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Models and Methods of Production Management

Nedeljko ŠTEFANIĆ, Ozana KRIŽAN* and *Ivo ČALA

Fakultet strojarstva i brodogradnje,
Sveučilište u Zagrebu (Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb),
Ivana Lučića 5,
HR - 10000 Zagreb
Republic of Croatia

nstefan@fsb.hr

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Subject review

This paper deals with the methods and models of production management, the concepts being adopted by all types of organizations - manufacturing and service. Organizations in today's highly competitive environment must devote significant time, energy, human and financial resources to achieve strategic goals. These methods and models have emerged as a proven and effective tool for all organization's stakeholders, and in the process allow organizations to successfully implement differentiating strategies, information technology (IT) However well-educated engineers are the major key for their success.

Modeli i metode proizvodnog menadžmenta

Pregledni članak

U ovom članku opisane su metode i modeli proizvodnog menadžmenta, koje su primjenjive u proizvodnoj, ali i uslužnoj djelatnosti. Organizacije u današnjoj, vrlo konkurentnoj okolini moraju posvetiti značajno vrijeme, energiju, ljudske i financijske resurse kako bi postigli strateške ciljeve. Te metode i modeli pojavili su se kao dokazani i sposobni alati za sve dioničare sudionike u organizaciji, i u procesu dopuštaju organizaciji uspješnu provedbu različitih strategija, kao što je informacijska tehnologija (IT). Ipak dobro obrazovani inženjeri su glavni ključ za njihov uspijeh.

1. Introduction

In a contemporary environment, the companies whose main characteristic is permanent change of competitiveness, must dedicate significant time and resources, give financial support and human potential as well as energy to measure their own performance in achieving the assigned strategic goals.

Changes of business processes are necessary, not only because of new technologies, but also because of the very wish of the superiors to increase effectiveness and productivity of the company. Only organizations using contemporary methods of support in making decisions can achieve and keep the necessary quality of their business operations; they can accomplish a competitive advantage in running and managing business relations being affected by rapid technological changes additionally complicated by complex interrelationships among different economy sectors and market factors.

Business strategy and its role have become more important than ever, but a devastating fact indicates that 9 out of 10 companies fail to implement a defined strategy. In view of all of this, it is quite obvious that there is a need for a managerial system which would balance historical financial data and contemporary promoters of business success in the way that enables the company to effectively carry out its business strategies. The financial indicators presented the impacts of business decisions carried out, but they couldn't give adequate guiding principles for the development of a long-term strategy. In order to keep the company competitive on the market, an increasing need for comprehensive reporting on different business parts emerges. As an answer to such a need, several concepts and tools developed during the eighties and the nineties of the last century, e.g.:

Table 1. Contemporary Methods and Models of Production Management

Tablica 1. Suvremeni koncepti i alati za upravljanje organizacijom

Abbreviation / Kratica	Methods and Models / Metode i modeli
BPR	Business Process Re-engineering / Reinženjering poslovnih procesa
BSC	Balanced Scorecard / Uravnotežene kartice rezultata
ISO	International Organization for Standardization / Međunarodna organizacija za standarde
JIT	Just-In-Time-Production / Proizvodnja Just-In-Time
CIP	Continual Improvement Process / Neprekidni proces poboljšanja
SMED	Single Minute Exchange of Dies / Brza promjena alata
TPM	Total Production Maintenance / Ukupno održavanje proizvodnje
TQM	Total Quality Management / Potpuno upravljanje kvalitetom
	Lean production / Racionalno poslovanje
	20 keys / 20 ključeva
	Benchmarking / Benchmarking

It was established by various investigations that a large number of organizations are orientated to sale, product or technology and only minimally to market and buyers. Such organizations sooner or later receive a shock on the market. After that, they try to become "market oriented", to adopt some of the contemporary methods and concepts, introduce the system of quality, but if a business organization and its employees have not taken into account the aspects as presented by Ishikawa diagram in Figure 1, only then does a series of difficulties occur.

Modern corporation culture has, as an imperative, adopted the principle of continuous improvement of quality in all business processes. A leader in all the activities should be management, which should clearly define a business strategy with a recognizable accent on achieving the principles of quality. Reorganization includes changes in the way that a business being runned, including implicitly also the elimination of some business patterns. The changes are facilitated if a good system of information and communication has been established, preventing the introduction of fear and uneasiness among employees.

Therefore, the organization should be simple and the employees should easily recognize the logicality of changes in business activities. Administration and management should be ready to consider all new, well-explained ideas regardless of the hierarchical position they come from. Humanization of relations should be carried out by means of a good personnel policy – to choose a manager on each level, give appropriate education of managers for team work and permanently measure the contentment of employees by targeted anonymous polls, etc.

