regulatory structures. Davenport recommends a type of federalist systems where different versions of the same system are rolled out to each regional unit, e.g. Monsanto, Hewlett-Packard and Nescafe have found this approach successful. This raises its own problems for the company, i.e. deciding on what aspects of the system need to be uniform and what aspects can be allowed to vary (Horwitt 1998).

In Europe, ERP projects are more complex than in North America, because of diverse national cultures, which influence organisational culture and make successful implementations of multinational ERP solutions difficult. Thus, failure to adapt packages to fit the national culture leads to projects, which are expensive and late (Krumbholz 2001). Also, users can no longer hide behind their mistakes (Staehr, Shanks, Seddon, 2004), forcing new visibility and accountability.

Thus, multi-nationals face a choice between using their ERP as a standardisation tool or preserving (rather tolerating) some degree of local independence in software terms (Davenport, 1998). Most local subsidiaries do not have a say in the decision to implement ERP, so it is usual that the global solution lacks some capability to deal with the local requirements. This notion of global vs. local requirements is a recurring theme in the research. Our study seeks to understand the essential trade-off of centralised control against local autonomy, and what this means for the competitive advantage of the local organisation.

Ward & Griffiths (1996) look at the models that have been used to present these conflicting forces of control and flexibility (in the context of IS planning), and within which organisations must attempt to steer the best path. They discuss various approaches to IT planning, including the Infusion / Diffusion model proposed by Sullivan (1985). Using this model,

which was intended to demonstrate the different approaches to IT planning, we can depict the evolution of the use of information systems in the organisation. In particular, ERP systems may be depicted as a function of the drive to integrate ever greater business functionality and the drive to control the means of delivery of this functionality.

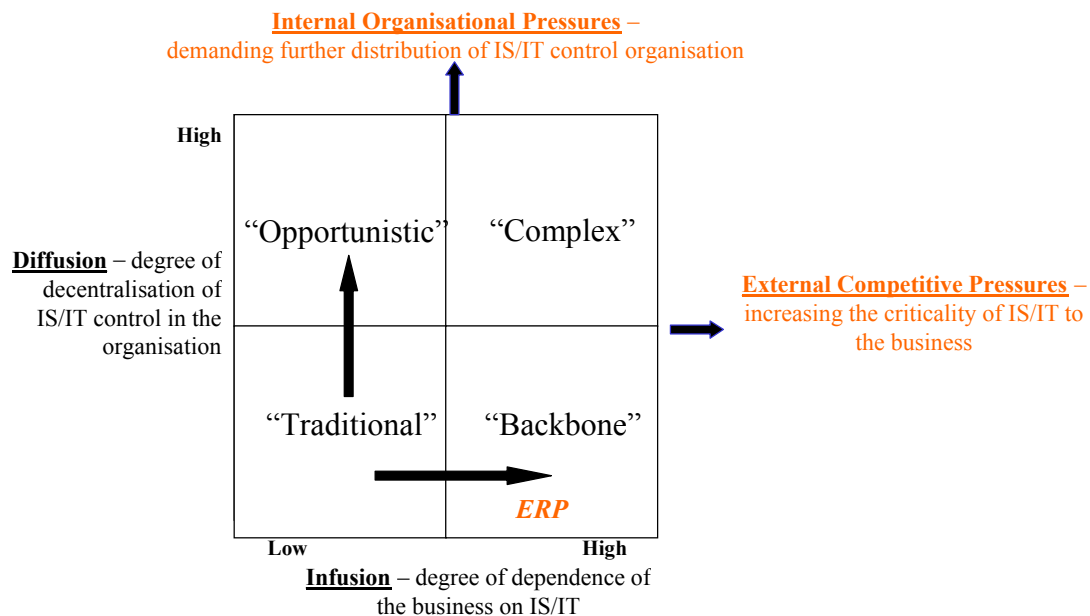


Figure 1: Environments of IS / IT planning (Sullivan, 1985) in Ward & Griffiths (1996)

Firstly, *infusion* is the degree to which an organisation becomes dependent on IS/IT to carry out its core operations and manage the business. *Diffusion*, on the other hand, is defined as the degree to which IT has become dispersed throughout the organisation and decisions concerning its use are decentralised. These axes reflect the “opposing” forces of automation in industry :

