Supply Chain Integrated Logistical Processes: Achieving the Key Logistical Process Linkages Required to Deliver Optimal Supply Chain Performance

Track Title: Global Supply Chain Management

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Abstract

As the globalisation of industries continues and as supply chains consolidate and start competing as entire chains rather than as individual entities, so will the requirement to manage the supply chain in an integrated end-to-end way, intensify.

In undertaking the application of Supply Chain Management concepts, companies are endeavouring to improve their business's performance. Specifically they are trying to improve their customer service offer and the delivery of that offer. They are trying to reduce costs and improve their working capital, asset utilisation and intra-supply-chain generated feed usage.

This paper describes the progress that BHP Steel has made in understanding the logistical processes that are used to manage its supply chains and importantly, to identify and understand all of the feed-forward and feed-back linkages that are necessary to enable that supply chain management to be most effective.

Ideas for further work are also presented.

Introduction

Particularly so for mature industries, the situation whereby businesses competed in an environment of excess demand, where they were primarily locally and internally focussed, were smaller in size, more reactive than proactive to consumer demands, where market share and margins were not that difficult to achieve, has substantially changed.

Today and into the future, expanded global competition is the norm rather than the exception, with an almost unprecedented number and variety of products and consumer choices (Mabert, Venkataramanan 1998). Customers' desire (demand) for high quality and quick service has added pressures that for some companies come as a culture shock.

Competition is more fierce in these changing markets, the introduction of products with short life cycles, heightened customer expectations (Simchi–Levi, Kaminsky, E. Simchi-Levi, 2000), cash and earnings demands are the new reality.

As companies realise that a cost centric focus is not going to be enough to ensure their survival, many are discovering that effective supply chain management is one crucial element to that survival. (D Simchi-Levi, Kaminsky, E Simchi-Levi).

In this emerging arduous competitive environment, businesses are tending to no longer compete as stand alone entities. As supply chains lengthen, or more accurately, supply networks broaden, and as the number of "players" within any supply chain decrease (through amalgamations, alliances, minimisation of suppliers), competitive survival depends on the end-to-end effectiveness of any given chain or indeed, across the network of multiple businesses and relationships (Lambert, Cooper, 2000).

Further, success stories such as National Semi-Conductor, Wal-Mart, Procter & Gamble illustrate that integration of the supply chain is possible and brings significant benefits to company performance and market share (D Simchi-Levi, Kaminsky, E Simchi-Levi).

Supply chain management offers the opportunity to at last capture the synergy of intra-and inter-company integration and management.

What is Supply Chain Management (SCM) and what is the Case for Adopting It?

The US-based "Global Supply Chain Forum" (as in Lambert, Cooper, 2000) defines supply chain management as:

> *…the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders.*

In a way, SCM is as much a philosophy as it is a business practice. Importantly, SCM moves beyond the integration of internal business processes. It reaches to the extended enterprise in

all facets of organisational relationships with a strong focus on the integration of inter-company business processes (Gardner, 2001).

SCM is therefore considered to be more about integrating and managing key business processes across the supply chain, from product design to final delivery, from customers to suppliers to service providers to strategic partners (Lambert, Cooper, 2000).

Refer to Figure 1

But what of the case for SCM? Companies undertake SCM as an initiative, in order to:

- Improve customer value delivery;
- Lift supply chain velocities;
- Lower costs and optimise earnings;
- And of course, an element not often mentioned is the social side of truly collaborative SCM, that is, the value and benefit obtained from the building of better relationships between supply chain partners.

What is Integrated Supply Chain Logistics and What is the Case for It?

In October 1998, the Council of Logistics Management (as in Lambert, Cooper, 2000) updated their definition of Logistics:

> *Logistics is that part of the supply chain process that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point-of-origin to the point-of-consumption in order to meet customers' requirements.*

Integration of these planning, scheduling, implementing and controlling activities is what creates an edge in visibility, earnings optimisation, inventory turn improvements, supply chain speed (realised manufacturing lead time), control and enhanced customer service (on-time and in-full).

Excepting very simple businesses, modern SCM requires implementing multiple solutions in the logistical areas of planning and optimisation, production, procurement and transport. Whilst some improvement can be obtained from better local solutions, the real opportunity comes from integrating the multiple supply chain processes to make the entire chain more visible, easier to co-ordinate and more responsive (AMR, 1999).

Supply Chain Management at BHP Steel

BHP Steel is a steel manufacturing company whose geographical area of focus is South and South East Asia, Australia and New Zealand regions.