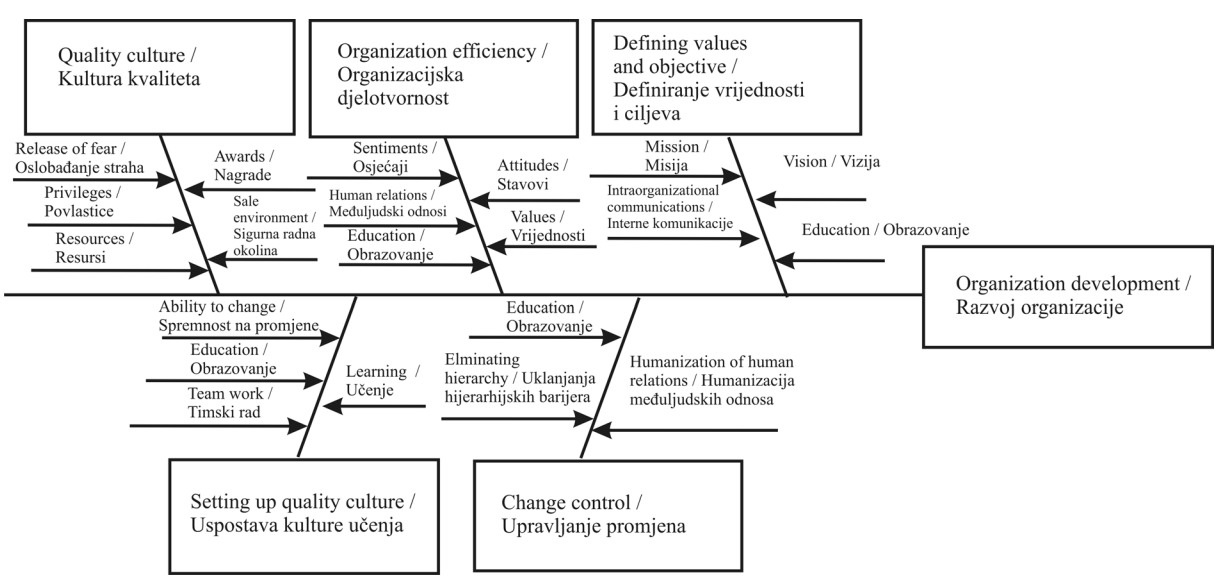

Figure 1. Ishikawa Diagram of Organizational Development

Slika 1. Ishikava dijagram za razvoj organizacije

2. Total Quality Management

TQM is a system of improvement, an increase of flexibility, effectiveness and efficiency of business activities. TQM is based on the concept of constant development and improvement of the processes, on permanent quality and team work, all resulting in continuous improvement. The companies which adopt TQM not only work differently, but also the employees feel and think differently. The change of culture, being accompanied by the implementation of TQM, creates greater participation of employees in a company in all phases of work, a higher degree of collaboration and better working ethics is achieved, all of which result in better efficiency and a more successful company.

One of the definitions of TQM is – a system that includes all the employees and all the activities in a hierarchy, from the simplest jobs up to the highest levels of management. Or, gathering joint forces to achieve a maximum, effective and efficacious common goal, creating and giving a service in a way a user wishes and expects and constantly repeating this level of quality.

TQM completely changes a work organization, employees and management relations and the relation with a buyer – consumer. W. Edwards Deming (1900 - 1993) is considered to be the establisher of a management philosophy of quality, productivity and competitiveness. With his famous programme of 14 points, he has completely changed the earlier theory and practice of management and formulated a new contemporary one. The Deming's programme of quality implementation can be summarized and presented by a PDCA circle presented in the following figure.

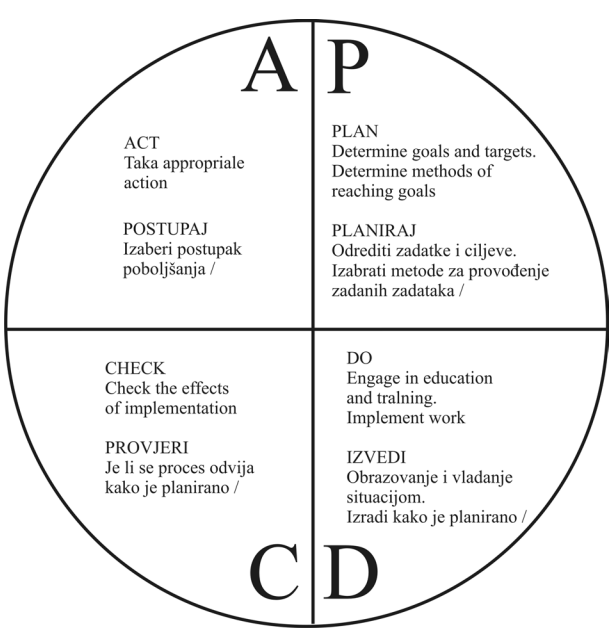

Figure 2. PDCA circle [10]

Slika 2. PDCA krug [10]

3. Business Process Re-engineering (BPR)

Business process re-engineering is an organizational method whose goal is a radical redesigning of business processes. Today, it is clear that the starting point of business process re-engineering has become identification of the problems in using information technology, in particular the data base.