1. creating advantage from tools by working with them close to the point of application (possibly inventing new and unforeseen uses of tools depending on immediate business need) : this emphasises the notion of *effectiveness*
2. keeping control of resources and skills so that the benefits of automation can be shared throughout the organisation : this emphasises the notion of *efficiency*

ERP is considered *low diffusion* because it is by nature a centralising force in the organisation, often chosen to consolidate disparate legacy systems and standardise across variations in business practice. It is *high infusion* because it has the effect of spreading the threads of integration across the business functions.

The model is useful as it allows us to portray the balance between the 2 elements of any business process automation, the organisation (real) and the information (virtual). Humphries & Jimenez (2003) adds to this a third dimension, which is how real-time the information needs to be, arguing that the requirement to operate the virtual enterprise at, or near, real-time will continue to grow.

5. Research design

The objective of this research is to examine the positive and negative effects of ERP implementations on multi-national subsidiaries, and how organisations can plan to protect local competitive advantage from the “steam-rolling” effect of adopting standard business processes.

The first question concerns gaining an understanding of how multi-national subsidiaries see themselves in the corporate context, and how they formulate and defend their own unique competitive advantages in the global organisation. The second question concerns the impact that ERP implementations have on this unique competitive advantage.

The third question looks at the impact of ERP implementations on the local organisation. ERP systems change the tools people use to do their jobs, their responsibilities and the relationships with colleagues. This study seeks to demonstrate the longer term effect of implementing ERP on the company.

Following the concept of "purposeful selection" as described by Patton (1990), we selected a number of "information rich" cases for in-depth study. Our sample was based on satisfaction of a certain number of criteria, including: access, size, organisation of IT, nature of activity, multi-national, stage in ERP implementation process and penetration of ERP modules. Thus the organisations we studied are multi-national companies in manufacturing sectors. As it turned out, all have implemented or are in the process of implementing SAP. As subsidiaries of major multi-nationals they have local IS departments who are responsible for the maintenance, delivery and support of non-ERP applications and interfaces. They also have overall responsibility for local infrastructure and desktop issues.

Shang and Seddon (2000) argue that it is not meaningful to talk of benefits of IT systems without identifying the stakeholder group in whose interest the benefits are being judged. In this study we focused on the end-user in a local subsidiary, be they at the transaction level (operational) or at the reporting level (management).

The resulting research questions can be summarised as follows:

•How do multinational subsidiaries identify and cultivate unique competitive advantage (value) in a global organisation?

•What impact (negative or positive) has the implementation of a global single instance enterprise solution on the value of the local subsidiary?

•How has the implementation and day to day running of an ERP system changed the local company's organisation, its way of working and the relationships (both local and with other parts of the global organisation)?

Our research was based on 4 case studies carried out in manufacturing companies at different stages in their ERP implementation lifecycles :

- a leading pharmaceutical company engaged in primary manufacturing (active ingredients manufactured and shipped to "secondary" tabletting customers), at the pre-implementation stage with a global SAP project
- an international subsidiary of a leading high-tech manufacturer of computer equipment (one of 3 manufacturing plants worldwide, with responsibility for financial services for all countries outside the US), 2 years after go-live on a global Oracle system
- a manufacturing subsidiary of a leading pharmaceutical company, still in the process of adding functionality to a mature SAP implementation
- the Irish site of a US based supplier of electronic devices

6. Findings

6.1 Longitudinal case study

In the first of the case studies quoted above, an interpretive / longitudinal case study approach was taken. Information was gathered via questionnaires and face-to-face interviews with the project team. The first questionnaire (concerning the objectives, benefits and project team organisation) was distributed to all team members during April 2003. Because our access to this site was excellent, in this case study, we were able to ask key Project personnel some questions on the expected level of impact on the business. The results are presented in Table 1.

Taking the same basic format, but using some of the information gathered during the first survey, the second questionnaire was distributed to team leaders during May 2003. Questions centred on the key outstanding issues as the design was being locked down. Known or proposed workarounds for these outstanding issues were discussed. Areas where SAP functionality would improve the business process were also highlighted. This stage also involved interviews with the local Information Systems team.