BHP Steel has an extensive supply chain and ships approximately 7 million tonnes per year of steel products over its supply network. Management has set the company's logistics practitioners the challenge of coordinating the supply chain in order to make best use of BHP Steel produced feed, assurance of delivery service promises, control of inventories and flows and maximisation of earnings. In short, the goal is to optimise the supply chain with respect to the above mentioned criteria.

The supply chain configuration is shown at figures 2 and 3 below:

Refer Figure 2.

Along these flow paths travel the main intermediate products of Hot Rolled Coil, Cold Rolled Coil and Metallic Coated (Zinc/Aluminium) and Painted steel products. Figure 3 shows these main 'arteries' as thick dark lines:

Refer Figure 3.

Using a process of facilitated workshops, BHP Steel's logistics practitioners developed a set of 'as-is' and 'should-be' process maps for the main flow management process controlling or influencing the obtainment of management's imperative. This work resulted in the development of a high level model (shown at figure 4) that was used as both an education tool and template for the detail supporting it that needed to be described.

That description was attempted and resulted in the current 'should-be' process maps shown at figures 5, 6, 7 and 8.

These maps form the basis of the integrated set of processes that exist either manually or are supported by a number of key system implementations in order to achieve the level of flow management required. The overall task (ie every part of the supply chain) is not complete at the time of writing, however sufficient confidence exists from the parts of the supply chain that are complete, to know that this is a valid design. Further supply chain logistics development projects are underway at the time of writing, that will extend the influence of this integrated model.

One such project that serves to illustrate the last point is that of GSOP – Optimiser (Global Sales and Operations Plan – Optimiser). This project concerns the development of a LP solver based system that takes the inputs shown at Figure 5 and solves given all constraints to do with flows, routes, process capacity and process capability, to maximise $ contribution. This process can be used at both the Sales and Operations Planning level and the Master Production Schedule level.

Refer Figure 4.

Of particular note in figures 5, 6, 7, and 8, are the feed-forward and feedback linkages shown at each level of the logistics continuum. These links of course, provide the actualisation of true integration. It is via these linkages that the synchronisation and coordination of the supply chain is achieved in practice. Along each of the links is passed a packet of information that is used by both the level above and the level below. In practice the entire process is thus very iterative. The cycle times on the lower processes (time resolutions are shown in Figures 5, 6, 7 and 8) are such that the intra-and inter-level activities become seamless to one another and as such the level distinctions only have relevance from the point of explanation of what is happening.

The other characteristic worthy of note is that of product detail and time resolution. This 'granularity' starts off broad at the top levels and rapidly increases towards the lower levels. There are two reasons for this. The first is to do with the computational power required to run at detailed products over a large number of time periods. Hence the upper levels have coarser 'granularity'. The second is to do with the requirement to have access to more specific order information as the level of actual manufacture is approached. Operators must know specific order details if they are to impart the product characteristics required by the customer. Hence finer 'granularity' towards the lower levels of the logistics processes model.

Included in the activities of the logistics processes are a number of essential face-to-face meetings. For example, the logistics practitioners meet weekly for the S&OP and MPS levels and the Master Schedulers and Unit Schedulers meet daily. The data and information considered at these meeting is as described on the process map charts (Figures 5, 6, 7, 8).

Obviously, an enterprise's logistics process cannot operate in isolation. And so in Figure 5 is shown the feed-forward couple to the overall business / marketing strategy. The goals and policies used by the logistics 'world' are shaped by these strategic inputs.

Also important are the specific inputs and outputs for each of the levels and their intermediate iterative check-and-improve steps. These are also shown on each of the maps.

In addition to the process maps and projects of the technical process, it is considered equally if not more important to also map and improve the social processes (focal roles, communications, and relationships). These social processes are really the

enablers of the technical solution. For BHP Steel, this work is in its infancy, however there is a growing awareness that it must be done else the technical solution will not be sustained no matter how solid its correctness.

Refer Figure 5.

Refer Figure 6.

Refer Figure 7.

Refer Figure 8.

Learnings and Further Work

As stated above, this paper represents the current status of what is a lot of work-in-progress. However, it is considered important to record and share this work as the authors have found a dearth of specific information or detail on the integration of supply chain logistical processes. Many references are made to "integration" and supply chain logistical process linkages (Mabert, Venkataramanan 1998) and a number of authors have remarked on the importance of doing this (AMR, 1999), the detail is however scarce. Hopefully, this work is one step towards providing that clarification and understanding.