Today, it is not possible to carry out an efficacious and coherent BPR without a contemporary information technology. Besides human resources and organizational changes, information technology represents a key factor of a successful BPR. Information technology (IT) is used in all phases of re-engineering, being particularly prominent in defining business strategy, defining business processes brought to the fore. By means of information technology, analysis of structure and courses of the prevailing business processes is carried out, performances of the prevailing processes are measured, new processes designed, implementation and operationalization of the new and changed processes are carried out and communication among the members of a project team is also made easier. After carrying out re-engineering in an organization, the employees get broader powers and are oriented to satisfy the clients, not the managers. Organization structure has changed from hierarchical to "horizontal" differentiation (distribution of tasks and organization by "range", better communication between departments, everybody is comparably responsible for successes and failures, better quality control). The key persons in an organization are engineers (ahead of managers).

The BPR process is also a long-lasting process and while making a decision on its launching, the fact whether a company is under the influence of permanent changes should also be considered. Exactly from the long duration of a BPR process, which takes place in a dynamic system, it is completely clear that timing of its development is one of the important factors of success. From the time of recognizing the BPR process until the time of implementing the new model, several years may pass.

4. Lean Production

For the purpose of more rational economizing in the field of purchasing, particular significance has been given to systematic investigation of a purchase market, optimization of the purchase scope as well as to optimal number of orders during a year, while recently by introducing the system "just-in-time" and the "kanban" principle, specific results of business costs reduction in the field of purchase have been achieved.

"Just in time" is the philosophy of solving the problems due to which safety supplies should be kept. The most

important task of JIT is to reconcile supply and demand. JIT can be found under the terms: "Production without Supplies", "Zero Supplies", and "Lean Production", etc. The JIT principle represents one of the foundations of the famous Toyota system. According to Shigeo Shingo, this is the system whose main task is to eliminate all that is unnecessary.

The JIT method would be successful if numerous requirements were met:

- quality of parts must be high – defective parts can stop an assembly line;
- without or with minimum supplies;
- there must be a reliable correlation and strong cooperation with suppliers;
- ideally, the suppliers are located near the company, with easily accessible reliable transport;
- the quantity of production depends on the demand;
- team work is required and the employees are responsible for the maintenance of their equipment, the managers are trainers and mentors that respect their employees and actively participate in a production process;
- buyers' satisfaction.

By application of the JIT system the materials, parts and assemblies are used only in the quantity exactly needed with the least possible time of flow. Also, the need for double quality control can be eliminated at the producers' end as well as consignments at the buyers' end. Such a production process implies that each employee should check the job done a step ahead, because this is at the same time a precondition for doing the job well.

The employees are familiar with the principles of quality and testing procedures. Where practical, the testing is carried out automatically to eliminate human error and subjectivity and reduce the costs of labour. In general, each employee corrects his mistakes by himself. In this way, he learns which errors occur and what causes them and so he can develop methods for preventing such problems. This procedure ensures immediate recurrent information on the problems and actually makes employees responsible for the quality and also for a quicker delivery. Sometimes a defective product unit is much easier detected by an immediate buyer than by the person responsible for it. Often a procedure called "Jidoka" is used – designing the machines and processes in such a way that they can be stopped as soon as the problem occurs. Each worker in a production can, or more accurately – must, stop the line if he observes the problem. In all parts of the production there are mechanisms by which this can be done, most often the ropes hanging beside a production line are in question. When a worker observes the problem, he pulls the rope and if the problem is not solved, the line is automatically stopped. This guarantees that the problem has been observed the very moment when it occurred and its possible effect on the following processes; in the worst case even to come to the buyer of the car has been prevented.

Toyota factories are organized by the principle of cells, each operating cell having five to six employees with one of them being the manager who works actively together with the others. One cell corresponds to one step of a factory assembly line.

Toyota uses the system called "andon", which works on the principle of a semaphore. While a production process proceeds normally with no problems – a green

