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Full Length Research Paper

Key performance indicators in a joint-stock company

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This paper presents a method of problem solving using Key Performance Indicators to measure, monitor and manage business results in a joint-stock company. A joint-stock company has a large number of functions, that work on the principle of several profit centers, which have mutual processes of management, marketing, development, sales, supply and logistics and have an established Quality Management System according to the demands of the ISO 9001:2008 standard. At the same time, the measurement of process performance, as a key element of the Quality Management System in a joint-stock company must be done in a unique manner no matter the diversity of the functions. This is the basis for development of the unique measurement methodology of performance process measurement and key business indicators as a whole. The results of the application of a given methodology on certain processes in a given joint-stock company are described.

Key words: Key performance indicators (KPIs), quality, system, joint-stock company, balanced scorecard, total quality management (TQM).

INTRODUCTION

Globalization of the world market and the speed of technical and technological developments have entirely changed the business environment, the certainty of which we can no longer speak. Today, every business must be globally competitive for survival in the market. Competition knows no boundaries. In modern businesses, organizations are confronted with different demands from consumers, innovative technologies and the growing pressure on cost and product development time.

In these changing surroundings, companies can survive and achieve their long term goals only through timely definition of a good strategy and its successful implementation. These processes can be achieved through familiarization and implementation of certain management methods that are used to measure business success.

The path to adjust quickly to these changes requires the establishment of a flexible organizational structure that can be adjusted quickly, to unexpected changes - dangers and opportunities. Classical, rigid organizational structures are in the past. Their maintenance in companies shows their inability to insure future survival and development. Also, in adjusting to change conditions, the organization should expand their functions, so that they start working as joint-stock companies.

The company that has different functions, a branched organizational structure, complex internal relations between processes and dissolved management in width and depth is defined as a joint-stock company. The latest research shows that the complexity of the company in general is conditioned by (Maksimović et al. 2008) the number of elements and their relations. This is shown by the number of connections between the elements of the company structure.

Due to the increased efficiency of the organization's business and adjustment to market movement, the joint-stock company must be viewed as a network of business processes, and not as a hierarchical structure of organizational units defined by the organizational scheme.

General approaches and principles in an organization and managing the joint-stock company - based on the

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development of the structure of the company and integration of its functions, are universally valid and create the establishment of the standardized criteria system - performance parameters of the processes that are sufficient and needed to maintain the efficiency of the process and general success of the joint-stock company. On this basis, a model of joint-stock company quality assurance can be built. It should be noted that quality has become a key to competition in the open market. It will become a fundamental method of running every business, anywhere in the world.

Changes in the market and in companies have presented the need for adjusting to certain standards. The notion of quality has changed as well - as an organization's quality, not just the quality of the product and service, the quality of the organization as a whole must be improved through the establishment of quality standards in the entire business. Quality is no longer a concern of just the supervisors and the technical staff, but becomes a main task and responsibility of upper management.

Quality as, in the modern concept of business, (Maksimović et al. 2008) become a tool for achievement of all business goals that sets before company management the task of achieving as high a level of satisfaction as possible in a manner that balances the interests of all parties.

Given a basis of organization, management and functioning of business systems - companies have a goal of increasing product quality that is integrated and observed by the company as a whole and sets partial goals of its elements in consent with integrated goals. This can be done only through a systems approach in observing business systems and using methods and techniques of systems theory and cybernetics in the analysis, and application of modern management techniques supported by informational technologies. At the core of such a management system, among other things, is a quality management system (QMS) that is built on eight principles. These principles have been derived, among other things, as a consequence of the experience of the best companies in the world and adhere to the ISO 9001:2008 standard. Finally, the process of establishing a Quality Management System under the conditions of a real business system should show the efficiency and effectiveness of the Quality Management System and, through the mechanism of reversible connections should secure permanent corrective activities and the improvement of projected solutions. The complexity of processes and relations in a joint-stock company today is a cause of the existence and the need for establishing sophisticated management processes that follow the most representative indicators of performance and allow management to take appropriate action on the performance values. The complexity of managing processes has been studied for decades in a scientific environment from a number of aspects, from fundamental to entirely practical.

Special attention must be given to the implementation of new approaches to management, both in a conceptual, and in an organizational sense.