The learnings so far and further work suggested can be describes as follows:

(i) As SCM as a concept grows and moreover its application grows in practice, then the management of large supply chains will be a complex undertaking. Thorough understanding of the controlling logistics processes is therefore considered to be essential;
(ii) Information requirements and local policies and rules and product descriptions will of course vary form organisation to organisation. The underlying material flow theory however, has been found to be global;
(iii) The work required to bring about changes to the way a large supply chain is operated and coordinated, can be both very slow and very time consuming. Priorities, constancy of focus, adequate resourcing, felt need, commitment and a proven solution have been found to be crucial issues;
(iv) True integration is not 'rocket science' nor though, is it 'easy';
(v) In enterprises fueled by human effort, most activities fit a socio:technical model. Attention to the social side is equally (if not more) important as the technical side. This area represents a great opportunity for further research;
(vi) How to apply an effective integrated logistics framework or model, within an environment of difficult to change legacy systems, emerging e-commerce, B2B, B2C

techniques, is also considered to be an area for considerable further understanding and research;

(vii) How to achieve (vi) in a cleverly simple and least cost way, providing for future flexibility and agility, is also a very considerable task worthy of some very serious study.

References:

1 Lambert, Douglas M., Cooper, Martha C., 2000 "Issues in Supply Chain Management," *Industrial Marketing Management*, 29, p65-83, (2000).

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3 Gardner, Daniel L., 2001, "Logistics in the Supply Chain," *Traffic World*, vol 265, issue 3 (Jan 2001) p30-31.

4 Mabert, Vincent A., Venkataramanan, M.A., "Special Research Focus on Supply Chain Linkages: Challenges for Design and Management in the 21st Century," *Decision Sciences*, Vol 29, #3, (Summer, 1998), p537 – 552.

5 Simchi-Levi, David, Kaminsky, Philip, Simchi-Levi, Edith, "Designing and Managing the Supply Chain," *McGraw-Hill, Boston*, (2000) p1 –15.

6 "Maximum Supply Chain Performance Takes an Application Architecture*", The Report On Supply Chain Management,* AMR Research, Boston, (June, 1999), p3 to 20.

