CHAPTER 11.0
RESULTS & DISCUSSIONS

11.1 INTRODUCTION

Surveyors of various parts of the world have been working aiming towards the performance improvement of BPR applications. Finding out a methodology for the performance appraisal / effectiveness of the success of BPR applied in industries could be of current interest. This thesis is focussed on the study towards Small and Medium Enterprises (SMEs). This study, of arriving at a methodology for finding the rigorousness of the SMEs approach towards Re-engineering in SMEs in Indian context, will be of good importance to other industries to perform better when they take up re-engineering.

11.2 METHODOLOGY

The percentage improvement in process timings before and after development / re-engineering for certain selected products were calculated. Graphical representation of the percentage improvement of various attributes over the process time as a basic parameter was drawn to develop mathematical model to analyse the rigorousness of the enterprises in their approach towards BPR.

11.3 CONSOLIDATED REPORT

The research study was conducted in five different industries that carried out re-engineering as they claim. These five industries were both of small and medium in nature and also different either in their kind of production process or products. All the relevant details regarding their re-engineering activities like reasons, areas & level of application of BPR, involvement of consultants, rigorousness model and observations were analysed in detail in the previous chapters. The results of them are tabulated in a consolidated manner as a ready reckoner in Table 11-1.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Chapter No.</th>
<th>Size of Industry</th>
<th>Type of Industry</th>
<th>Product</th>
<th>Reasons for BPR</th>
<th>BPR applied in</th>
<th>Level of BPR</th>
<th>Outside Consultants</th>
<th>Rigorousness model</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>Medium</td>
<td>Similar Products Batch Production</td>
<td>Electric Motors</td>
<td>Customer Quality Competition</td>
<td>Total Industry</td>
<td>Radical Redesign</td>
<td>Yes</td>
<td>Linear</td>
<td>Rigorous start to become leader in the market - employed all tasks - Employee resistance - Incomplete.</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>Small</td>
<td>Similar Process Job type</td>
<td>Plastic components</td>
<td>Implementing Innovative Technology</td>
<td>Production &amp; Plant layout</td>
<td>Fragmented Partly Redesign Layout</td>
<td>Partly</td>
<td>Linear</td>
<td>Partly rigorous - Implemented innovative technology - Certain difficulties exist in technology &amp; layout but can be improved.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Small</td>
<td>Assembly line Production</td>
<td>Textile Equipments</td>
<td>Customer Productivity Quality Competition</td>
<td>Assembly line Layout</td>
<td>Radical Redesign of Assembly Line</td>
<td>No</td>
<td>Quadratic</td>
<td>Less Rigorous - Total Industry has to be studied.</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>Medium</td>
<td>Continuous Process</td>
<td>Sugar</td>
<td>Wastage Reduction</td>
<td>Production Process</td>
<td>Fragmented</td>
<td>Partly</td>
<td>Linear</td>
<td>Less Rigorous - Effectiveness is good but BPR is only fragmented - Minor Technical Improvement - Strategic developments are to be studied.</td>
</tr>
</tbody>
</table>
11.4 DISCUSSIONS

A consolidation of the study of individual enterprise is made to arrive at a conclusion of this study.

11.4.1 ENTERPRISE # 1 (Chapter No.6)

This medium enterprise manufacturing similar products, motors in batch production, made a good start and progressed in a methodical way but forget the most important point of its Human Resource (HRD). The opinions of many surveyors like Willmott (266), Leonard (145), Attaran etal (12) Attaran etal (12), Zucchi etal (271), Bos (31), Briskin (36), Martinsons etal (163), May (167), Moreno (179), Plenert (201), Roy etal (214), and Whiting (263) were that the missing link in an industry, that is undergoing re-engineering, is its human resource development. The motor unit of this industry is far from its readiness to change its existing culture and style of operation. Efforts should be made to install confidence before effecting change so that it would have been successful to implement re-engineering. This company was little premature in its approach towards re-engineering. Though the enterprise had undergone all the phases of re-engineering, and the implementation of re-engineering itself is under question. However the enterprise was rigorous in implementing BPR but missed a link and has become incomplete.

11.4.2 ENTERPRISE # 2 (Chapter No.7)

This Small Enterprise, undertaking plastic moulding jobs and making them in batches, adopted brainstorming techniques by forming Information Technology team to solve a specific production processes namely mould redesign. The team arrived at two alternatives Single Minute Exchange of Dies (SMED) and Hot Runner with Chilling type by evolution. made prototypes, tested and implemented.

- The percentage improvement curve was an ideal curve for SMED concept namely the percentage improvement being constant, the mathematical representation being \( Y = \text{constant} \). But it is a fragmented BPR as the team itself carried for further developments.
The percentage improvement curve for Hot Runner with Chilling type mould was a linear curve governed by the equation \( Y = aX + c \), showing less percentage improvement for the less processing time jobs. Reasons and remedies were suggested to improve such jobs to the same percentage improvement, thus revealing the insufficient information available with the IT team. Couger et al. (67), Barrett (21), and Clegg et al. (61) suggested the methodology for innovation and implementation of new ideas.