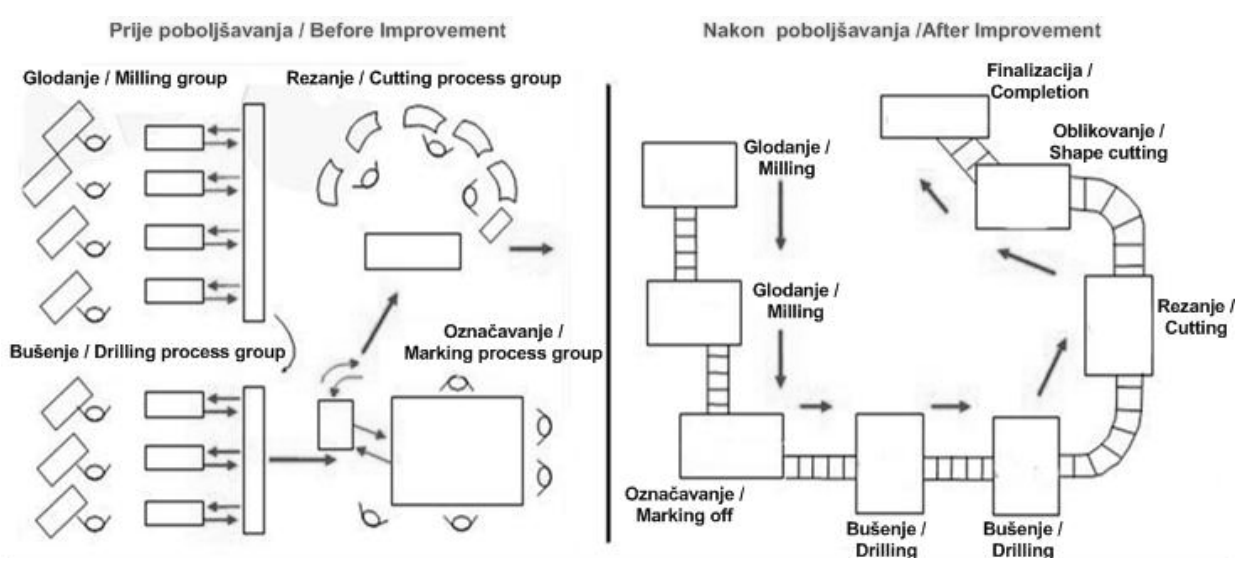

Figure 3. Traditional Layout Changed to Cellular Layout [14]

Slika 3. Tradicionalan raspored operacija zamijenjen ćelijskim [14]

flag is up. If a worker observes a problem on his working operation, he tries to solve it and if he fails, he raises an orange flag and in that moment all the members of his cell must come and help him. In the case where the problem cannot be solved until the shift of the "moving assembly line", a red flag is lifted and the whole factory is stopped. At the moment when the whole factory is stopped, the task of all the employees is to try and solve the problem. This is one of the most significant principles and advantages being developed in the Toyota's production system.

Namely, in western culture, errors are traditionally considered as weakness and people are very reluctant to admit their failure, so such a method provokes heavy resistance in new factories. The next advantage resulting from the "andon" system is that the manager is always informed at the very moment the failure occurred; because the theory says that if you do not inform your manager about the problem, it will never be solved, because nobody knows that the problem exists. The philosophy says that it is better not to produce than to produce incorrectly. "*The aim is to make things correct, for the first time*." There is never a level of quality which is "good enough"; one must always look for a way how to make it better.

Table 2. Comparison of Japanese and American Way of Production Management [14]

Table 2. Usporedba japanskog i američkog načina upravljanja proizvodnjom [14]

Japanese Production Management / Japansko upravljanje	**American Production Management / Američko upravljanje**
1. Associate; Job monitoring / Kontrola kolega	1. Manager control / Kontrola nadređenog
2. Supervision / Kontrola usmjerena na ukupni rezultat	2. Personal achievements quality control / Kontrola usmjerena na osobni rezultat
3. Dignity; Job preservation / Očuvanje ugleda	3. Policing / Utvrđivanje krivnje
4. High level of quality control / Široka uporaba krugova kontrole kvalitete	4. Limited quality control / Ograničena uporaba krugova kontrole kvalitete

The JIT production system is rather simple; it does not require much use of computers and in some industries it can offer full, stronger control than the alternatives based on computer support. The idea is to deliver the manufactured products in time for sale, sub-assemblies exactly on time for assembling into final products, manufactured parts exactly on time for including them into sub-assemblies and materials bought exactly on time for remaking into the manufactured parts. The purpose of all the "materials" is to be in active use within the entire process.

As additional advantages of the JIT system the following can be indicated:

- Better degree of capacity utilization.
- Simplified planning and distribution.
- Better quality and fewer losses.
- Better morale of workers.
- Better collaboration with suppliers.
- Quicker solving of problems.

But, before implementing the JIT system the following disadvantages should be taken into account:

- High initial investments.
- Long time until it gives results.
- Risk that your suppliers would not be able to follow you.
- Applicable for stable industries.
- Impossibility of adaption to customers' wishes.
- Permanent investment in reducing the time of tool exchange (due to small series).
- Necessary engagement of all employees.
- To reduce movements as much as possible, the factory's arrangement should be changed.
- Not all the workers succeed in adjusting to enhanced responsibility.

5. Benchmarking

If a company wants to achieve the anticipated results some guidelines should be accepted, so that its problems, business processes, functions and technical solutions could be improved. And the most effective way for establishing efficacious changes is to learn from others.

Benchmarking is not a business strategy; it is a management "tool" which improves work, being at the same time the most effective way of achieving goals – of one's own, but also the goal of a company, which is a business success. Benchmarking as a method can be used sporadically – according to the need, continuously – as a separate activity and in the frame of creating the business strategy – as its integral part.

Benchmarking is not copying, networking or passive reading of summaries, articles or books. It represents an active learning, not only just a comparison of figures or statistic data on a performance. The figures are useful for establishing gaps and disproportions in a performance; however, the real process of benchmarking is to enable identification of how and why such gaps occurred. Therefore, benchmarking is a mean for diagnosis, measuring, comparison and – what is most important – a means for learning.

