

DIGITAL FACTORY AND MANAGERIAL TOOLS

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ABSTRACT

Enterprises and management are under the pressure to improve the efficiency based on their needs and the technology development. In this paper we use an analytically-based field study to investigate our proposition regarding the active role of managerial tools in enacting and (re)formulating a strategy.

Information and communication technologies are an important driver of efficiency in manufacturing and organizational issues. Currently, computer-aided tools are developed under the name "Digital Factory" and they are mainly directed towards development and application of the methods, instruments and tools for modeling, simulation, visualization and optimization of products, manufacturing resources and processes. Not only must today's factories be flexible enough to accommodate multiple product series and short product lifecycles, but periodically a significant design modification may require a complete reconfiguration. Digital planning is a key to optimization, because it quickly improves and provides planning results, as well as reducing total costs and time.

A synthesis of methods, information technologies and application of business intelligence in practice, may develop a new qualitative enterprise system in order to improve the work on operational level, and especially to help the top management in decision making processes, that are important for survival and development of enterprises.

It is a managerial tool that balances what is needed to be spent against what can be afforded, and helps make choices about priorities. There should be a strong integration of technologies and management using information technologies.

Keywords: digital factory, managerial tools, computer-aided tools, information technology

1. INTRODUCTION

The development technologies are today, more than ever, an important driver of innovation in manufacturing. They have drastically changed the characteristics of business. Advanced modeling and simulation tools are necessary for design, manufacturing, production planning, process planning, or more general factory resource planning. But the development of managerial tools was made possible by the new technologies and new insights into how these technologies can best be applied to aid management decision making.

Many enterprises have responded to these changes by using different managerial tools that can drive enterprises to make significant improvements in profitability, productivity and competitiveness. Modern factories must be flexible enough to accommodate multiple product series and short product lifecycles, but periodically a significant design change may require a complete reconfiguration, to quickly improve and secure planning results, as well as reduce total costs and time as learned from the experience of companies that have created great value propositions for customers and employees, achieved significant improvements in productivity, created a robust profit model, and protected both their profit streams and their customer relationships from being eroded by competitors [1].

2. CONCEPT OF DIGITAL FACTORY

In the shortened product life cycles and product changes, increasing product variety and delivery times, survival on the market demands an enterprise to possess flexibility. A large part of the factory production and planning has already supported information communication technology by digital tools. Today it uses the name Digital Factory to describe a network of digital models, tools and methods, including simulation and 3D/VR(virtual reality) visualization, which are integrated through continuous data management.

Although during planning, all elements within the production should be modeled by computer-supported methods, in such way that the manufacturing of the product meets all quality, time and cost goals, tools are not integrated and thus are generally carried out in isolation concentrating primarily on the development of new and/or the improvement of existing methods for modeling and visualization, simulation and evaluation of planning alternatives. A key technology within this concept is simulation and it can be applied in virtual models to various planning tasks and to improve the product and process planning at all levels.

Simulation technology can be applied in the digital factory concept to enhance the operative production planning and control as the integrated process from the top level.

Simulation models enable the running of what-if scenarios without an existing production system. It is also possible to explore characteristics and optimize the planned production and logistic systems before the systems are installed, especially for production systems with complex dynamics, JIT/just-in-time requirements as there are large benefits for the production planner. Simulation offers a powerful platform to improve transparent and open communication between all departments involved in a planning and operating process. The planning reliability saves time and money.

The concept of a digital factory requires that the integration of CAD designs and CAE information and synchronization of the engineering processes enable all of the product related teams to work together effectively without regard to their physical location. Hence, it also accelerates product delivery and establishes re-useable product configurations across an entire product lifecycle and products.

These digital manufacturing and named technologies are really developing, rapidly bringing to market new innovative products and enabling a dynamic analysis. Additionally it contributes to the reduction of a time to market. Last, but not least, digital manufacturing is of high quality, productive and cost efficient. One of the drivers is linking the product design with the engineering phases. It is a process with the approach that the product is not important and the software of all the manufacturing processes relates to that fact.

This solution enables the compression of time by giving this capability to planners, describing the manufacturing process itself, and to the tooling designers, while they are designing the tools, and to the simulation engineers, using a different set of tools in a collaborative way to come up with the finalized and optimized manufacturing process through a digital mockup. With these tools, manufacturers can assess each process before implementing it at the factory level through the power of digital mockup.

CAD/CAM, Delmia, CATIA, and Enovia, software were supports to collaborative tools, all support product lifecycle management through a common infrastructure. With this solution, you can induce new demands by the means of a digital mock up, the access to the 3-D visualization of process on the execution side, faster production and adaption of production capacity to the contemporary market.

Manufacturing enterprises in transition countries are learning how to achieve good integration of equipment, people, and operations via digital computer technology. They are also beginning to discover how to integrate that both technology and people perform at full potential, integration of the process planning and production planning, fast redesign of new products, simulation of manufacturing

systems, modeling of manufacturing equipment performance, agile manufacturing, including the human operator, functional product analysis, virtual machining and inspection algorithms. Integration of methods, information technologies and application of business intelligence in practice, may develop new qualitative enterprises. A managerial tool balances what is needed to be spent against what can be afforded, and helps to make choices about priorities.

3. MANAGERIAL TOOLS

Traditional manufacturing environments have been transformed into more physically distributed enterprise environments, which include e-commerce, supply chains and virtual enterprises. The current environment of globalization and economic turbulence increased the challenges for managers and, therefore, the need to find the right tools to meet these challenges. Therefore, it has become important to look into the management function and the role of managers in the so-called 'digital enterprise' environment.