The researchers also attended Gap analysis workshops facilitated by the global roll-out team, where the team formally presented perceived gaps and impacts to the business. Workshops for Planning, Production and IS were attended.

Table 1: Impact Matrix for ERP project in the first of our sites

	LEVEL OF IMPACT						
Core Competency/Area of Excellence	HIGH		MEDIUM		LOW		
	P	N	P	N	P	N	
Customer Responsiveness	3		4	3			Medium to high positive/medium negative
Innovation, New Product Introduction (NPI)			3	2	3	3	Medium to low positive/low negative
'CAN DO' Attitude	1	2	1	1	3	2	Low positive/high to low negative
R&D	1	1	2	1	4	2	Low to medium positive/low negative
Implementation of New Processes/Technologies			4	1	2	3	Medium positive/low negative
Manufacturing Knowledge and Ability	2		4		4	1	Low to medium positive
Project Delivery Track Record/Proven Performance	1		4	2	3	2	Medium to low positive
Highly Efficient and Flexible Operation/Quality		1	5	2	1	2	Medium positive/medium to low negative
Other (please specify)							
Inspection Readiness	1						High positive
Quality	2						High positive

In addition to these questionnaires, one-to-one interviews were carried out with business process leads during the design phases of the project from May through to July. These interviews were aimed at gaining an understanding of outstanding issues in each of the process areas.

A key observation on the results in Table 1 is the spread across positive / negative attitudes, one could have expected more consensus. There may be good reasons for this divergence. Different processes are subject to different levels of change in a large integration project of this sort.

In this ERP project, there was a subtle change in the team's motivation (which coincided with the first chance to get some hands-on experience with the application modules), moving from an attitude of this being a "necessary evil" to one where team members begin to feel "this isn't so bad, in fact there's some good functionality here". It is vital for the team to make this transition, the risk being that if they don't, users out in the organisation, with much less exposure to the new functionality than the global roll-out team, will not make it either. As "ambassadors" for the new system, their own commitment will directly influence that of the business in general.

6.2 Post-implementation study

The other three case studies, both post-implementation, were interview based. Key personnel in the manufacturing, finance and information systems functions were interviewed to solicit feedback on the impacts of the move to a global single instance ERP system. Face to face interviews and questionnaires were used.

Based on our observations, subsidiaries of multi-national companies that are implementing a global ERP solution frequently

find themselves in a position where the changes are imposed rather than designed. There are specific changes to the local business functions (steep learning curve on new business processes, more dependent on corporate resources, less authority to introduce local process changes, loss of ownership of data). There are equally quite dramatic changes to the role of the local information systems support function, who have usually lost control of the hardware and software resources used in satisfying user demand. Furthermore, they have often seen their responsibilities dramatically narrowed down to data maintenance and desktop support duties.

The following sections contain a catalogue of the problems we have observed at the sites we visited.

6.2.1 Problems with data entry into the ERP package

One of the first changes to the organisation imposed by integrated ERP systems is that they push the responsibility for data correctness and completeness back to the point of entry. A sales rep taking an order on behalf of a customer is driven by the desire to see the order processed as quickly as possible so that the revenue can be recognised and commission payments made. This can represent a significant cultural change in organisations where the sales function is used to much more freedom in the manner in which orders are recorded, often with a sales administration function doing the clean-up of the order behind the scenes.

The net effect can be a sudden increase in data entry for the sales function. A multi-national high-tech manufacturer admitted from the start of their implementation project that they were going to suffer a 10% increase in workload in the Sales Admin function. Given the goal of making processes more efficient, it

may be difficult to convince sales of the benefit to them of providing more accurate information at the outset, which ostensibly only benefits others further along the revenue cycle.

In the high-tech manufacturing site we visited, one of the driving forces in implementing an ERP solution was the ability to execute customer orders as the business grew (scalability). However, use of the new sales order functionality implied a heavier workload on Order Entry (more screens, each with more fields) than previously on legacy systems. Therefore a change to the organisation would be required before any net benefit could be derived.