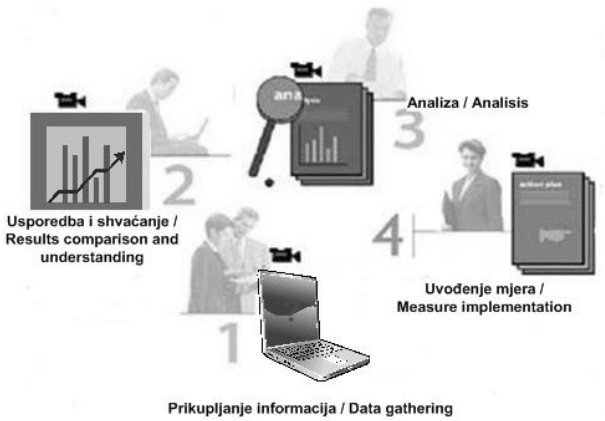

Figure 4. Benchmarking Process

Slika 4. Proces benchmarkinga

Benchmarking can indicate the areas in which our company has gaps and disproportion between where we are, where we want to be and what we should concentrate on if we want to achieve the best possible results. Consistently, benchmarking represents the approach of an organized search for better practices, giving at the same time also guidelines of how to apply these practices for providing an improved performance.

Table 3. Before and after the Benchmarking Process [4]

Tablica 3. Karakteristike poslovanja kompanije prije i nakon provođenja benchmarkinga [4]

Before Benchmarking / Prije benchmarkinga	After Benchmarking / Nakon benchmarkinga
Without innovation / Neinventivnost	Utilization of good ideas / Iskorištavanje svake dobre ideje
Only one solution / Samo jedno moguće rješenje problema	Multiple choice / Više opcija rješenja problema
Internal focal points / Fokus na interno	External focal points / Fokus na eksterno
Objectives from the past / Ciljevi iz prošlosti	Objectives for the best business activity / Ciljevi su najbolje poslovanje
Low appreciation of market / Slabo razumijevanje tržišta	High appreciation of market / Dobro razumijevanje tržišta
Internal priorities / Prioriteti interni	External priorities - customers / Prioritet potrošač
We' re good / Dobri smo	We should be better / Trebamo biti bolji
Guidance by experience / Upravljanje prema iskustvu	Guidance by facts / Upravljanje činjenicama
Progeny! / Slijedi druge iz svoje privredne grane	Leaders! / Vodeći u industriji

6. Balanced Scorecard (BSC)

According to the selection of Harvard Business Review, a Balanced Scorecard is *one of the most important concepts of management* in the last 75 years, which represents successful implementation of a business strategy through the systematic preoccupation with performances of BSC. It was established on transformation of a vision and strategy into an action plan through comprehensive monitoring of anticipated strategic goals.

Today BSC is implemented in thousands of companies, organizations and government institutions. It is estimated that 50 % of 1000 largest companies implement the BSC method.

The BSC method is effectively implemented in profit and non-profit organizations of any size. Today it helps companies in optimizing strategy and managing the activities, in testing different strategies, evaluation of achievements and changes of strategies according to feedback information and changes in the environment. Although at the beginning of the nineties it was originally conceived as a measurement system, the BSC method has developed into a system for strategic management and a powerful communication tool.

Croatian authors use different terms for the Balanced Scorecard, so in literature the following may also be found: the system of balanced indicators, balanced card of goals, balance of achievements, balanced table of results, card of balanced goals, balanced credit system, system of balanced goals.

The Balanced Scorecard system gives us the possibility to look at three different dimensions of organization performance:

- Results (finances and buyers),
- operations, and
- capacity.

The starting point of BSC method is the vision, the mission and the strategy of a business system, as shown in the following figure.

Besides presenting a measurement system, the Balanced Scorecard is also a system of management which allows the company to identify a clearer vision and strategy, which it turns into an action plan. The measures of impacts can be based on financial and non-financial information.

1. **Finances –** *How a company looks to investors and other parties involved and what should be done to succeed in a financial sense?*

A traditional financial metrics people are used to is observed. This includes profitability, income growth, costs control, etc.

2. **Buyers –** *How buyers see your company?*

It represents the ability of a company to provide products and services of good quality, effective delivery and buyers' satisfaction.

3. **Internal business processes –** *Which basic processes a company should improve to satisfy its owners and users?*

They result in efficiency of a company. They emphasize productivity, turnover cycle and costs.

