The Productivity Paradox

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Introduction

Indian Manufacturing sector continues to suffer from the problem of very low or even negative growth in the last few years while we often hear about double digit growth of several sectors of manufacturing in China. This is a major cause of worry not only to those who own manufacturing plants but also to the investors, the government and the general public. For a country that ranks very high in the number of engineers and other technical manpower trained annually, manufacturing sector clearly could provide a solid foundation for employment, wealth creation and economic progress. Despite this common knowledge, why is the manufacturing sector not growing as much as it ought to? One could attribute this to many factors. However, we address in this paper the problem of manufacturing firms from the perspective of productivity of manufacturing plants and seek to analyse the causes in some detail.

A few statistics about our manufacturing sector and competitiveness is in place before we address the problem. The Centre for Monitoring the Indian Economy (CMIE) reported during 2001 – 2002 worst performance by manufacturing companies since 1989-90. Further, PAT margins in the manufacturing sector had remained between 0.8% and 1% in the year 1998-99 to 2000-01[i]. India's standing in International ratings is no better. Even after a decade of economic reforms, India continues to be rated nearly at the bottom of the table by independent rating agencies. Table 1(a) has details on the Global Competitiveness Report brought out by World Economic Forum, Davos. India's ranking during 1997-98 on several factors related to management of manufacturing firms is in the bottom quartile[ii]. Similarly,

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India's overall ranking in the World Competitiveness Year Book brought out by IMD, Switzerland is also considerably low (see Table 1(b)).

Analysts and industry leaders attribute this to several factors. Our input costs and interest rates continue to be high relative to our competitive neighbours. We still do not have a robust system of VAT. The labour policies are not yet conducive to the industry. Some of these problems may significantly affect the growth of manufacturing firms. However, they still do not explain why some firms operating in such identical conditions excel others in their performance. For instance, the Centre for Monitoring Indian Economy (CMIE) reported that the growth in sales in 2000-2001 over the previous year was about 11.8%. However, out of 917 companies, nearly 2/3 had either zero or negative growth in sales during 2000-2001[iii]. Clearly, firm-level issues could provide another dimension to understand the problem and look for alternative solutions. Our effort in this paper is based on this approach.

We define a term "Productivity Paradox" and use it to demonstrate how firm-level issues seriously inhibit organisations from achieving satisfactory growth rates. We also identify factors that contribute to Productivity Paradox. We leave specific solutions that organisations can employ to resolve the productivity paradox to future research.

Productivity Paradox Defined

Several manufacturing organisations in our country have been making concerted efforts to improve their competitive positioning. The South based TVS group of companies have between them several coveted awards including the Deming Prize and the PM prize. Automobile majors have been making investments in technology and product design capabilities. Machine tool industry is striving to improve the state of affairs through industry

level studies. The 10th quality summit of the CII held in November 2002 in Bangalore proudly showcased 17 road shows of some of the best improvement projects. Despite these efforts over nearly a decade, Indian manufacturing firms have not yet dented International competition significantly. The notion of productivity paradox helps us understand the problem pertaining to this.

Productivity paradox is defined as the state in which firms have rich perceptions of productivity improvements but gain very little from such improvements. Much of the problem lie in these "rich perceptions" that executives experience. For example, firms make visible improvements in their plant layout and cut inventory by half. In other cases, they rationalise work force and capacity investments and visibly improve maintenance. Despite all these, they do not see either bottom line or top line improvements. From several of such examples that we came across, we have been able to see a pattern in the problem. We identify productivity paradox when one or more of the following exist in an organisation:

- Getting stuck with an inappropriate understanding of the term productivity
- Incompatibility between performance reports and ground realities
- Excellent performance in some parameters but not in "order winning"
- Cashless profit and Profitless turnover

Definitional issues in productivity

Economics literature provides a rich repository of knowledge on productivity. Economists use productivity measures to assess the progress at a macro-economic level. Although several variations exist in defining productivity, fundamentally they all seek to measure how much output has a firm been able to obtain from a unit of input. The greater the output is for a given input or fewer the number of units of input required for a given output, the greater is the measure of productivity.

