1999-09-01

The Systems Solution

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Introduction

Companies have long realised the need for company-wide approaches to organisation design and redesign. The development of systems engineering approaches to manufacturing system redesign in the 1970s and 1980s was followed by the focus on organisational re-engineering, often based on business processes, in the 1980s and 1990s. A common feature of all of these approaches is a recognition that "the whole is greater than the sum of the parts". In other words, optimising subsystems (whether those subsystems are functional departments, production sites or individual processes in the manufacturing cycle) can result in a sub-optimised total system. There are numerous examples of companies who have generated significant improvements in competitive advantage as a result of the application of this "total systems" thinking.

One critical weakness of these traditional company-wide business improvement models is that they focus largely on a company's internal operations and business processes. As a result of the increasingly complex global supply chains of which companies are part, improving ones own business is no guarantee of success in today's business environment. This article describes an extension of traditional systems approaches beyond the operations of an individual company to the complete supply chain. The result is the ***systems approach to supply chain re-engineering***.

What is supply chain re-engineering?

Supply chain re-engineering is about analysing the existing configuration of a supply chain, planning improvements to that configuration and then putting these improvements into practice. In short,

Re-engineering = analysis + planning + implementation.

It is important to recognise that when it comes to re-engineering there is no "magic" solution. In the past companies have often come to regard the latest managerial philosophy (whether it be total quality management, just-in-time, business process re-engineering or whatever) or the latest technological development (e.g. materials requirements planning or electronic data interchange) as some kind of "silver bullet" or panacea. Whilst these management philosophies and technologies all potentially have a role to play none of them in isolation can ever solve all of our problems. We should also beware of copying

solutions which are inappropriate for our businesses. This involves recognising that every company is unique (in terms of products, processes and, above all, people) and that, therefore, just because a particular solution worked in one organisation it does not automatically follow that it will necessarily work in another.

That's a lot of bad news. So, what's the good news? The good news is that there is a logical and systematic way of addressing the task of supply chain re-engineering. This logical and systematic approach is referred to as the ***systems approach***.

Why do we call it the *systems approach*?

We call it the systems approach for two reasons. Firstly, we want our supply chains to display the characteristics of a system. The Oxford English dictionary describes a *system* as, 'a set of *connected* things or parts; an *organised* group of things; *orderliness*'. The italics are those of the author because they highlight those aspects of the definition which provide some pointers to problems which exist in supply chains and, hence, to the type of change which might be required. In other words, we want the different elements of our supply chain to be *connected* and we want our supply chain to be properly *organised* and to be characterised by *orderliness*. Secondly, we should tackle the re-engineering task in a systematic manner with dedicated resources and with proper attention to detail.

Elements of the systems approach

The systems approach to analysing supply chains and improving their performance has been developed based on the experiences of a range of companies in a range of different business sectors. There are four distinct constituent elements of the systems approach. The ***principles*** summarise the underlying thinking and concepts. The ***methodology*** is the series of steps to be followed in analysing and improving a typical supply chain. The ***guidelines on good practice*** summarise the main relevant elements of world class operating practice. Finally, the ***tools and techniques*** support the implementation of the methodology.

Principles

The supply chain system could be regarded as shown in Figure 1. The interaction of the system with its environment is represented by the system inputs and outputs.

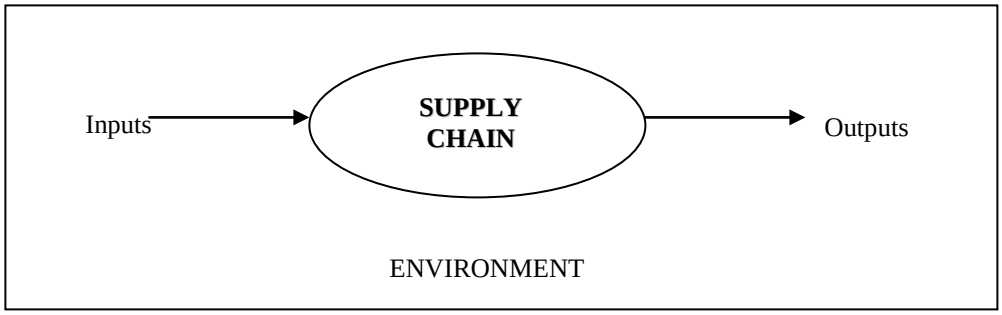

Figure 1 – The supply chain as a system

In practice, supply chain systems can be broken down into subsystems. This aids understanding of the operation of the system and facilitates systems analysis. Each of the subsystems should display the characteristics of a system; each subsystem will have inputs, outputs and a boundary. When considering a company's internal supply chain the subsystems can be regarded as the company's business processes (e.g. designing, buying, making, moving, selling). These business processes are multidisciplinary activities that cross traditional functional department boundaries. When considering a supply chain which comprises several companies the subsystems can be regarded as the individual companies or the business processes which cross company boundaries. Traditionally, efforts at improving supply chain or organisational effectiveness have focussed on making changes within the subsystems. This often resulted in optimal subsystems but sub-optimal total systems.

The systems approach to analysing supply chains and improving their performance is based on the need to consider the whole system rather than confining improvement efforts to particular subsystems. Developing the best solution requires the analysis, planning and implementation work to be carried out *systematically* (i.e. methodically, thoroughly and with proper attention to detail). This involves a far reaching investigation and radical reappraisal of the whole supply chain and often results in a complete redesign of supply chain organisation and operations.

Methodology

The systems approach to analysing supply chains and improving their performance involves the application of logical, structured methods rather than relying on making limited improvements in particular areas of the system. The methodology provides guidance on how to address this process in an organised manner, proceeding in logical stages to develop a solution. Figure 2 shows an outline of the methodology.