Wider acceptance of a new marketing model is required. A communication component of marketing is presented through a model of integrated marketing communication, then the development of integrated management systems based on standards of quality management, etc.

A complex company that wishes to be successful in a turbulent and complex business environment must adopt a policy that will make the organization capable of doing three important things simultaneously - improve, expand and innovate.

BRIEF LITERATURE REVIEW

Quality as a strategy of development of competitive advantage and achievement of business success has been recognized previously. The initiators of quality management philosophy were Joseph Juran (Juran et al., 1999), Philip B. Crosby (Crosby, 1996) and Kaoru Ishikawa (Ishikawa, 1989). They were the founders of the program named Total Quality Management (TQM). The basic idea of TQM is that management of the organization is concentrated on quality, based on participation of all employees, with the goal of long term business success achieved through the pleasure of employees and customers.

The basic goal of such an approach is quality awareness in all organizational processes at all levels. All employees in the organization must be aware of the need of final customers. A great step in securing development of the quality management approach based on TQM was achieved through regional awards given for quality such as the Deming Award in Japan (Deming, 1986), the Malcolm Balridge in the USA and the European Award for quality in Western Europe. Thanks to these regional awards, a lot of modern methods were developed for performance-measurement that add new dimension to the existing measures of company scorecards.

Most modern studies concerned with engineering management are focused on the application of existing models and the development of new models upon which business excellence can be achieved. These include establishment of the systems approach, integration with existing approaches and models, and the definition of key elements (metrics attributes, improvement areas, control methods, identification of elements key for changes). Control and delivery of strategic goals is achieved through inter-organizational measures and their comparison with historical data from the company's database (List et al., 2005). A great deal of scientific research deals with the problems of program establishment of measuring process in the company. This is in regard to measuring establishing the process, establishing the database, selection of the optimal cluster of indicators, measurement, and application of different statistical models to analyze data for performance improvement.

Modern research (Garengo, 2009) contributes to understanding the performance measuring system based on the example of leading small and middle companies in Italy. Performance measurement data are shown, as well as recommendations as to how they can be used for evaluating the performance measurement system. They include criteria usage for the achievement of high efficiency of the Quality Management System based on the TQM principles under which a small or a middle company would most probably achieve business excellence as the quality award winner.

Different researchers are trying to set a cluster of quantities that would be useful for advanced development process management of software products. They include initiation and control of improvement program realization. An optimal cluster of elements, evaluated on an industry case study, was suggested (Wang et al., 2006).

An example of the functioning of modern methods of performance measurement in a joint-stock company with the suggestion for efficient and effective process and quality management and the purpose of business excellence achievement was presented by Abran et al. (2004). Management based on quantity data is one of the conditions of greater maturity in the company mentioned in this model of quality management.

The international standards organization (ISO) points out the significance of measurement and quantity process management in a complex company. One proof of the importance of quantity measurement in the development of software programs is that the software engineering body of knowledge, SWEBOK, as one of the standard references for software engineering, is planning to incorporate a special knowledge area dedicated to measurements.

In the early 1990's, a new organization performance measuring system was developed under the name balanced scorecard (BSC). This was just a reporting tool in the beginning, but included the critical aspects of business. Today, BSC is a system, or a methodology that transforms the mission, vision and strategy of the organization into a comprehensive cluster of selected measures that secure a framework for strategy implementation. It is used for the transformation of organizational strategic goals to performance indicators.

The Balanced Scorecard is a concept presented by Robert Kaplan and David Norton at the end of the last century as a revolutionary new system for performance measurement (Kaplan and Norton, 1999). The basic idea is that BSC be a model for managers.

The balanced scorecard cannot function, as all modern systems of measurement of performance, without informational support. The complexity of the business surroundings and companies today is such that the company, for performance measurement must use a number of information and process a large amount of data, which can be done only with excellent informational support. A well built informational system was presented as one of the most important factors of successful implementation of BSC (Kaplan and Norton, 2001; Alleman, 2003; Clinton et al., 2002; Martinsons et al., 1999).

This paper presents one approach to establishing, managing and measuring key performance indicators of the company to include the establishment of a quality management system based on ISO 9001:2008 standards, and TQM principles, with application of the balanced scorecard methodology. This model of a company's key performance indicators can be used as a basis for successful management, with a special focus on joint-stock companies with a diverse (complex) organizational structure.