Operations Management literature and management control system literature have largely borrowed these concepts and used them without appropriate modifications to suit the requirement. With the result, one can show that while an organisation has been very productive (by producing more output from a given input), they may not reap proportional gains from the market. What happens if an organisation has a very efficient production system churning out products that the market does not need? Consider the following scenarios:

a. An organisation has a very efficient manufacturing system but a poor supply chain
b. An organisation has a well orchestrated supply chain to manufacture and deliver product to customers but is unable to sense what the market wants
c. An organisation has pockets of excellence in manufacturing but produces products that are either too expensive or taking a longer time to deliver to the customer

Clearly, in each of the above scenarios, mere output does not contribute to productivity. On the other hand, it may represent a vast amount of wasteful resources lying unutilised in the inventory.

Alternatively, if we define productivity in a period as the ratio of the fraction of the actual output that resulted in “revenue generation/sales” to the ratio of the input, then the whole perspective will change. Organisations will realise that having excessive Finished Goods (FG) and Work-In-Progress (WIP) inventory may result in a poor productivity measure. Traditional accounting convention of classifying WIP and FG as value added will become questionable. WIP and FG will have to be treated as cost and risk added until they could be sold to a customer. Designing inappropriate products and inability to meet customer expectations in terms of cost and lead-time will also result in poor productivity.

Further, consider the effect of economic reforms on the market dynamics. Often, in a liberalised economy, more players enter into a sector of industry and build excess capacity. For instance, when passenger car manufacturing was liberalised, several players entered the market and created capacities much in excess of demand. This alters the competitive dynamics and forces organisations to reposition their value offerings to preserve market share. When markets are overcrowded organisations will experience pricing pressures. During the last five years, prices of industrial goods such as turbines and circuit breakers dropped to as much as 60% of their earlier levels. Productivity improvements in such situations will happen only on account of cost reduction initiatives. Similarly, when delivery quotes shrink, organisations will be able to maintain and improve their sales performance only by undertaking lead-time reduction initiatives. Lakshmi Machine Works of Coimbatore had to bring down its lead-time from the order of a few years in 1996 to less than 10 months to remain competitive.

Essentially, the definitional change will make the measure customer focused and dynamic in its behaviour. It will call for improvements in certain areas of operations that will directly influence our order winning ability.

Trajectories and Scoreboards

Managers relentlessly pursue improvements in performance and report it through periodic reports. Performance reports are meant for the top management to comprehend the financial and operational well being of a manufacturing organisation. However, they also play a useful role in detecting the productivity paradox that an organisation is going through. In several organisations performance reports often project "*better than the previous quarter*" results because that is how incentive mechanisms tune the psychology of the executives in

organisations. Detecting productivity paradox requires a macro-level treatment of these reports and corroborating them with ground realities in the organisation.

Some of the typical examples of productivity paradoxes in organisations are obvious but often overlooked. For example, several organisations report shortages of production material. Simultaneously, they also report high investment in inventory and better machine utilisation and greater absorption of factory overhead. Similarly, although they may enjoy low cost of labour, the market will perceive high cost of their delivered products and services.

A materials manager, for instance, will show how the stores inventory levels are falling over time. However, the organisation may have neither reduced the stores space by any significant amount nor cut down the cost of follow up and rush purchases. Purchase department may report newer initiatives in supply development and sourcing but shop floor may continue to experience shortages and quality problems. Furthermore, cost of follow up and purchase ordering could have gone up. Kaizen program reports will detail the number of projects implemented and quantum of cost savings, yet the product may have problems in the market on account of high price[iv].

Performance reports are at best scoreboards of divisional and functional performances. On the other hand, the grounds realities captured through a variety of operational measures and snapshots are like the trajectories of performance. It is therefore useful to constantly check and compares scoreboards and trajectories to detect impending productivity paradoxes and early trends in the phenomenon.

Piece-meal improvements Vs Order winning

Improvements are always good as they beget some change in the organisation. However, improvements that do not result in enhancing "order winning" attributes represent half-hearted effort in jumping across the "well" of productivity. In some extreme cases, it represents wasteful expenditure accruing out of a lack of vision of the senior management in an organisation. A single improvement does not always result in enhancing the order winning attributes of an organisation. But a series of such efforts carefully planned and executed will. However, each improvement project will demand considerable time and effort to address change management issues, employee retraining, capital budgeting, and executing the change programme as per schedule. Consequently, several organisations do not have the stamina to go through such a long haul of improvements to realise the benefits. On the other hand, they tend to brand these improvement efforts as either ineffective or wasteful and abandon them mid-way in favour of a newer one.

