



### ■ Dr Mosongo Moukwa

**P**roduction fragmentation refers to the activity of companies dividing the previously unified processes of product R&D, manufacturing and marketing into several relatively independent processes that are carried out in different countries and/or regions. This organisation model has transformed the manufacturing process from a central, vertically integrated process based in a single location to a network of processes scattered across the globe. It has had a profound impact on how manufacturing companies have organised themselves and what processes take place where. It has enabled R&D, manufacturing, marketing, and other stages of production to be carried out in different countries and regions. While some segments of the manufacturing industry, for instance, the mobile phone sector, have achieved a high level of production fragmentation, the paints and coatings industry has not been able to display such a high level of fragmentation due to several constraints.

### Technology and competition

Production fragmentation depends upon the available technology. In other words, companies will not resort to it unless technology makes it possible to divide production in such a way that it reduces the cost per unit. Only for products

# Production fragmentation to open new avenues

The changing dynamics of international trade, increasing competition, growing outsourcing phenomenon that compelled every industry to revisit production processes gave rise to the concept of production fragmentation, wherein production is sliced into several processes located within a country as well as across countries. Though this manufacturing model proved a boon to several sectors, it has failed to add another hue to the paints and coatings industry.

where the division of the manufacturing process is technically feasible will the production of components and the final assembly to independent companies in different countries and regions will take place. This becomes more pressing when competition intensifies.

There are essentially four basic organisational modes that a company can take (Figure 1). In the first mode, a company refuses to outsource, and confines all stages of production, including product design, R&D and manufacturing within the company. In the second, a company builds its own manufacturing facilities inside the country and outside. In the third mode, a company outsources and collaborates within the country. Finally, in the fourth mode, a company opts to outsource and collaborate outside the country.

### Going high-tech

Companies operating in industries where technology is fairly advanced opt for the first mode in product design, R&D and marketing, but they opt to outsource manufacturing. The diversity of mobile phone hardware and software has progressed to such an extent that it makes it possible for manufacturers

of mobile phones to adopt production fragmentation by means of outsourcing.

### The paints industry

The production of paint involves a batch process blending of a wide range of raw materials such as organic and inorganic pigments, resins (otherwise known as binders or polymers), solvents and additives (Figure 2). The manufacture of pigmented paints involves the dispersion of pigments into part of the binder and solvent components. This is performed using high-speed dispersers or other grinding mill devices such as sandmills, beadmills and ballmills. Production is conducted on a discrete batch basis in volumes anywhere between 200 and 2,00,000 litre. Plants tend to be multi-purpose rather than specialised, with small manufacturers producing a range of paints.

This reliance on batch production, as opposed to 24-hour continuous shifts, limits the scale of economies in paint production process. Fixed costs that can be reduced by increasing volumes are hard to find. In operations, increasing large batch size has the expected advantages of reducing average manufacturing costs. However, large manufacturers are then faced with the costs of distribution