Figures follow…

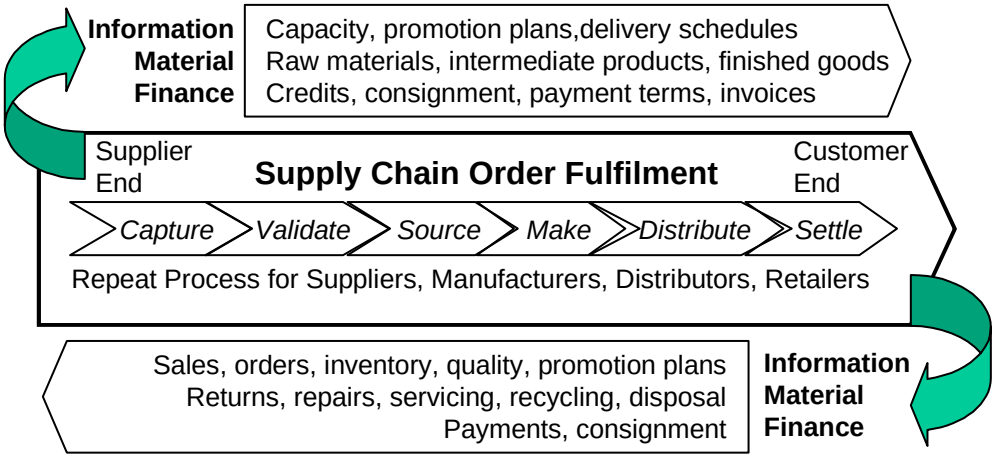
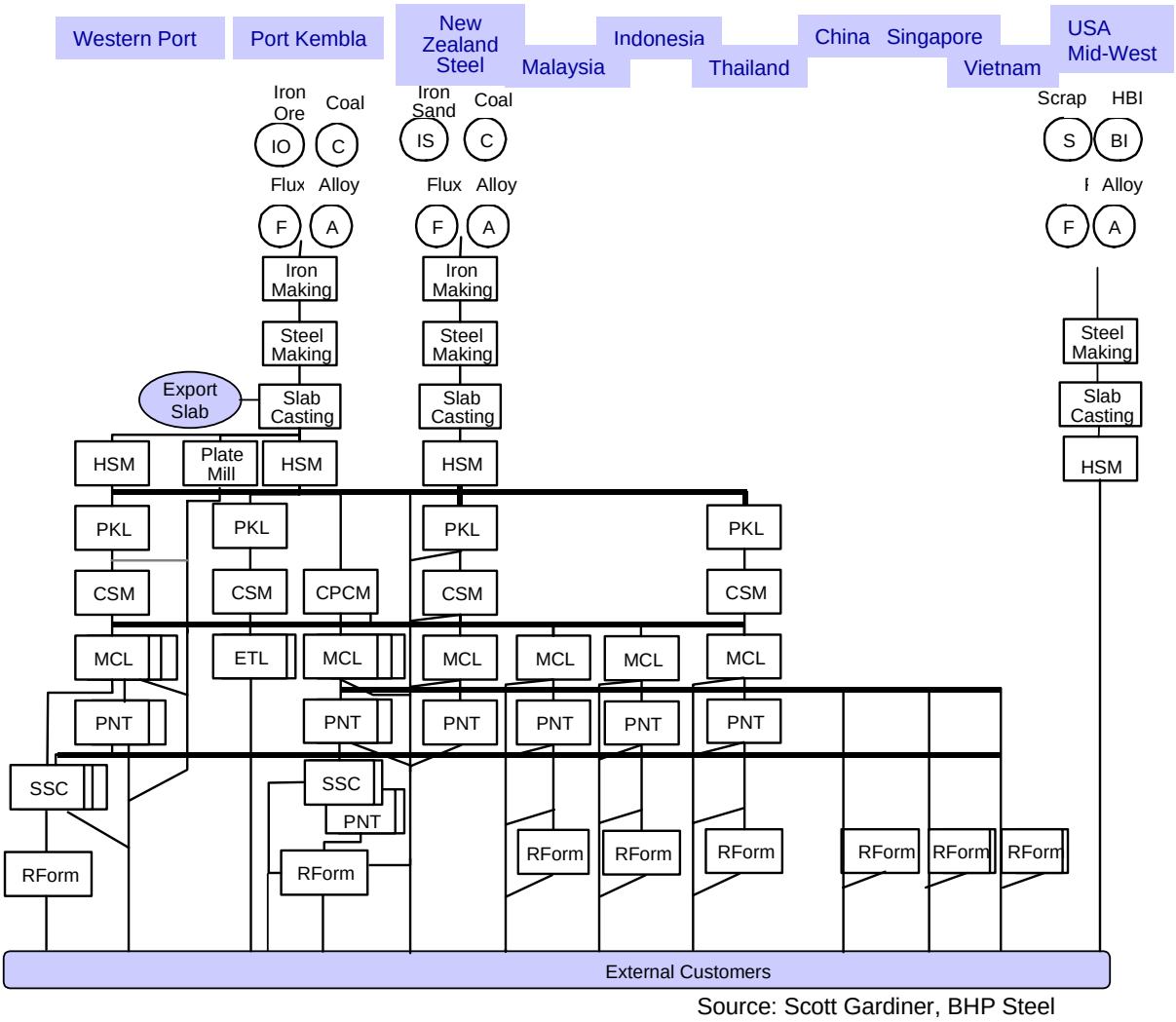


Figure 1: The Concept Of Supply Chain Management Applying to the Core Business Process of Order Fulfilment With Associated 'Flows' of Information, Materials and Financials Up and Down the Supply Chain (Adapted from Lee, 2000).

Figure 2: BHP Steel's Supply Chain Major Flow Paths (Source: P. Robertson, 2000)