4. **Learning and development –** *Can a company maintain the ability of producing value, permanent change and system improvement?*

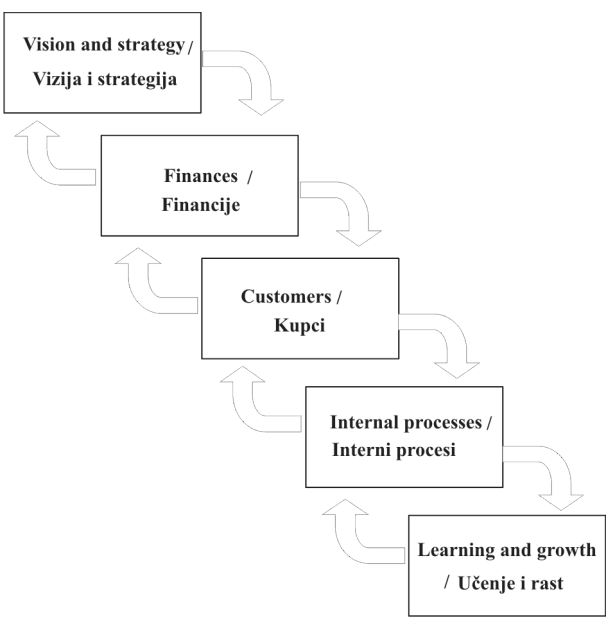

Figure 5. Perspectives of the Balanced Scorecard [7]

Slika 5. Perspektive BSC modela [7]

Here the ability of personnel is observed, quality of information system, effects of organization balance and ability of achieving the goals set. The processes will result in buyers' satisfaction only if the personnel are qualified, motivated and informed. To satisfy the ever-changing needs of buyers, personnel should adopt completely different responsibilities, new knowledge and acquire proficiency in new skills.

By introducing these four equal perspectives the problem of unilateral perception of the company's development will be eliminated.

The perspectives mentioned offer a balance between short-term and long-term strategic goals. Once the majority of assets of a company were measured by land, factories and equipment, but today, in this information age, the majority of a company's values are measured through human resources and innovativeness. Financial accounts are no longer the only standard of successfulness.

To define a vision, mission and strategy of a company as successfully as possible, but also for the purpose of analyzing the environment – external factors, as well as internal ones, different methods and techniques can be used, e.g. Boston Consulting Group portfolio matrix, product life curve, SWOT analysis, diagram of causes and effects (Ishikawa diagram, ''fish-bone'' diagram), brainstorming, method of scenario, etc.

By introducing the BSC method, the perspectives are connected with the strategy of a company. Exactly by means of perspectives, the BSC needs to translate the vision and the strategy of a company to strategic goals, cause-and-effect connections, indicators and relevant measures.

In organizations which introduced BSC the main executive manager and the rest of the top management could not implement BSC on their own. They asked for an active contribution of all the employees. In a strategically managed company, it is necessary that all the employees understand the strategy and carry out their daily business activities in a way which would contribute to the success of their strategy. Here it is not a question of a hierarchical "Top-Down" responsibility, but it is the matter of "Top-Down" communicating the strategy. Top management uses BSC to assist them in communication and education of organization on the new strategy.

In order to understand the strategy, employees had to learn about market segmentation, system of calculating variable costs, marketing, etc. In order for the employees to adopt this as well as possible, the companies carried out activities of education on the mentioned strategic components at all levels.

A successful BSC is one which represents a strategy through an integrated package of financial and non-financial measures:

- BSC describes the vision of a company in future to all employees;
- BSC creates a holistic model of strategy which enables all the employees to understand how much they contribute to the company's success. Without such bonding, individuals and departments may bring to optimum their local business activities, but they do not contribute to the achievement of strategic goals;
- Quality, price, promptness, motivation and skills of employees are measured;
- BSC directs the efforts for changes. Conservative firms based on inspections and claims are transformed towards modern innovative and flexible companies. If proper goals and measures are recognized, implementation will be successful.

Looking at BSC, we should also see what lies beyond it, the strategy which underlies goals and measures of BSC. BSC reveals those processes which are crucial to

the realization of a successful business for consumers as well as for shareholders. Linking with the goals of learning and development, reveals a logical foundation for significant investments in training of employees, information technology and systems and improved organization procedures. Investments in people, systems and procedures are the greatest novelty and improvement for internal business, buyers and eventually, owners. The process of creating BSC explains are strategic goals and it reveals the crucial promoters of strategic goals.

BSC points out that financial and non-financial measurement must be available to the employees at all levels of the organization. All the employees must understand the financial effects of their decisions and actions.

BSC translates the vision and the strategy of a company into tangible goals and measurements. It can be said that BSC is a methodology for transforming organizational strategic goals into indicators of performances. At the same time, BSC is also a structured approach for using information related to measuring performances; it significantly facilitates goal settings; it helps in allocating and prioritizing resources; to managers it provides maintenance or change of strategy of the achievement of the goals set; it enables reporting on the development in achieving them.

The measuring of performances is a process of measuring the progress in the sense that the goals are defined in advance. The perspective management represents the use of information on performance measurement to achieve positive effects in organization culture, business system and processes.