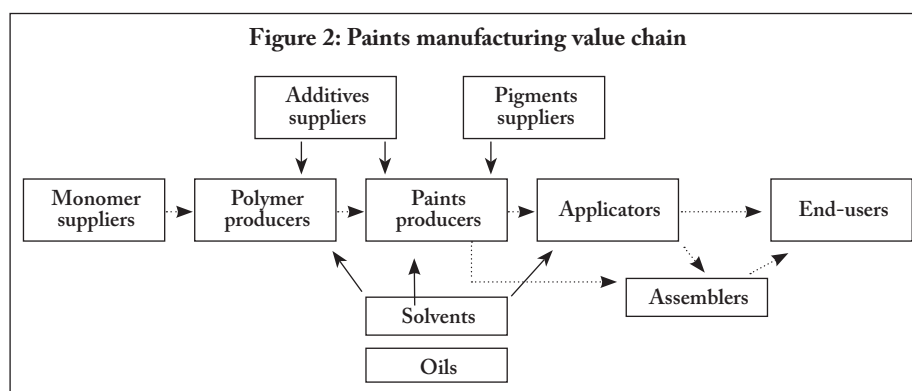
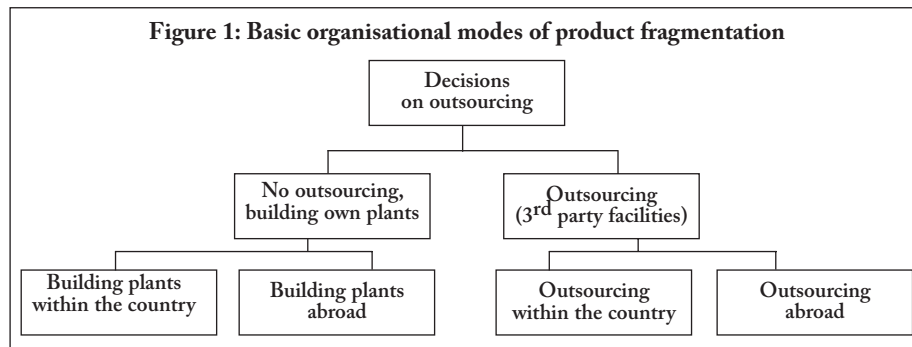
that quickly overtake the advantage of increasing batch size.

The industry is characterised by its low- to medium-level capital intensity, justified by the semi-automated production process pursued by most industry participants. This has increased in recent years as companies have been forced to adopt various efficiency improving measures in the face of a highly competitive environment. Changes in technology in the paint manufacturing industry have traditionally been slow, though the pace has picked up in recent years aided in part by environmental pressures.

The cost of goods sold is the single-largest expense item, representing 60-70 per cent of sales. Included in these costs are the cost of pigments (including titanium dioxide pigments), which are now thought to account for one-fifth of raw material costs, epoxy and other resins (accounting for as much as one-half of raw material costs), solvents, fillers and additives. In addition, as many of these raw materials are petroleum-based, the expense will vary with changing oil prices.

Packaging costs are also included in this cost item. Therefore, the efficient use of raw materials is a critical cost component. The second-largest expense tends to be labour costs (representing more than 10 per cent of sales in some countries), reflecting the fact that the paint manufacturing process is only semi-automated. Distribution and advertising costs make up a significant proportion of overheads incurred by operators. These are included among 'other costs', as are environmental costs, which have also increased in recent years.

The extent of integration is generally limited to outsourcing activities, such as paint detackification, water treatment, spray booth balance, paint system cleaning, logistics and warehousing, which offer a competitive advantage by enabling the plant to focus on its core competencies, in turn, improving quality and throughput & reducing total cost. Generally, the industry has opted for the first or second organisational mode.



When it seeks to build partnerships, it is for the purpose of manufacturing for local needs. Shipping costs are prohibitive to allow shipment of large volumes of paints across the globe profitably.

### Getting ready for the future

In the first organisational mode, a company adopts a vertically integrated structure by manufacturing all components independently, rather than outsource. In stages with diminishing returns to scale, it can adopt an internally integrated mode, whereas in stages with increasing returns to scale, it may outsource to specialised manufacturers to increase profits. Provided that the technology of a given manufacturing sector allows for production fragmentation, the extent of outsourcing is determined primarily by the degree of development within the industry and the intensity of market competition.

Therefore, with increasing intensity of competition, companies will first divide from the whole process, stages whose average costs decrease with the increase of output; ie stages with increasing returns to scale. They will instead purchase intermediate products from specialised manufacturers engaging

in these secondary production processes while preserving other stages of product development and manufacturing within the companies.

Product fragmentation is limited in the paints industry because of various reasons – chemical reactions can be complex, and the cost of shipping and transportation make it prohibitive to ship chemical components over long distances. What is different in the high-tech industry is that standardisation and economies of scale have created favourable conditions for vertical fragmentation and specialisation, while at the same time enhancing the competitiveness of some stages in the high-tech supply chain. This situation does not exist in the paints industry. Maybe one day this may happen. ■



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