Source: Scott Gardiner, BHP Steel

Figure 3: BHP Steel's Main Intermediate Product 'Arterial' Flows

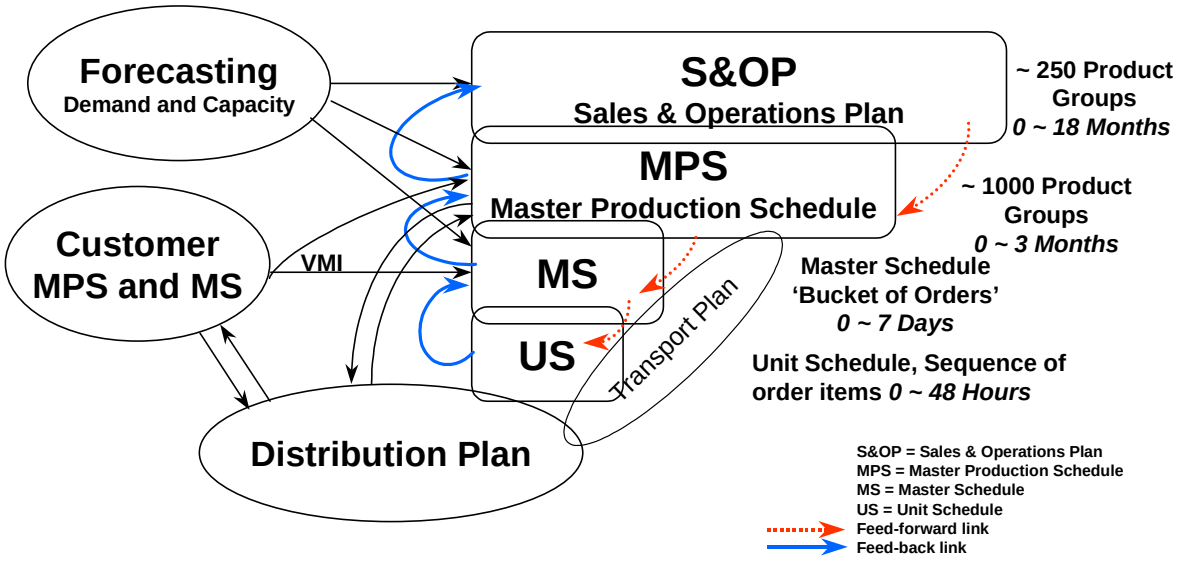


Figure 4: The Workshop Developed Concept Diagram of an Integrated Set of Supply Chain Logistics Processes. (BHP Internal Reports, 1998)

