

Abstract

Introduction

In the past twenty years more and more manufacturing companies have started to implement popular manufacturing improvement programs. These programs are well known 'hypes' which have varying success when they are implemented by different companies. In this research the focus lies on four different programs:

- Lean Manufacturing
- Six Sigma
- Theory of Constraints
- Total Quality Management

Some people see these 'hypes' as a new religion which will solve all manufacturing problems instantly. While others think it's just a bag of tools which only work for a very limited set of companies. In any case: there is a lot of vague talk about these hypes, without subsequent factual background and understanding.

Goal

Analysis and comparison of manufacturing improvement programs through the Delft systems approach.

Approach

In this research the improvement programs were broken down to concrete manufacturing principles using the Delft Systems Approach. A three step approach was taken:

- 1) Evaluate and categorize each of the four programs using two main themes:
 - Production structure
 - Personnel structure
- 2) Compare results to traditional mass manufacturing as Henry Ford applied it to production of the model T at the start of the 20th century. Six KPI's defined by prof. Bikker will be used to make a comparison.
- 3) Analyze and compare the results of the analysis. Results are displayed in a table and a historical overview is presented to draw conclusions from.

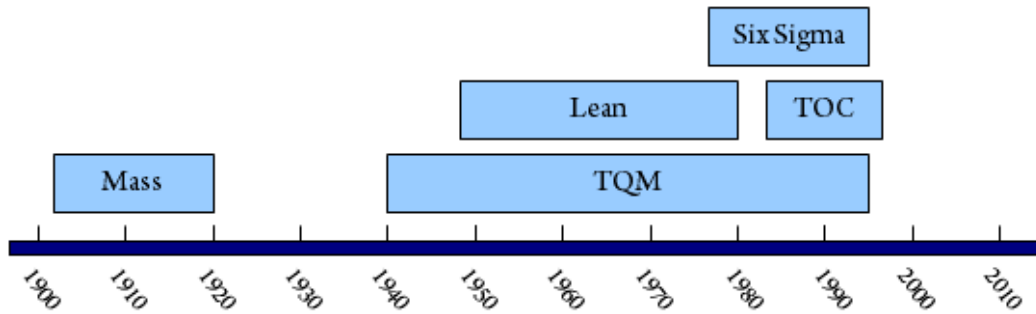
Results

The figure below shows the overview of the two structures and six KPI's for all the programs. Mass was taken as a standard so all KPI's were set to medium for mass production.

	Mass	Lean	TOC	TQM	Six Sigma
Prod. structure	PP	PPN	PP / OP	All	All
Pers. structure	Line	Line func.staff	Line func. staff	-	Matrix
Effectiveness	Medium	Very high	Medium	High	High
Flexibility	Medium	High	Medium	Medium	Low
Productivity	Medium	Medium	High	Medium	Medium
Control	Medium	Very high	Medium	High	High
Quality of work	Medium	Medium	Medium	Medium	High
Innovative potential	Medium	High	Medium	Medium	High

On basis of this table a distinction is mad in two groups: mass, lean and TOC form one group. Six sigma and TQM form the second.

The timeline overview is show below to provide insight in the reason for the differences between the improvement programs.



The timeline supports the division in the two groups.

Conclusion

First of all it's a shame that there I so much talk about CSF's within the programs. There are so many vague terms and general principles in many of the books. This doesn't make it any easier to focus on the real improvement tools. This is especially true for many books on Six Sigma and TQM.

TQM and Six Sigma are smaller process control-based programs which can help most companies to improve on a process level in quality. Many people believe that these programs are broader and can help fix more than quality programs. This is a fad. TQM and Six Sigma will only improve product quality and process quality control.

Lean and TOC are better defined programs, that also improve production and personnel structures of an organization. The application of TOC and Lean is very hard and not suited for every company. Lean is more detailed, specific and harder to implement than TOC but the rewards are also better on all KPI's. The tools in Lean and TOC (but mostly in Lean) are well packaged. Implementing only a few and not understanding their impacts properly, will result in problems. Many companies who experience companies with Lean programs have implemented some of the tools without careful deliberation.

Recently the five programs are becoming more and more closer to each other. Six Sigma is becoming more Lean and the other way around. There are even companies applying Lean-sigma or Lean-TOC. This is partly caused by misunderstanding of the programs and partly caused because the programs lack some valuable aspects.

Manufacturing companies blindly implement improvement programs for the general sake of operational excellence. Careful study of program possibilities and company expectations, often lack. All five programs do contain valuable tools and principles, which can be helpful to companies if carefully selected.