Consider one division of an organisation manufacturing industrial motors. The management and the employees were enthusiastic about the changes taking place in the organisation. These changes promised to usher in a new era of productivity. They witnessed reduction in the WIP inventory levels. Lead time for manufacturing fell sharply. The shop floor wore a new look with well laid out machines and clearly marked places for tools and inventory. However, after three years of major manufacturing restructuring exercises, their enthusiasm level had dipped the lowest. The division continued to have poor order winning performance.

Table 2 has some details on the situation that existed at the end of the restructuring exercises. In the case of standard motors, about 50 % of the lead-time was attributed to order handling and scheduling whereas in the case of special motors it was nearly 80%. It is amply clear that

although the organisation had a good manufacturing system, it may not win orders in the market on account of excessive lead-time in “non-manufacturing” areas.

Consider the case of another manufacturing organisation that has strengths in product design. The organisation was experiencing problems in selling products that were perceived to be technologically sound. Table 3 has some data on the distance travelled in the shop floor for manufacturing the product. It appears that the shop floor was perhaps tuned to manufacture Product A. Components of Product A on an average travel 1/3 of the distance that components of Product D take. After visiting the factory and discussing with the executives, we confirmed this inference from the data. Ironically, Product A was no longer the prime revenue earner for the organisation. Products C and D were expected to bring revenue in the future and the manufacturing resources were least in favour of manufacturing these products.

There were other examples in our research that provided additional insights into this issue. There were organisations that had a good product, improved their manufacturing system very well over a decade of continuous improvement efforts but lacked in innovation skills in their senior management. With the result they started showing decline in their order winning capability. They were unclear of the emerging market needs and the new products that they need to bring out of their drawing table. There were also other examples that showed superior improvements in several areas of business but had an inefficient supply chain. Clearly, the supply chain partners moderated their performance at the market place. Finally, there were organisations that invested substantially in IT infrastructure to improve operational efficiency in both the offices and the factories but were automating the whole set up without simplifying and improving existing business processes.

All these examples convey an important message when it comes to improving productivity the way we have redefined the measure. Piecemeal improvements do not result in productivity increase although there are several positive effects "locally". Organisations need to see clearly see the linkages between these improvement efforts and productivity and endeavour to cascade these projects across the chain to finally impact the order winning attributes.

Bottom line Blues

If top management misses these signals pertaining to productivity paradox, they have other ways of detecting the phenomenon. We have found that in several of the cases the paradox eventually shows up in the bottom line. Consider the examples of making piecemeal improvements. Organisations vastly incur costs and create unwanted inventory in the first place. This clearly affects the profitability.

Analysis of balance sheet sometimes reveals significant increase in operating cycle. In order to clear the mounting inventory, it is not uncommon for organisations to launch special sales promotional schemes and trade discounts. Further, credit terms for the customers will be compromised to push the finished goods inventory down the pipeline. All these generate two undesirable effects on the financial health of the organisation. Some organisations manage to report profit but most of them are in the form of accounts receivables. Still others succumb to the mounting cost pressures and report no profit even when they increase the turnover.

Resolving the paradox – Making a beginning

What have managers to learn from knowledge of Productivity Paradox? How do they resolve the paradox? We identify three aspects that need grater understanding on the part of the managers to make a beginning in resolving the paradox.

First is the need for a realisation that yesterday's "order winners" are in fact today's "order qualifiers". Consider the nature of competition in global markets over the last twenty years. In the early eighties, much of the battle was won on the basis of "quality". Japanese corporations snatched away valuable market share from US competitors on the basis of value offerings constituting mainly of high quality – low cost. After a few years, there were several firms offering consistent quality and order winning required newer dimensions. The competitive advantage shifted to "delivery and flexibility" and firms successful in offering these value propositions were productive. We have witnessed a steady set of alternative value offerings ever since then[v].