In the Pharmaceutical subsidiary, extra data entry staff are required to input Purchase Orders (created in SAP) into the Fixed Assets module of SAP. The presumed goal of integration was not achieved in this case and this does not seem to have been anticipated until it was time to go live.

6.2.2 *Loss of Productivity*

The biggest single concern of management at another pharmaceutical manufacturing site we visited was how to maintain its hard won reputation for excellence and efficiency (eg. number of shop-floor technicians employed per compound manufactured) in the face of expected changes to the organisation due to a corporate ERP implementation. This organization rates its customer responsiveness as its top core competence, proud of its ability to deliver 98% of customer orders within pre-set lead times. It achieves this today in some cases by being able to "express" deliver unplanned orders from customers, even to the extent of turning around an order within one working day. Managers' concerns arise from the news of a sister site in the previous stage of the global roll out, which went live at the beginning of 2003 and is still (9 months later) struggling to recover from the drastic reduction in its on-time customer delivery rate from 92% to 64%.

In the procurement cycle, pushing the responsibility for correctness of data and approval back to its source (any creating or approving a purchase) also has significant organisational impact, and one that no amount of training can prepare the company for. In another company we visited, managers baulked when the head of international finance, responsible for several billion dollars worth of revenue, was inundated with hundreds of purchase requisitions after go-live.

The team in charge of the purchase approval hierarchy, which had spent months trying to get the users to co-operate in configuring approval levels, suddenly got a lot of close co-operation when it was too late to make substantial changes without reworks to the software configuration.

6.2.3 *Aiming ERP at a moving target*

A high-tech company implementing a single instance global Oracle system found that the business needs (or core value) of fast execution changed during the 24 months it took to implement. Initially chosen because of its "scalability", that is its ability to grow and expand with the rapidly growing demand for products, the ERP solution was replacing creaking legacy systems which were barely able to cope with each new quarter end. By the time the system was going live, the demand for products had dropped dramatically, and the business value was no longer geared towards execution of orders, rather it was getting the orders in the first place. Thus, ERP projects can also fail because they try to match the stable and monolithic functionality of the ERP package to the moving target of the challenges facing the organisation.

6.2.4 *Changes to routinised processes towards less flexibility*

The discipline imposed by the system can again introduce strain in processes where there may have been greater flexibility in the past. Staff shipping product are not responsible for the accuracy of the configurations in finished goods compared to the sales orders to be fulfilled, but they will feel the pressure most acutely if the system is preventing them from shipping product with what they would feel to be marginal differences with the sales order.

Even the simple fact of working off a single global customer database can create problems for subsidiaries with different local practices. Global customers may have complex legal structures with different legal entities in different countries, albeit rolling up under the one parent company from a financial perspective. What is an acceptable bill-to address for a customer in the US may not be acceptable in Japan. One manufacturing company found 40 occurrences of the same customer name in their legacy systems. While this was acceptable as long as each country knew from experience which customer number corresponded to the active one, this is not transferable to a global system, which will

change all customer codes and refuse duplicates. Certainly an ERP system will impose discipline in terms of working with global data sources, but this discipline is often perceived as a loss of flexibility and lack of adaptability.

Many ERP systems require that all inventory movements on the floor be associated with work orders, such that inventory gets consumed as the work progresses. In the high tech manufacturing company we visited, the in-house production model didn't match this concept for 2 main reasons:

- The starts plan for products are not work orders in that they do not yet relate to a specific sales order. Instead they are a best guess for finished goods requirements at quarter end. This is a build to stock scenario.
- Components that are "consumed" at the beginning of testing may well be returned to inventory when a product is "de-configured" for allocation to a specific sales order

For this reason, a workaround involving the definition of Standard Starts Configurations (as work orders) was created. These standard configurations allowed inventory to be consumed / returned, but do not form the basis of a match with a sales order.

6.2.5 Customisation

The multinational high-tech company we visited was quoted a \$1m modification budget for a customization to the system to allow lines to be shipped from a sales order independently of each other. In some cases, these small, but prohibitively expensive changes matter a lot for the proper operation of the firm. A pharmaceutical site we visited found that the automatic determination of batches from the warehouse to satisfy process orders precludes them from making any changes to batch weights as the process orders progress through manufacturing, a simple facility of their legacy system that they had been using routinely for years.