To do this successfully, managers must be more knowledgeable than ever as they sort through the options and select the right management tools for their enterprises. They have to choose the tools that will best help them make business decisions that lead to enhanced processes, products and result in superior performances and profits.

The use of such tools requires an understanding of the strengths and weaknesses as well as an ability to creatively integrate. Over the last decades, several management tools have been developed and rather thoroughly tested, and matured. Jointly considered, and along with the contemporary developed and developing tools, they support the processes. In the past dozen years, the businesses have witnessed an explosion in the use of management tools and techniques. The tools range from broad processes such as strategic planning and benchmarking to highly focused initiatives such as the use of radio frequency identification (RFID) tags. Keeping up with the tools and deciding which ones to use have become an essential part of every executive’s responsibilities.

Bain & Company launched a multiyear research project to gather facts about the use and performance of management tools (Table 1., Figure 1.) [2].

Table 1. Top 10 management tools through epoch of fifteen years [2]

1993	2000	2006	2008
<ul style="list-style-type: none"> • Mission & Vision Statements (88%) • Customer Satisfaction (86%) • TQM (72%) • Competitor Profiling (71%) • Benchmarking (70%) • Pay-for-Performance (70%) • Reengineering (67%) • Strategic Alliances (62%) • Cycle Time Reduction (55%) • Self-Directed Teams (55%) 	<ul style="list-style-type: none"> • Strategic Planning* (76%) • Mission & Vision Statements (70%) • Benchmarking (69%) • Outsourcing** (63%) • Customer Satisfaction (60%) • Growth Strategies* (55%) • Strategic Alliances (53%) • Pay-for-Performance (52%) • Customer Segmentation (51%) • Core Competencies (48%) 	<ul style="list-style-type: none"> • Strategic Planning* (88%) • CRM***(84%) • Customer Segmentation (82%) • Benchmarking (81%) • Mission and Vision Statements (79%) • Core Competencies (79%) • Outsourcing** (77%) • Business Process Reengineering (69%) • Scenario and Contingency Planning (69%) • Knowledge Management (69%) 	<ul style="list-style-type: none"> • Benchmarking (76%) • Strategic Planning* (67%) • Mission and Vision Statements (65%) • CRM***(63%) • Outsourcing** (63%) • Balanced Scorecard (53%) • Customer Segmentation (53%) • Business Process Reengineering (50%) • Core Competencies (48%) • Mergers & Acquisitions (46%)

*Tool added in 1996 **Tool added in 1998 ***Tool added in 2000

Every tool has its own strengths and weaknesses. To succeed, you must understand the effects of each tool, then combine the right tools in the right ways at the right times. Do not naively accept hyperbole and simplistic solutions.

The use of the tools does not give instructions and a guarantee but it will improve results only to the extent that it:

- Discovers customer needs;
- Builds distinctive capabilities;
- Exploits competitor vulnerabilities;
- Develops breakthrough strategies by effectively integrating these accomplishments.

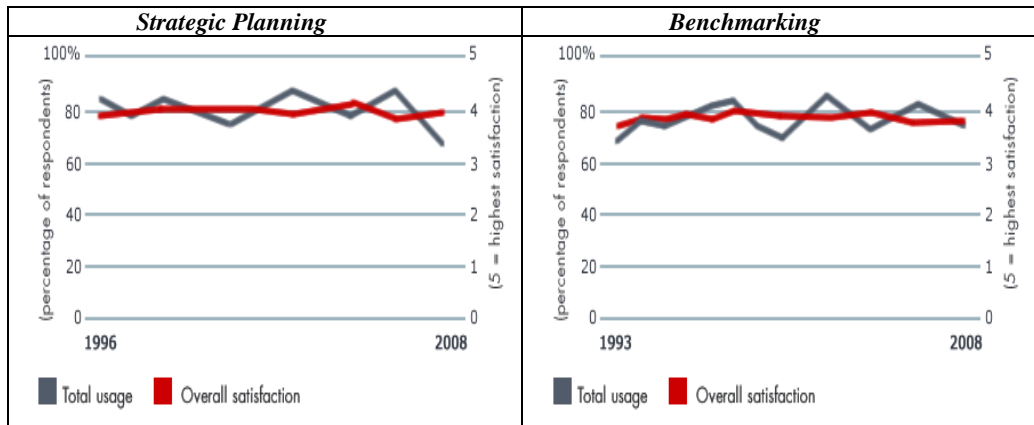


Figure 1. Usage and satisfaction management tools: Strategic Planning and Benchmarking

4. STRATEGY

The strategic approach is oriented towards the future. By anticipating the future, organizations can help to shape and modify the impact of environmental change.

It has an external emphasis which takes into account several components on the external environment, including technology, economics and politics. The strategic approach is a process. It is continuous and recognizes the need to change goals and activities in the light of shifting circumstances within the environment. The latter require monitoring and review mechanisms capable of feeding information to manager continuously. Strategic management (or planning) is not something that can be applied only once and forgotten or ignored.

5. CONCLUSIONS

Global competitive pressures have made enterprise focus increasingly centered on the management by changing business requirements that have always been a basic component of any successful business strategy. Managers need to select, implement and integrate tools that are appropriate for their enterprises. A tool will improve results only to the extent that it helps discover customer needs, helps build distinctive capabilities and helps exploit the vulnerabilities of competitors, or a combination of all three. Synthesis of the information technologies and application of business intelligence may develop new qualitative enterprise to improve the work on the operational level, and to help the top management in decision making processes, that are important for survival and development of enterprises.

6. REFERENCES

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