COMPANY'S KEY PERFORMANCE INDICATORS - THE METHODOLOGY AND DETERMINATION

For the company to accumulate the knowledge necessary to achieve its goals, measurement of Key Performance Indicatoirs (KPIs) is obligatory. Measuring and reporting in the Balance Scorecard concept are done through Key Performance Indicators in light of certain perspectives that include different key processes in business. These are, originally (Kaplan and Norton, 1999) financial perspective, buyers perspective, internal processes perspective and learning and development perspective.

Due to different views on the measuring problem and success rating, additional different measuring methods were developed such as the balanced scorecard (BSC), system of 20 keys, Six-sigma models, TQM, etc. Lately, the balanced scorecard has become the most used model due to its rationality and reliability. It tracks an optimal number of key characteristics, whose selection comes from the vision and strategy of the company. The research (Kaplan and Norton, 2001) has shown that the BSC, in comparison to other models, is mostly directed to the results and nearest to the consumer. It is easily connected to other tools for success measuring that are used in the company.

In the research presented in this paper these methods and techniques are used:

1. System approach.
2. Deductive methods.
3. Literature review.
4. Analysis.
5. Synthesis.
6. Comparative methods.
6. Mathematic modeling.
5. Process mapping.

The performance indicators become key elements that enable the company to learn, based on experience and condition of the changes that are presented for future performance improvement. KPIs, for a joint-stock company viewed from the perspective of internal processes, are determined by analysis of single process parameters used in a given company and are presented in Table 1.

Presented KPIs are specific to a specific company/ industry - Not a generic Key elements of many industries.

ESTABLISHMENT OF KEY PERFORMANCE INDICATOR SYSTEM IN A JOINT-STOCK COMPANY

Joint-stock company organization

Since quality has become one of the most important strategic factors of success, changes in the market have led to new approaches to quality. The quality of services and goods is conditioned not only by the characteristics of the products/services and the effectiveness and efficiency in production and quality control, but also includes the market approach and quality characteristics, of the organization and all of its processes. Successful realization of the process includes realization of timely management action in, organizing and securing needed inputs with the goal of accomplishing set plans.

Constant monitoring of the plans presents an opportunity to manage the processes and elements that influence realization. It is necessary to stress that the goal is setting planned values for variables, such that the participants in a planning process will have the opportunity to select the variables that they think are most acceptable (Schmitz and Platts, 2004; Busi, 2005; Lin and Yahalom, 2009; Rodriguez et al., 2009).

A complex company that has adjusted to changes in the market and made constant progress over the classical approach has dealt with production [exploatation of mineral material (bauxite ore)]. It has begun to develop other functions, such as: traffic, production (exploatation) of non metal material, machine production, food production, construction, hotel services, gas and oil sale and other functions that are on the market today.

The assumption was that leading such a complex company would be even more successful after the establishment of a Quality Management System, based on a method that assures constant business improvement, with the goal of constant improvement of its performance. Today, such a complex company has a dispersed organizational structure, as shown in Figure 1, and complicated internal relationships between processes. The management of the company is complex as well.

Process model in joint-stock compay

Every functional activity in a complex company has its own working processes that are managed such that the business is done in a way that assures stabile connections. The goal is that the work, as a whole, should be done effectively and efficiently. For effective and efficient management, processes were identified, that present the basis for the QMS functioning in that company.

Processes and their connections are presented in a process model for a typical joint-stock company (Figure 2). It is comprised of the following process groups:

1. Managing process.
2. Realization process.
3. Support process.
4. Monitoring, measurement and improvement process.

The Quality Management System is an abstract and organizational system, the project of the applicable model is presented in the form of project documentation (log, plans, procedures, manuals, records...) in which technical development also requires certain standard demands. In a company with complex functionality, there is a need that the area of influence of certain documents be expanded and generalised. Certain universal processes occur in more organizational units, at many locations. It is necessary that they have mutual documentation.

It should also be mentioned that the process of distribution and documentation of the management system, which includes updating, accessibility on working posts, the possibility for usage and the ease of change in a company with complex functionality and structure, is impossible to be realized with the application of classic and manual procedures. In the observed company, a given process and a number of other system activities is supported by a so called QS module of the integrated information system.