Second is the crucial understanding that the entire value chain moderates the productivity of an organisation. Our examples repeatedly point to this phenomenon. Not paying enough attention or treating supply chain partners as outside entities are likely to contribute more to productivity paradox than resolving them. Managers need to devote considerable efforts towards supply chain design and optimisation. Top management needs to mandate these initiatives and actively support them.

Third, managers need to apply more thought towards managing myriad improvement programs going on in organisations. Kaizen teams, TPM task forces, BPR and ERP exercises, SCM initiatives and several other such improvement activities happen in organisations

simultaneously and in a piecemeal fashion. Unwittingly at times, several of them work at cross-purposes and cancel out their efforts resulting in productivity paradox. Organisations need a well laid out productivity improvement management programme that recognises these issues and avoids them.

Manufacturing firms are likely to be better of by recognising productivity paradox. There lie the real problems and solutions in making a firm competitive and posting impressive top line as well as bottom line growth. Such large-scale efforts in several sectors of our industry will not only provide immediate gains but also help in improving our pecking order when it comes to International rankings.

Table 1(a)
Performance of India on some factors
(Global Competitiveness Report, World Economic Forum)

Criterion	1997	1998
No. of countries evaluated	53	53
India's Rank on selected factors		
Customer Orientation	46	48
Total Quality Management	43	40
Cost Control	36	39
Work place organisation	n.a.	49
In-company training	46	n.a.
Worker Motivation	n.a.	53
Average Tariff Rate	51	53

Table 1(b)
Performance of India (Overall)
(World Competitiveness Year Book, IMD, Switzerland)

Criterion	1999	2000	2001
No. of countries evaluated	49	47	49
India's Rank (Overall)	42	39	41

Table 2
Example of a good manufacturing system with poor productivity

Stage of processing	Lead time (Days) Based on a sample of 79 orders		(%) of the total lead time
Standard Orders	Range	Average	
Order handling	**1 – 3**	**2.1**	**5.1**
Scheduling	**2 – 24**	**17.9**	**46.1**
Production	**1 - 3**	**3.3**	**7.7**
Assembly & Testing	**5 – 15**	**7.8**	**20.5**
Packing	**3 - 8**	**4.0**	**10.3**
Invoicing	**1 - 9**	**4.1**	**10.3**

Stage of processing	Lead time (Days) Based on a sample of 13 orders		(%) of the total lead time
Special Orders	Range	Average	
Order handling	**33 – 77**	**71.2**	**39.6**
Scheduling	**0 – 231**	**79.2**	**44.1**
Production	**1 – 10**	**3.1**	**1.7**
Assembly & Testing	**3 – 27**	**12.6**	**7.0**
Packing	**0 – 2**	**0.3**	**0.1**
Invoicing	**0 – 25**	**13.7**	**7.5**

Table 3
Example of a good product with poor productivity

Product Line	Total Distance Travelled (in meters)	Number of items Manufactured*	Average Distance per item
Product A	375,655	1080	347.83
Product B	415,125	757	548.38
Product C	288,710	301	959.17
Product D	297,110	405	733.60

* The total distance travelled includes only those of the items manufactured on the shop floor. The number of items that finally get assembled into the final product includes many bought out items in addition to these.

Notes & References

[i] Monthly review of the Indian Economy, CMIE, December 2002, pp 50-51.

[ii] This data is extracted from Mahadevan, B. (1999), "The New Manufacturing Architecture", Tata Mc Graw Hill Co. Ltd, New Delhi , pp 32.

[iii] Monthly review of the Indian Economy, CMIE, May 2001, p.74.

[iv] Sometimes these distortions are caused by a faulty reporting system that did not change when the organisation made dramatic operational improvements. We do not include those under this category of productivity paradox. For an excellent treatment of these issues please see "Kaplan, R.S.,(1990), "Measure of Manufacturing Excellence", Harvard Business School Press.

[v] Researchers in the filed of corporate strategy denote this phenomenon as value migration and argue that one of the key requirements for sustaining the competitive advantage of a firm is to respond adequately to value migration. For an excellent treatment of this concept, see Sylvotzky, A. (1996), "Value Migration", Harvard Business School Press.