STAGE	STEP
INITIATION	- Set project scope, objectives and time plan - Create project team or task force
DATA COLLECTION	- Determine structure of supply chain and objectives of each element - Supply chain audit: detailed data collection concerning the companies and their competitors, markets, currently available resources and future resource requirements
ANALYSIS	- Preliminary analysis of supply chain - Identification of key supply chain business processes
PLANNING / DESIGN	- Realignment of organisation and operations in line with key business processes - Detailed design of organisational structures - Detailed design of operational procedures - Develop business plans
IMPLEMENTATION	- Development implementation plans - Implementation of change - Performance measurement - Continuous improvement

Figure 2 – Outline of systems approach methodology

There are a number of features of this methodology which are worth highlighting. The data collection, analysis and planning stages are carried out by a project team or task force. Such a team is multi-company (multidisciplinary in the case of internal company supply chains) and possesses the knowledge and skills necessary to carry out the tasks required. It should have the commitment of management and be dedicated to its task for the duration of the project. Once the overall structure of the supply chain has been determined and the strategic objectives of each element identified, the task force carries out a supply chain audit. This audit involves collection of detailed data concerning all aspects of the supply chain. The general classifications of data to be collected are: general company and competitor data; market and customer data; data concerning currently available supply chain resources; and, data concerning future resource requirements. The supply chain audit is one of the most important parts of the methodology and it results in a considerable volume of data. The next stage of the methodology involves analysing this data with a view to identifying the key supply chain business processes. The planning / design stage involves (top-down) realignment, and (bottom-up) detailed design of supply chain organisational structures and operational procedures. Business plans for each element in the realigned organisational structures are also required. Detailed implementation plans define how the required change will be put into place. An effective performance measurement system forms the basis of the continuous improvement process.

Guidelines on good practice

Every supply chain is unique. It has unique products, processes, people and a lot more besides. Hence, there is no universal solution which can be applied which will automatically result in a supply chain achieving its optimum competitive potential. The methodology helps to identify the most suitable solution for a particular supply chain but there are approaches which appear to exist in the majority of world-class companies. Figure 3 shows some of the major manufacturing improvement initiatives, all of which can be considered to be elements of world class operating practice.

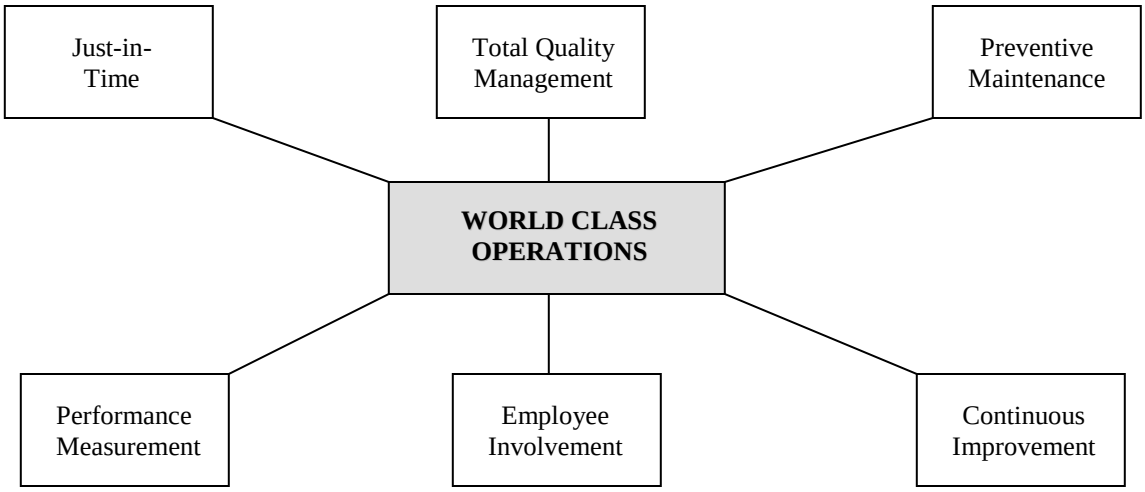

Figure 3 – Elements of world class operations

These approaches include employee involvement, total quality management, JIT, (total) preventive maintenance and a philosophy of continuous improvement. The key is not to blindly copy the approaches used by successful companies but to learn from their experiences.

Tools and techniques

A potential problem when analysing supply chain organisation and operations is that there are few (if any) established analytical tools which can be employed. The lack of such tools can result in practitioners failing to apply a methodical, scientific approach and instead relying purely on experience, intuition and iteration. However, there are many techniques in use in other fields which are relevant to supply chain analysis. Such approaches include financial analysis, strategic planning techniques (e.g. SWOT analysis, the Porter model), Pareto analysis, systems analysis techniques (e.g. input/output analysis, flowcharting), IDEF0 and process mapping. These techniques can be used to support various

stages of the methodology with many being particularly useful at the analysis stage.

In addition, computer-based tools, which assist in the application of the techniques, are also available. Many of these tools are useful in managing the data collected during the supply chain audit. Useful tools include spreadsheets, databases, visual interactive simulation and project planning software.

Conclusions

The systems approach to supply chain re-engineering provides a basis for achieving world class standards for supply chains operating in all types of industry. The approach involves considering the whole supply chain and avoiding a situation where subsystems are optimised but the whole supply chain is sub-optimal. To apply the approach requires a methodology, a recognition of what constitutes good working practice and the use of tools and techniques to perform the required analysis. The process of supply chain analysis and improvement is complex – it requires total management commitment and dedicated resources. With this commitment and the necessary resources, the use of the systems approach can result in significant improvements in supply chain performance.