Following, is part of the procedure for the surface production of the bauxite ore, with the example of the diagram flow, the defined schedule and method of activities and responsibilities of the participants in this process, is observed in the company (Figure 3).

Performance and goals management system in a complex enterprise

In the era of new economy (Knowledge Economy) the enterprise is expected to, in order to survive and improve, have great speed and flexibility, cooperation and organizational effectiveness and efficiency. Management performance is the key to organizational effectiveness and efficiency, giving the changing conditions of today.
Performance measuring systems play a significant role. They are the basis for evaluation and grading realization success as a key component of the company's goals within its competitive strategies (Elg and Kollberg, 2009; Goold, 2003; Franceschini et al., 2006; Schonberger, 2008; Downing, 2000).

In a given complex enterprise, a system of performance and goal management is established, developed and formalized for making, monitoring, measuring and controlling goals. The enterprise has a large number of processes and performances, which led to their grouping such that the BSC concept was applied in performance measurement to the following four areas or perspectives:

1. Financial perspective.
2. Consumer perspective.
3. Internal process perspective.
4. Innovation and learning perspective.

Key performances, viewed from the perspective of internal processes, are determined with the analysis of single process parameters. Manual examples are shown as well as the results of key performance process measurements of the surface production of bauxite ore, purchase, sale and maintenance of the mining and construction machines on the digging sites (Tables 2, 3, 4 and 5).

The results of KPI measurement in the observed joint-stock company were presented, as examples, in the "Process performance cards - Quality Process Characteristics" (Tables 2, 3, 4 and 5).

Cards "Quality Process Characteristics" contain:

Table 1. Analysis of single process parameters used in a given company.

Process parameters	Key performance indicators
Managing processes	
Business plan and analysis; performance and process analysis; internal and external communication	Plan and realization deviation; number of observed errors; plan development delay Analysis delay
Human resource management, employee records, employee specific training	Human resources adequately utilized; human resources plan realized; education and training plan realized
Quality assurance processes	
Method and techniques quality improvement Corrective and preventive measures, Quality management system documentation management	Customer satsfaction level; QMS effectiveness; key process goals
Marketing, commercial and economical and financial processes	
Public relation, market search, market information analysis and customer satisfaction evaluation	The degree of realization of obligations; level of customer satisfaction
The supply of materials, products and services, Rating and supply selection, Incoming control and acceptance of material and products, Resolution of complaints for purchased products and services:	Purchased product/service quality; timely supply of product/service; supply expenses
Sale-wholesale, retail, buyer complaint resolution:	Sold product/service quality; timely sale of product/service; buyer contact realisation
Development and information technologies application processes	
Investment development, product development, service development, geological exploration, geo project and measurement:	Number of incompatible projects; project realisation speed; building expenses
Production and control processes	
Mineral materials exploatation planning and preparation, exploatation terrain preparation, machine production planning and preparation	Production start delay; production realisation report update
Bauxite surface production, non metal production, building products production, machine production, agricultural products processing, consumer eggs production:	Product quality; product development time; product development expenses
Service processes	
Weight transport, remote traffic, passenger traffic, construction works, hotel services	Service quality; service duration; service expenses

Table 1. Contd.

Support processes	
Mining and construction mechanization on the digging site maintenance, vehicle maintenance, equipment maintenance:	Maintained product/service incompatibility; maintenance plan realisation; maintenance expenses
Infrastructure maintenance	Missing infrastructure; working tools delay; infrastructure maintenance expenses