Through the use of BSC, strategy is turned to action in such a way that strategy is adjusted with organizational structure and resources, knowledge is utilized, people and processes are linked with continuous stimulation of learning and development. The achievement of strategy and operation plans integration is of major importance. For individuals, particular goals and roles are clearly set, their responsibility defined as well as monitoring and managing of impacts. The indicators reflect the balance between externally directed standards for owners and buyers and internal measures for critical business processes, innovations, learning and growth. The balance between short-term and long-term goals is established, as well as between value and non-value indicators, and internal and external perspective.

The goals of an organization cannot be arbitrary, except in one of the four mentioned perspectives. For each perspective a goal to be achieved is set, key indicators of successfulness, targeted values and initiatives that will help in realization of the goals are set.

Table 4. Balanced Scorecards in For-Profit and Not-for-Profit Sectors [7]

Tablica 4. Perspektive ovisno o vrsti organizacije [7]

Perspective / Perspektiva	Organization / Vrsta organizacija	
	Profit / Profitne	Non-profit / Neprofitne
Finances / Financije	Profit / Profitne	Control of operating and Capital Budgets / Kontrola budžeta i troškova
Customer / Kupac	Satisfying the needs / Zadovoljavanje potreba	Fulfillment of public obligations / Izvršenje preuzetih javnih obveza
Internal Process / Interni procesi	Manufacturing efficiency / Sposobnost stvaranja vrijednosti	Creation of the necessary conditions / Sposobnost stvaranja izlaza
Employee Learning and Development / Učenje i razvoj	Employee Development / Razvijanje znanja zaposlenih	Employee Development / Razvijanje znanja zaposlenih

For each goal a measure, metrics, targeted value and action is defined, i.e. the whole measuring instrument. The four perspectives are not mutually independent, but lie on the chain of causes and effects.

Through its learning and growth, an organization becomes more competent, new technologies are introduced and organization climate improved. By this, the internal processes are improved by innovations and become of better quality and more effective. In this way, at the same time the level of products and services increases, so the buyers become more satisfied and the presence of the organization on the market also increases. This results in good financial indicators such as increased profitability, increased profit and quicker return of investments.

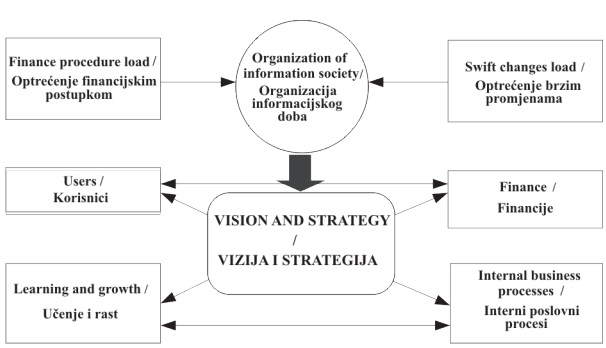

Figure 6. Balanced Scorecard as a Strategic Management System[7]

Slika 6. Balanced scorecard - sustav strategijskog upravljanja[7]

The perspective of employees is included in almost all BSCs in the perspective of learning and development. Similarly, if strong relations with a supplier are a part of the strategy which leads to successful financial business and a consumer, the results and measurements for the relations with the supplier will be included in the perspective of internal business activities.

Each organization defines its own metrics and relations in its frame. The results of measurements on a tactical level become the input data for more complex measuring instruments on a strategic level. By this, managing of an organization as a whole is provided as well as managing of particular functional areas separately. By using the BSC metrics, managers can easily and quickly establish parts of an organization which are not functioning in accordance with the business strategy.

The goals and measures defined on a strategic level are directed towards middle management that analyses the given goals depending on its functional area. The BSC is much more than a system of indicators containing also the non-financial indicators; it is a system of managing which designs an integral process of planning, managing and control. The results of BSC should also measure those factors which make competitive advantages and the success of an organization.

Like all other more demanding organizational initiatives, BSC also often records failures. The reasons are most often due to: remoteness of management to introduction of new procedures, too much or too little metrics which cannot be duly well controlled, the unbalanced structure of metrics. BSC should be used together with the application of information and communication technologies, but the companies do not have them, so this makes data collection for BSC difficult and slows it down. The absence of "Top-Down-Top Communication" is also a problem. In evaluating the results, a more subjective approach is present, rather than an objective one.

The four mentioned perspectives of the BSC turned out to be sufficient in different companies and business organizations. These perspectives should be used as guidelines, and not as a strict rule. The perspectives mentioned are used depending on business conditions and business strategy; thus some companies use only certain or additional perspectives.

7. Applicability of the Methods of Production Management

For TQM to be applicable, the business culture followed by implementation of TQM should be changed. This method enables a greater participation of employees in a firm at all stages of work, achieving by this a higher degree of collaboration and better work ethics, all leading to better effects and a more successful company. A production marketing system monitors and studies the buyer, his wishes and needs by using instruments of communication mix i.e. the Customer Relationship Management (CRM), binding the buyer to its products or services for always, winning the buyer for ever by its quality in solving and satisfying his needs for a certain product or service. This method is applied in serial and mass production, where work sharing is detailed, the production is automated, the parts standardized and the methods of technical control applied.