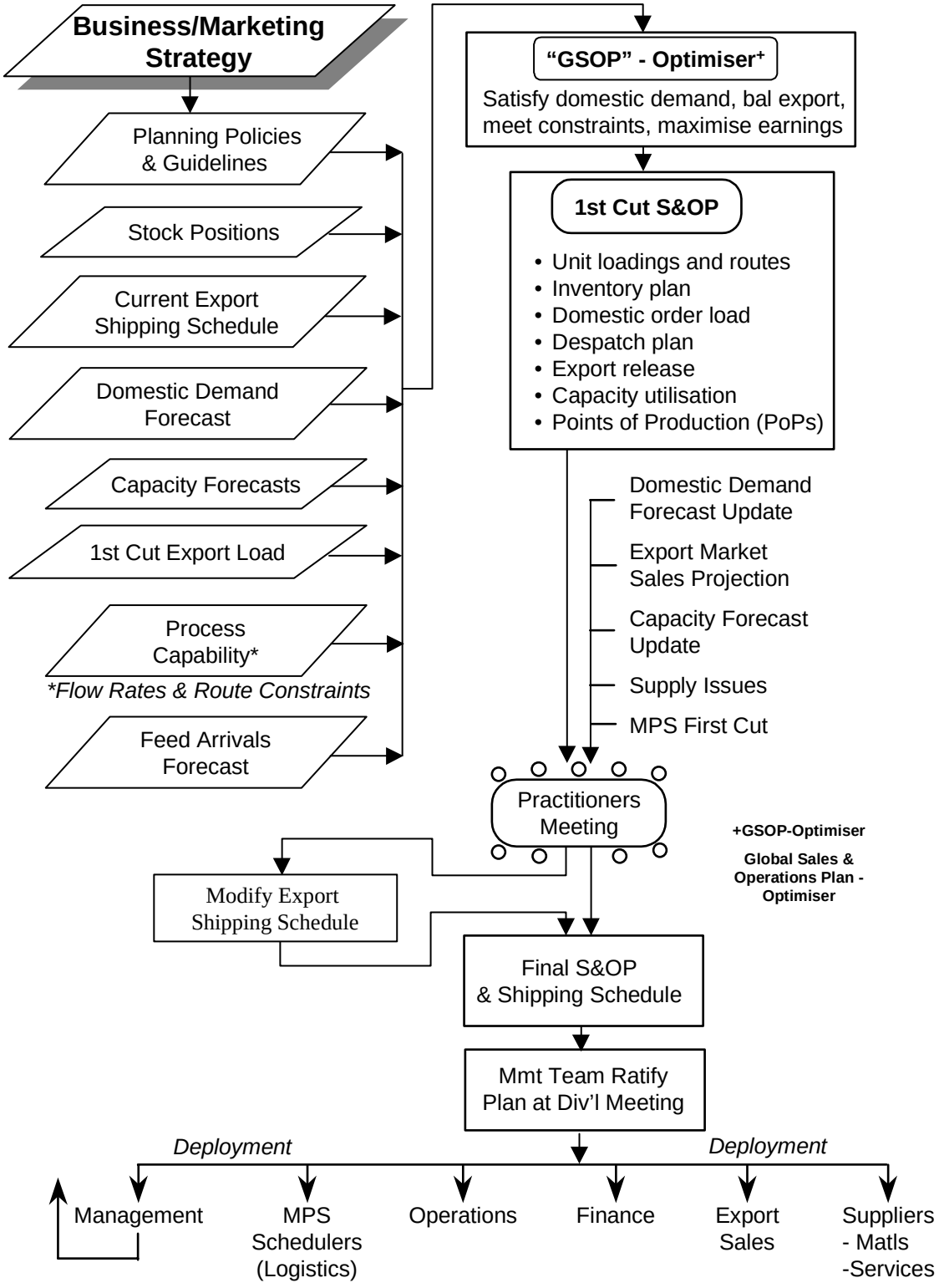


Figure 5: Aggregate Sales and Operations Plan (S&OP) Level. 250 Product Groups, 18 Month Forecast in Weekly Rests. (P. Robertson, 2001)