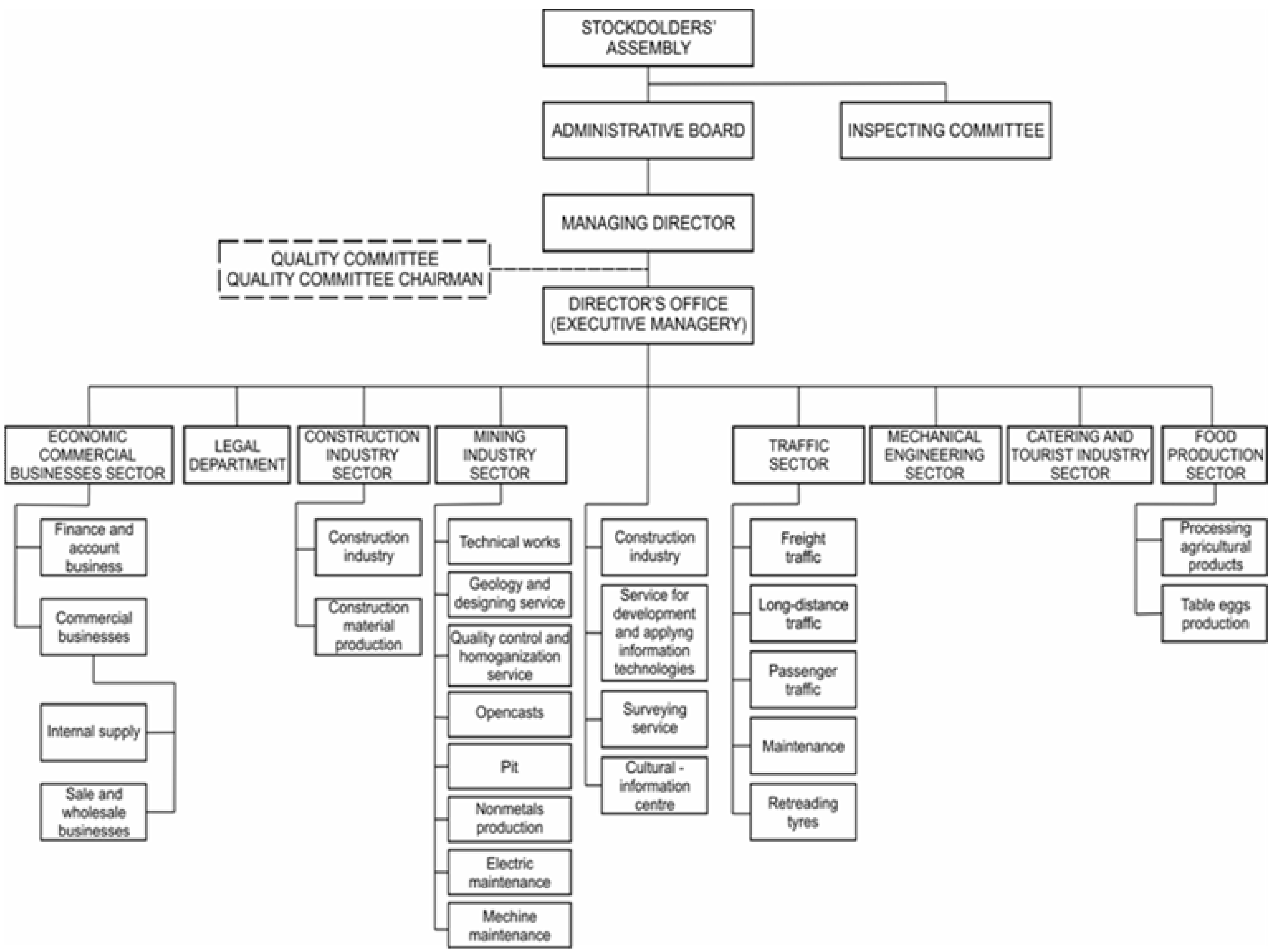

Figure 1. Organizational structure of real complex enterprise.

1. Three different Key Performance Indicators for each process.
2. Instruction (formula) for calculating Key Performance Indicators, as "quality index".
3. Calculated quality indexes and their garde (Grade O), through application of unique, specially developed scale of 10 - 100 range.
4. Quality index correction, through the introduction of