The very first question asked in the BPR models is: *what a company should do*, and only then: *how this should be realized*. The major concern is not improvement in a nutshell, but changes that are required are drastic. An assumption is that the existing forms of production organization have virtually fulfilled the possibilities for substantial rationalizations and have marginal possibilities for achieving improvements. Only with a particularly new approach can significant improvement be achieved. BPR is always orientated towards the process. In the analysis, the full course of making a product is taken into account, which means monitoring, testing and setting a new organization regardless of the existing limits among particular departments. In addition, specialization also increases and through the collaborative work of several departments the integration of individual functions in a coherent complex of tasks occurs. By reducing the delivery from one working place to another in a planned sequence, the possibility of possible misunderstandings and failures is reduced.

The responsibility for the whole process rests on an employee and in large and complex processes on a team of employees. Thus fewer participants take part in a process, so the competence is simplified and clearer. Competence of the right in making decisions is passed to a particular employee. By this, the need for his surveillance and control is decreased. In this way, for managing the same number of workers, fewer authorities are needed. At the same time, vertical and horizontal compressing of work gives numerous advantages: delays and total costs are less, reactions to buyers' wishes are quicker, with workers that are responsible and independent in work. This requires new concepts of educational systems. Besides the fact that a worker has to be highly qualified, he has to be ready for permanent education. And this is a characteristic of a small-serial and middle-serial production.

The consistent application of the principles of "lean production" in the existing production system leads to: the reduction of a production cycle, reduction of capital locking up, but also to reduction of the necessary personnel in all functions of a company.

A modern production approach says that we produce as much as the demand is, which means with approximately zero supplies. This is most appropriate for production on a large scale. By using JIT, materials, parts and assemblies are used only in the necessary quantity with the least possible flow time. Each employee must check the job done a step ahead, because this is at the same time a precondition to do the job well. The other characteristics of lean production are at the same time the characteristics of serial or mass production: production machines are predominantly special, distributed according to the sequence of operations – line production and cell production, respectively.

The meaning of a Balanced Scorecard is very simple. The BSC model integrates different indicators concerning the business-strategic vision through four different perspectives: financial, users', innovation and learning as well as internal business processes. The four perspectives mentioned do not eliminate but support the goals of different management techniques (like strategic planning, TQM and key abilities) which are used in the years of Balanced Scorecard. This model is best used in production of a larger scale.

8. Conclusion

Due to a quick, changeable environment, a successful company must have a developed process of making decisions. Only the companies using contemporary methods of support in decision-making may achieve and maintain the necessary quality of their business activities creating in this way a competitive advantage in controlling and managing business processes.

Investigations showed that companies fail in carrying out the strategies for four reasons:

- Awareness - 95 % of typical labor force do not understand the strategy.
- Resources - 60 % of companies do not link budget with strategy.
- Initiatives - 70 % of companies do not connect initiatives of middle management to strategy.
- Agenda of high management - 85 % of original teams spend monthly less than an hour in discussion on strategy.

New strategic orientation introduces the need for information necessary to carry out successful planning, decision making, progress monitoring and control. For that reason a management system must take into account also the external factors and must be expanded to include strategic information which could anticipate whether a company and its business will be competitive in future time.

REFERENCES

[1] AVELINI-HOLJEVAC, I.: *Kontroling: upravljanje poslovnim rezultatom*, Hotelijerski fakultet Opatija, Opatija 1998.

[2] THOMPSON-STRICKLAND: *Strategic Management: Concepts and Cases*, 12th Edition.

[3] KRAJEWSKI, L.J; RITZMAN, L.: *Operations Management: Processes and Value Chains*, Manoj K. Malhorta. 8th ed. Upper Saddle River, N.J.: Pearson Prentice Hall, 2007.

[4] RENKO, N.; DELIĆ, S.; ŠKRTIĆ, M.: *Benchmarking u strategiji marketinga*, MATE, Zagreb, 1999.

[5] KAPLAN, R.; NORTON, D.: The Balanced Scorecard, Harvard Business Press.

[6] KAPLAN, R. S.; NORTON, D.P.: *Strategy Focused Organization*, Harvard Business School Press 2000.

[7] KAPLAN, R. S.; NORTON, D.P.: *The Balanced Scorecard*, Translating Strategy into Action, Harvard Business School Press 1996.

[8] NIVEN, P.: Balanced scorecard, Step by Step Maximizing Performance and Maintaining Results, 2002.

[9] VUJIĆ, V.: *Kako uspješno voditi poduzeće*, GEA College PIC, Ljubljana, 2000.

[10] GRANT, E. L.; LEAVENWORTH, R. S.: *Statistical Quality Control*, McGraw-Hill, New York, 1988.

Internet addresses:

[11] http://efzg.globalnet.hr, 2009.

[12] http://kvaliteta.inet.hr, 2009.

[13] www.balancedscorecard.org, 2009.

[14] www.deloitee.com, 2009.