There is enough scope for further improvement. As an example of re-engineering, a new plant layout was suggested worth studying for effective handling of raw material, reground material, tools, moulds, preheated moulds, and mould material confirming with Malmborg (156) (157), Nori (186). Hence this industry was partly rigorous in its approach towards BPR.

11.4.3 ENTERPRISE # 3 (Chapter No.8)

This small enterprise, manufacturing two for one twister assemblies, arbitrarily decided to re-engineer the assembly line alone. The percentage improvement curves were governed by the equation \( Y=aX^2+bX+c \) showing less improvement for the middle order jobs. The radical redesign or complete re-engineering study should have been carried out to enjoy the complete benefit of re-engineering. Different techniques suggested by Wainwright (259), Chaharbaghi (51), Higton (112), Canen et al. (47), and Malmborg et al. (156) (157) could have been used to redesign. This would have resulted in inclusive of machining line also in layout design or would have resulted in a totally different manufacturing technique itself according to Laughlin (143), Stockton et al. (235), DaSilveira (72), and Wiendahl (265) showing that this industry was less rigorous in its approach towards BPR.

11.4.4 ENTERPRISE # 4 (Chapter No.9)

This medium enterprise is a sugar industry that cannot forgo any smallest percentage of wastage in its production line decided to reduce the leakage in the production line. A mechanical seal was designed to arrest the leakage of cane extract in 125 pumps. The percentage improvement curve was an ideal one namely the percentage improvement being constant governed by the mathematical model \( Y = \text{constant} \).
A total BPR could be possible in this industry to solve its strategic problems that this technical improvement is only a fragmented BPR. The industry has many more problems like factory size, farm size, farm development, rotation of crops, development of extraction process, crushing capacity, economic size, developing ancillary industries like alcohol, paper form bagasse, exploring new marketing strategies and exporting. Government policies play a vital role in every aspect of the above development that they should be developed within those constraints. BPR can be applied that an economical production line balancing, product mix, diversification, investment policy, strategic planning, human resource development etc shall be arrived, resulting in a total radical change. It is essential that entire industry should be totally re-engineered instead of finding solution to a specific technical problem, which is a fragmented BPR, and that its approach towards BPR is less rigorous.

11.4.5 ENTERPRISE # 5 (Chapter No. 10)

This small enterprise, a machine shop unit, produces different types of top rollers. As lot of time was wasted in the preparatory operations, an indigenous machine was fabricated to do such operations to be operated by a semi skilled person. A copy turning attachment was fixed to the existing lathe to be operated by the skilled operator for the subsequent turning processes with improvised cutting tools. The percentage improvement of various attributes for the additional investment were found to be governed by a general mathematical model \( y = ax + b \) revealing that jobs having high machining time showing less percentage improvement as constant time only is reduced from all kinds of top rollers.

Hull et al (117) suggested the development of “soft BPR” to emphasize human resource issues and sociotechnical design methods. The researcher suggested that this industry, by improving human resources, could reduce the time between each step showing an improvement in jobs having high machining time also. Mertins et al (173), and Hull et al (117), also emphasized on human resource issues. Klouvi et al (134) emphasized that the success of redesign relies more on the successful management of people than on the mere acquisition of new machinery. There are other methods also to improve machining to the tolerances. Chen et al (58) and Stewart (233) proposed surface turning conditions and gauging techniques in a CNC machine for the improvement in machining to the tolerances. Tseng et al (251) emphasized online measurements, by using a combination of laser beam diffraction and an electromagnetic “fine touch” sensor, to minimize errors so as to optimize machine-cutting performance. Hence the business processes have to be considered totally using information technology as emphasized by Chan et al (52), which this industry lacks. Then the redesigning would have resulted in a totally new solution, which shows that this industry was less rigorous in its approach towards BPR.
11.5 CONCLUSION

Enterprise # 1 (Chapter 6 – Medium Enterprise – Batch Production – Similar Products) made an effort for a total change but failed. Others enterprises made fragmented tasks either to solve a technical problem or to change a department alone which will not bring long-term success to the company. Studies revealed three different mathematical models for the percentage improvement namely Constant, Linear and Quadratic among which the constant performance model would exhibit ideal results and there exists enough scope for further improvement in other two models.

Business Process Re-engineering offers the promise of dramatic improvements in performance through streamlining the end-to-end processes. The business processes having been considered in totality and showing a constant performance improvement model after re-engineering would be the idealistic situation and they may be said rigorous in their approach towards BPR. The fragmented pieces of activities might show a constant performance model but is not rigorous in its approach. The less rigorous enterprises would exhibit either linear or quadratic form of curves.

This thesis concludes by saying that these SMEs were less rigorous in their approach towards BPR confirming the opinion of the surveyor, Raymond (206), in his study of industries in Canadian context.

* * * * *