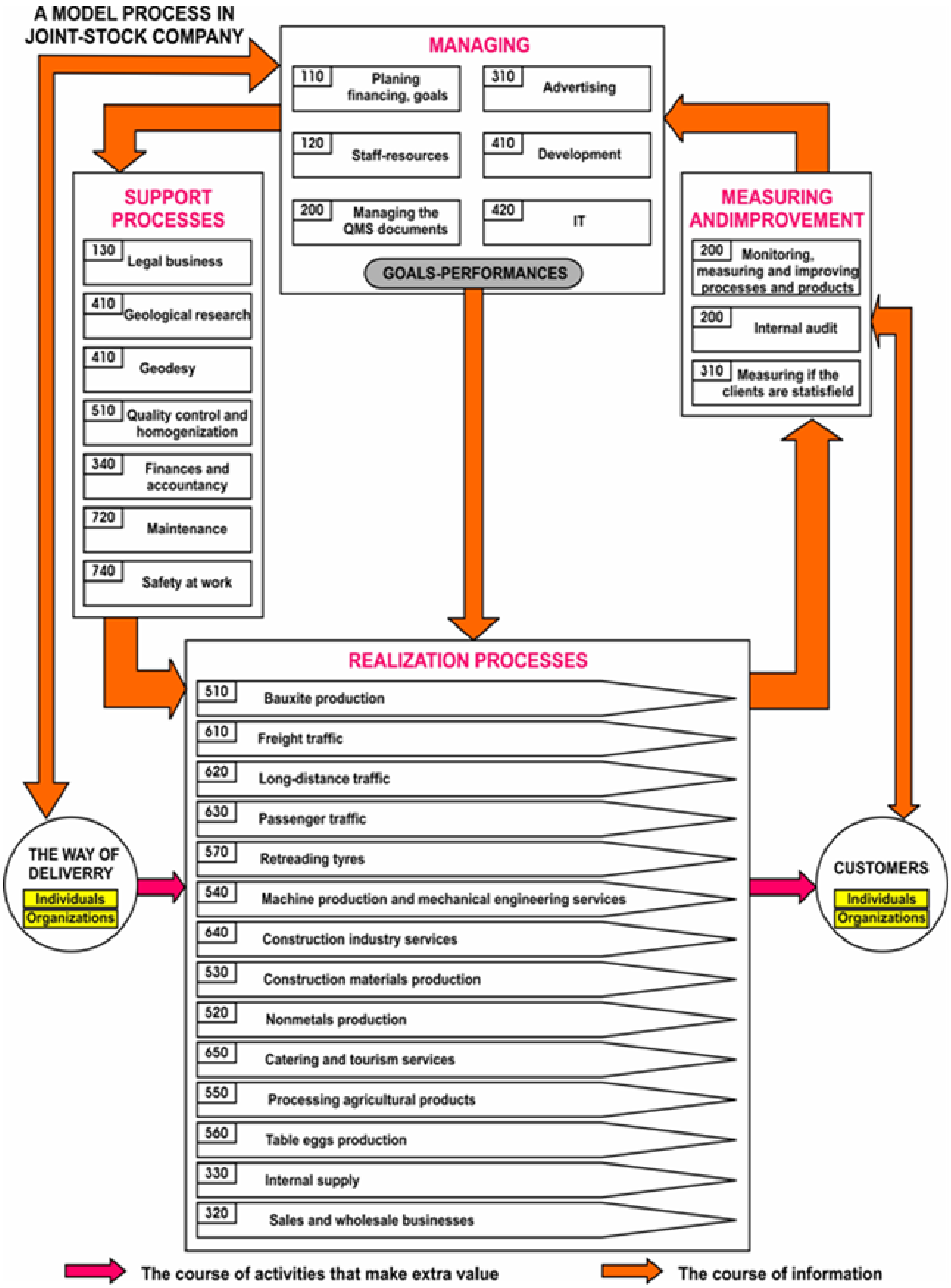

Figure 2. Process model for a real complex enterprise.