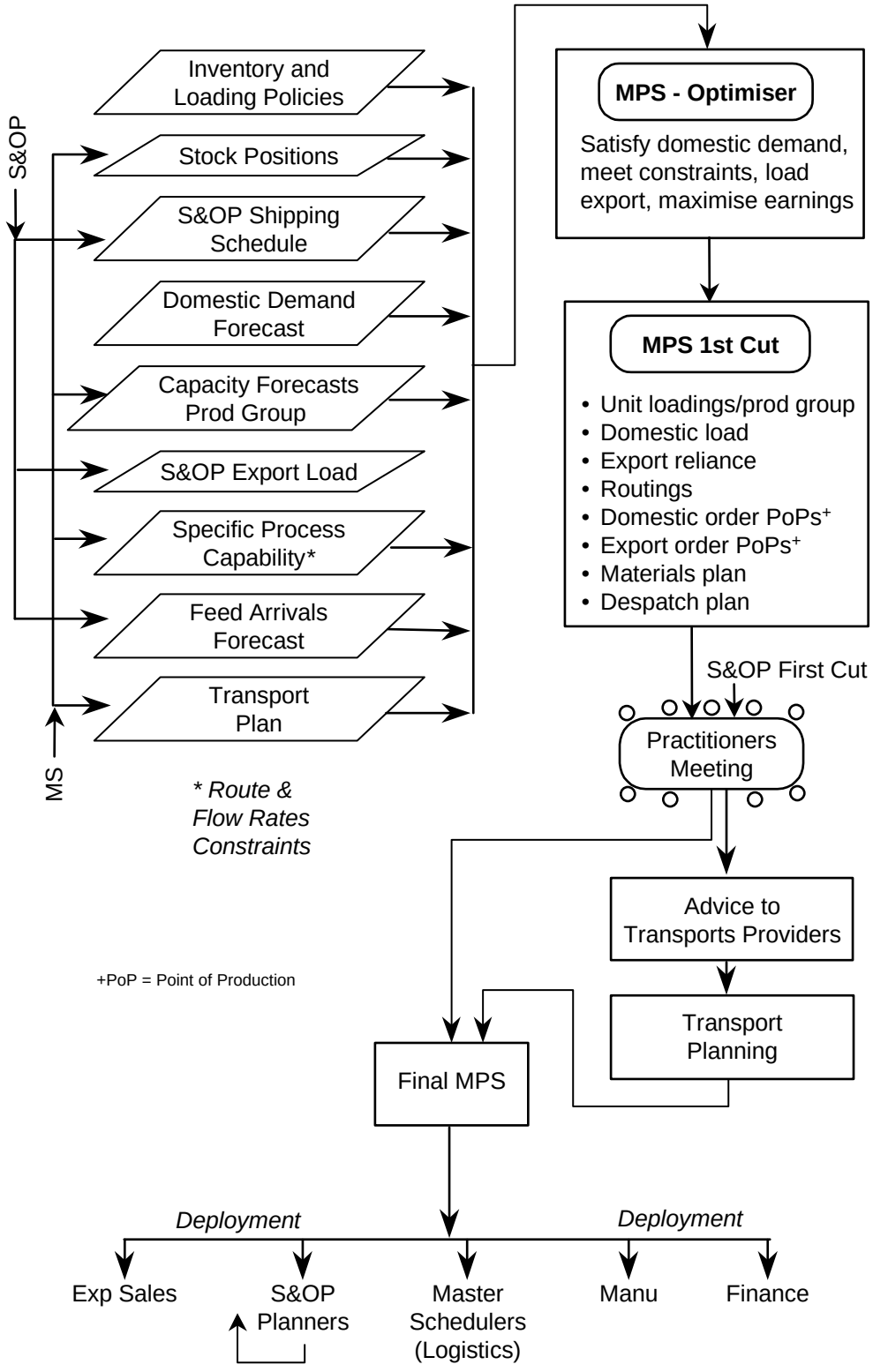


Figure 6: Master Production Schedule (MPS) Level. 1000 Product Groups, 18 Week Forecast, Weekly Rests. (P. Robertson, 2001)

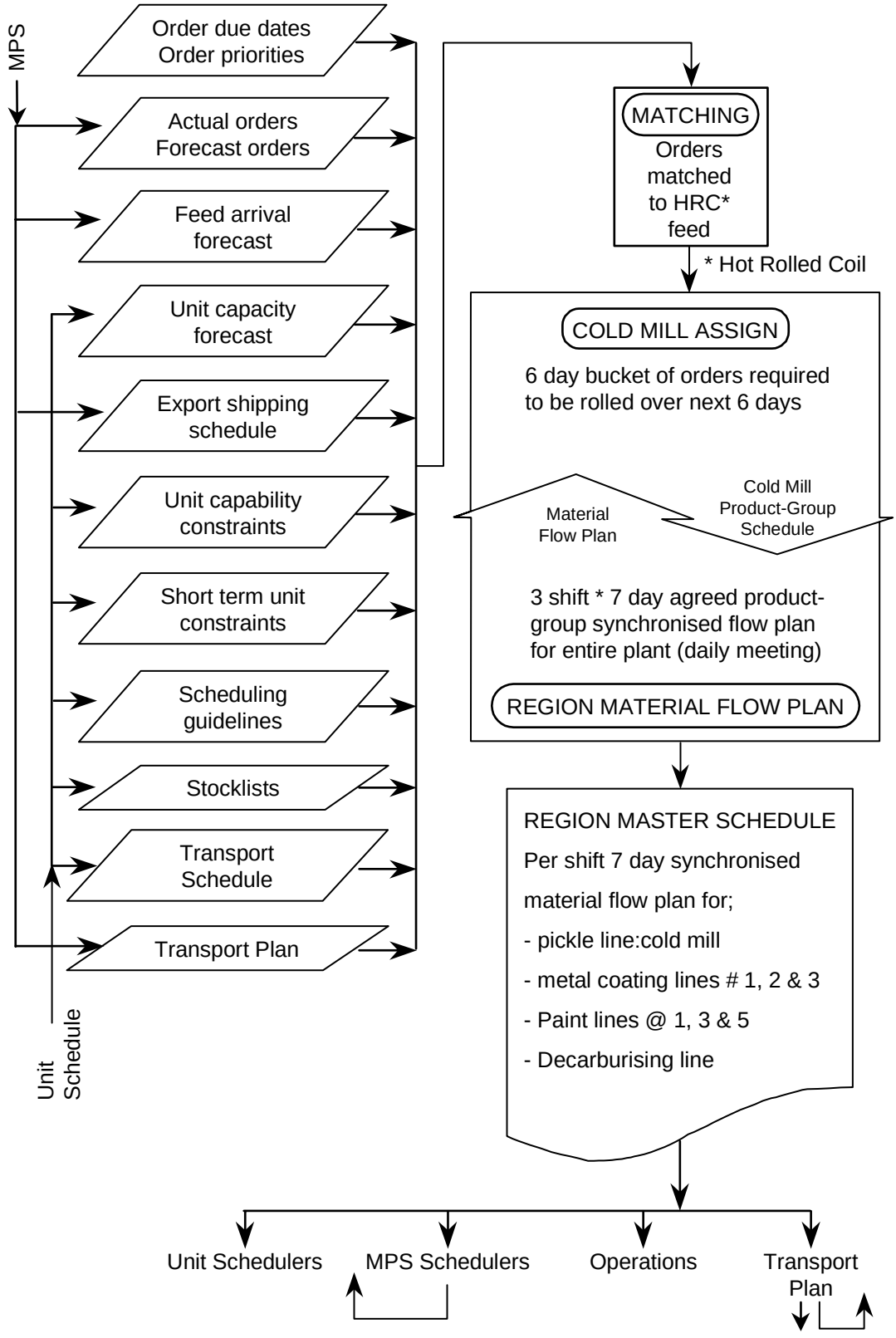


Figure 7: Master Schedule (MS) Level. 1000 Product Groups, 0 to 3 Weeks Forecast, Daily Rests (0 to 13 weeks forecast, weekly rests, for "hard-to-make" products). (P. Robertson, M. Pratt, BHP, 2001)