Most ERP systems operate user representation groups (eg. Oracle Application User Group, Sapphire group for SAP users) so that required modifications and enhancements can be channeled back into the application in new releases and "patches". These enhancements are released on an irregular basis, and are subject to the vendors view of the "marketability" of the updates. This means that a company with an unusual process

requirement may not be able to generate any interest in their customization because few other users have the same requirement.

The same is doubly true for a local subsidiary of a multi-national relying on centralised IS support for systems modifications. An Italian subsidiary of a high-tech multi-national, for example, had to wait 18 months before the IS department would look at a VAT report (the report took a matter of days to develop, test and implement), simply because the requirement was not perceived as global.

So ERP customers can end-up caught in a quandary of :

- no choice in the selection of the software solution (based on global requirements)
- huge commitment to the ERP project in terms of power users, training and cutover (particularly in smaller subsidiaries where fewer users handle more tasks)
- implementation support which rarely takes into account local user constraints (eg. language)
- no capacity for customizing the software (only vanilla ERP functionality used)
- no support for local reporting requirements if they do not benefit the global organization
- no local support as the solution has been built, designed and is run by a centralized core team
- no support for interfacing from the ERP solution to local systems

The typical scenario in these instances is that the local user falls back to downloading information from the ERP system, and uses local applications to solve transactional or reporting needs (severely damaging the integrity of the entire solution).

In the Italian subsidiary of a high-tech manufacturer, the ability to produce invoices dated with the customer delivery date (instead of the product ship date) was taken away by the implementation of the ERP system, and no alternative proposed. Although from a corporate perspective the stated objective of implementing ERP to shorten the financial close period to 2 days has been achieved, for at least one subsidiary this has meant the loss of the ability to automatically invoice customers. The workaround has been to put a hold on the invoice generated by the system, make the date change modification to the system generated output, and then release it.

This example illustrates the situation where the further users are (physically or hierarchically) from the central solution, the less likely they are to derive benefit from the application. A Financial Director for the same company, referring to the fact that modification requests tend to be met with a barrage of bureaucracy, except if they came from the headquarters themselves, said "It's still a question of location, location, location".

7. Conclusion

The research study presented in this paper is on-going and we are only able to put forward preliminary findings at this stage. However, the observations we made in the four sites we visited lead us to believe that there is a great need for multi-national companies to be more cautious before they embark on multi-million, multi-year, multi-phase roll out implementation of enterprise-wide software packages.

The positive arguments of the vendors are well known and well understood. However, it is not certain whether the reality of ERP implementations that steam-rolled local knowledge and local practices has yielded such tangible business benefits in real terms. Affording the illusion of greater control over large corporations to managers at head quarters can come at a high price if it dissolves the fragile fabric of an organisation's competitive advantage in the process.

The typical scenario of the roll-out, whereby all sites are asked to implement the common template within a prescribed time frame, may be appealing to managers in head office, but it is actually a *nightmare* for local managers. Typically, long hours have gone into fine-tuning their local knowledge and building this experience into their way of doing business. Applying the template may mean steamrolling these unique processes and jeopardise efficiency gains accumulated over time.

An even more perverse effect of such implementation stems from the perception of many local managers in multinationals that they are not competing against other firms, either in the area or abroad, but against sister sites of their own firm who are engaged in the same activities. This perception is often well founded, in the case of one of the companies researched, where 20 or 30 manufacturing sites were reduced to less than 10 key sites worldwide over a period of a few years. In this game of local survival, it is the performance and productivity of each site that enables managers to make a case for their site's

unique contribution. The roll-out of ERP wreaks havoc in local organisations and may, at least in the medium term, change the balance of power between sites. From our point of view as researchers, it is difficult to see how this upheaval can be beneficial to either local sites or the global corporation.

As we complete our case studies, we will be able to make specific suggestions for the development of more reliable models for creating the global implementation template for large scale ERP projects. This can be used both to guide further research in enterprise-wide systems and to inform the practice of implementing such systems in multi-national firms.

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