Recursive Nature of the Market for Enterprise Applications

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INTRODUCTION

The paper explores the recursive elements of the market for enterprise systems by examining the evolution of the sales discourse from vendors of enterprise applications. Enterprise systems are continually sold and implemented, on the basis that greater integration of the modules supporting business functions is a good thing. In this paper we question this assumption, principally based on the redundancy of much of the information that is produced.

Following the development of computer applications from early Material Resources Planning (MRP) days through to today's latest offerings in the form of Enterprise Resource Planning II (ERP II), we try to understand the circumstances which have generated the requirement (needs discourse). In parallel, it is posited that the sales discourse is characterised by a continual extension and re-packaging of existing solutions, responding to the business users' evolving requirements with ever greater integration between the operational modules. This tendency to over-integrate exacerbates the problem of information overload that is experienced by managers trying to monitor the organisation's performance, efficiency and effectiveness.

MRP was once implemented to gain better visibility and control of inventory, because it was understood that this was the most costly element of the cost of goods sold. Reducing inventory levels is a well understood management goal in most manufacturing organisations. On the other hand, the abundance of information that has accompanied the gradual computerisation of business functions doesn't seem to elicit a similarly "economical" attitude towards information. Instead of encouraging information excess, we argue in favour of a "Just-in-Time" approach to information provision, where appropriate information is delivered where and when it is needed, rather than exhaustive information being available to all. Going as far back as the fundamental design issues of enterprise applications, we question whether business value can be gained from continually integrating business functions into a single data structure.

BACKGROUND

The focus of industry in the years following the Industrial Revolution was on providing as much output as possible, as opposed to controlling inventory (Mokyr, 2001). With this change came the increasing need for systems to support the increasingly complex nature of mass production facilities and activities (O'Gorman, 2004).

Research had shown, however, that the main problem of managers was not a lack of relevant information, rather an overabundance of irrelevant information (Ackoff, 1967). In that era, the constraining factor on the level of computerisation was cost. The gradual commoditisation of technology has meant that storage hardware is (relatively) cheap, therefore there is no culture of economy with its use (or abuse).

This "changing cost balance" has been attributed to the original growth in the uptake of computer applications to support MRP (Miller & Sprague, 1975). Although the MRP logic was already available and widely applied, the use of systems had been hitherto prohibitively expensive for most businesses. Computation costs were falling as inventory costs were rising. The rapid update capability of computers, coupled with the MRP logic and appropriate data, made it possible for managers to cope intelligently with the thousands of changes that inevitably occur between the planning and execution of primary tasks.

The natural propensity of computer manufacturers is to sell new systems that use lots of computer time (Miller & Sprague, 1975). The same increase in price performance ratio prompted the adoption Enterprise Resource Planning (ERP) systems in the 1990's, integrated systems capable of uniting and correlating the basic units of the business transaction (from sales order to finished goods, from demand forecast to master production schedule).

In order to achieve this integration, ERP systems rely on large central relational databases. The amount of storage and memory required to manipulate and operate these databases grew in tandem with the improvement in cost/performance of the hardware. Furthermore, software houses gradually moved away from the client/server

model to the "thin client", capable of running on any PC with a browser. For the first time it was feasible for an organisation to operate its entire transaction processing infrastructure from a remote centralised server, using the internet to deliver functionality to the desktop.

Sammon et al. (2003) describes these 2 components of ERP systems as the solution to "operational" integration problems and "informational" requirements of managers. These are the same concepts expressed by Zuboff (1988) in describing the use of technology not only to automate manual tasks, but also to "informate" management tasks, such that "events, objects and processes become visible, knowable and shareable in a new way".

ERP systems are therefore expected to deliver the following benefits: (1) reduce costs by improving efficiencies through computerization; and (2) enhance decision-making by providing accurate and timely enterprise-wide information (Poston and Grabski, 2001).

Whether these centralized information systems really are capable of delivering both types of benefit has been a topic of debate for some time. "The notion that a company can and ought to have an expert (or a group of experts) create for it a single, completely integrated super-system – an MIS – to help it govern every aspect of its activity is absurd", according to Dearden (1972).

The Trend Towards Greater Integration

In a traditional manufacturing organisation, materials accounted for 75-80% of the total cost of provision of the cost or service (O'Gorman, 2004). The attitude of planners in the 70's was therefore to develop methods that minimised inventory excess (in materials, WIP or finished goods).

Conversely, the focus of today's ERP vendors as they strive for ever greater integration has been to provide as much information as possible (analogous to a "build to stock" model in manufacturing terms) rather than trying to control it.

ERP systems, with their focus on the integration of processes and their dependence on the integrity of data at the point of entry, can be compared to virtual assembly lines, where each stage in the business process is optimised for the throughput of high volumes of transactions.

A major downside to this level of integration of business processes is that informational "stock-outs" can occur (one small piece of relatively unimportant information missing can block a business critical transaction). A classic example would be an exchange rate missing blocking an invoice from printing.

One of the benefits of employing what ERP vendors call "best practice" is that all transactions must fit in the same system model, regardless of the relative importance of the transactions. Thisignores the 80:20 rule as elaborated by Orlicky (1975), in what is probably the definitive book on MRP, according to Browne, Harhen & Shivnan (1996). If 20% of the components account for 80% of the cost, why apply the same rigour to recording transactional movements of inventory across 100% of components?

Sammon & Adam (2004) describe how businesses can succumb to the "ERP steamroller" of integration in the area of procurement. The integration of procurement into one single instance ERP system implies a rationalisation of local suppliers and purchasing patterns and the elimination of redundant suppliers. This can result in the organisation losing its ability to vary the source of supply. It can also have the effect of "steamrolling" local differences in the supply base, for example, locally sourced components not having exactly the same specification as counterparts in other countries. As with all elements of master data (suppliers, parts, customers etc.), integrated systems covering global operations are intolerant of local nuances in data structure.

One downside to the large scale integration of business processes as exemplified in ERP systems is the onus it puts on data capture: the more integrated the system, the more data is required at the point of entry in order that flags and triggers encountered during subsequent steps in the process are populated. Broadly speaking, ERP systems push the onus of data quality back to the point of entry, decentralising responsibility for data quality back to the rightful owners of that data.

The Cyclical Nature of the ERP Market

The table in Figure 1, adapted from the IT planning matrix developed by Sullivan (1985), depicts the different stages in the evolution of planning requirements and corresponding management approaches. This evolution is plotted against the 2 main forces of change in IT: dependence of the business on IT (Infusion), and the degree of decentralisation of IT planning and control (Diffusion).

In simple manufacturing processes with few dependencies, material acquisition could be based on a principle of Economic Order Quantity (EOQ), whereby re-ordering of stock items was triggered automatically based on a minimum stock level. MRP originated in the early 60's as a computerised approach for the planning of materials acquisition and production for more complex manufacturing processes where interdependencies between components existed. Orlicky (1975) realised that a computer enabled the detailed application of the technique, making it effective in managing manufacturing inventories.

Based around the Bill of Materials (BOM), early applications exploded a production plan for a top level parent item into a plan of production and purchasing for compo-