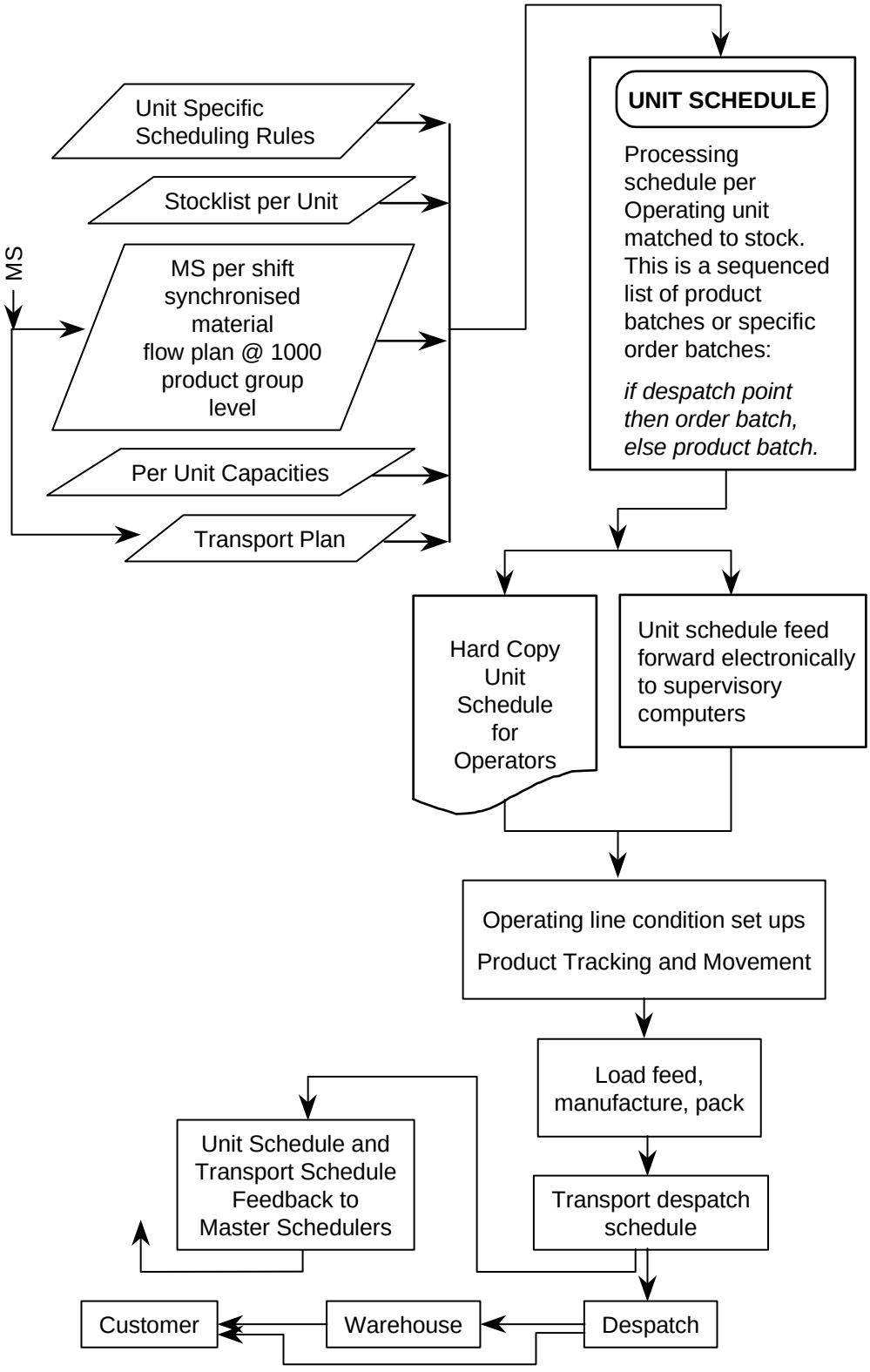


Figure 8: Unit Schedule Level. 1000 Product Groups, 0 to 48 hours, in Hourly Rests. (The processes shown from 'Transport despatch schedule' on, are illustrative only) (P. Robertson, M. Pratt, BHP, 2001).