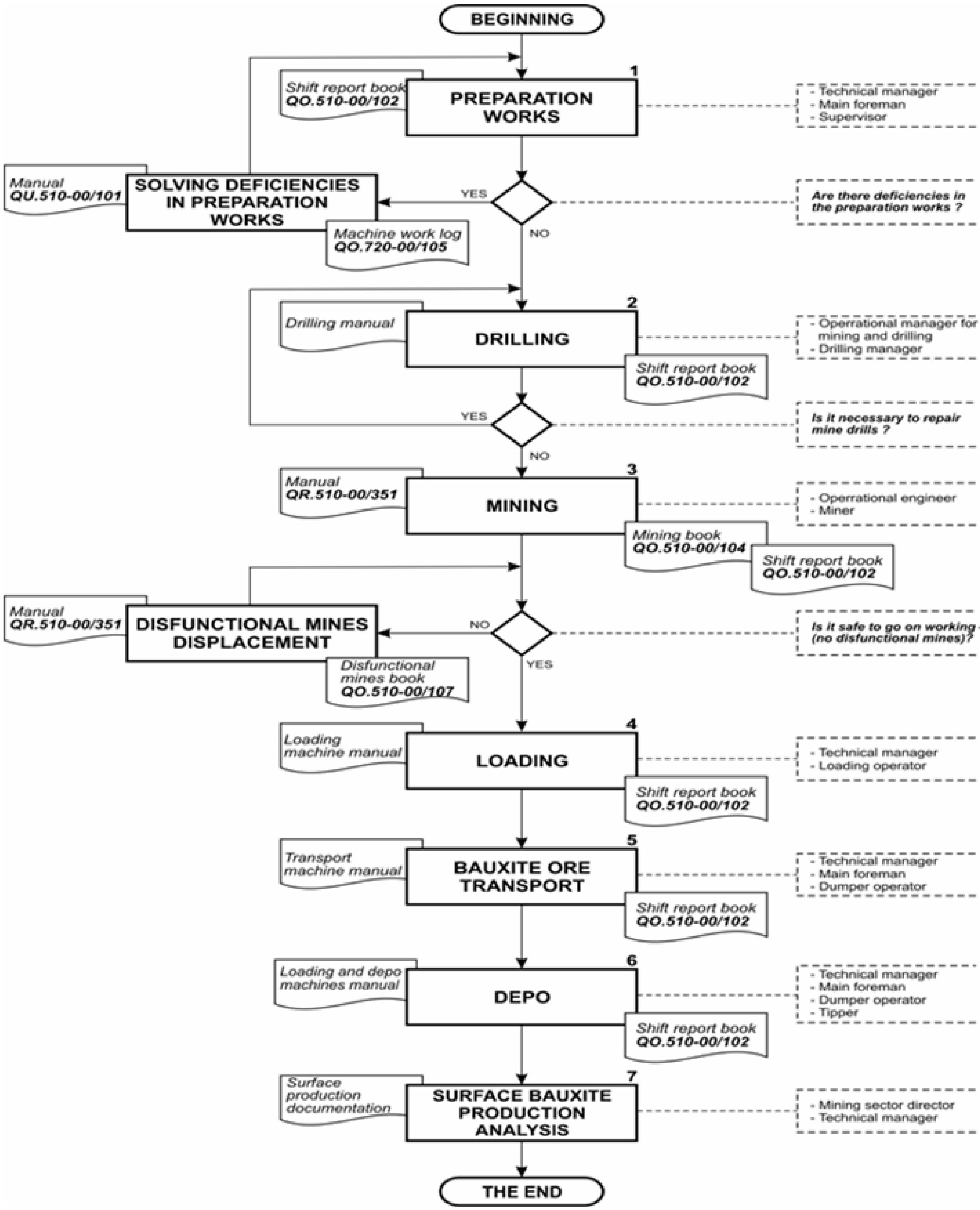

Figure 3. A flow diagram for bauxite surface-production process.

Table 2. Results of key performance indicator measurements of process 510 - bauxite production.

Quality process characteristics 510 - bauxite production			Process goals measuring results 510 - bauxite ore
Product quality - bauxite ore	**Exploatation time - bauxite ore**	**Bauxite ore exploatation cost**	
$IQ_P = 101 - \frac{\sum_{i=1}^{n} F_{zi} \times n_i}{N}$	$IV_i = \frac{V_i^u}{V_i^p} \times 100\,[\%]$	$IT_i = \frac{T_i^u}{T_i^p} \times 100\,[\%]$	see below
where: IQ_p - bauxite ore quality index F_{zi} - product incomperability significance factor n_i - amount of bauxite ore with the same signif factor N - total ore amount	where: IV_i - exploatation time index ore - bauxite in observed period V^u_i - total spent time for the exploatation total ore amount in observed period V^p_i - total planned time for exploatation of total planned ore bauxite amount in the same period	where: IT_i - exploatation cost index T^u_i - total exploatation cost in planned period T^p_i - total exploatation cost in observed period	
F_{zi} / Descriprion 1 – Ore - bauxite sent witout incomperability 50 – Ore - bauxite sent with minor incomperabilities that did not effect the final reception 100 – Ore - bauxite declined on the final reception			
Data source - QO.510-00/105 - Quality record ore - bauxite - Evidence of the operational workr on the control and homogenization plateau	- QO.110-00/102 - Annual production plan ore - bauxite - Buyers contract - Working account - Information system	- Working account - book record - Information system - QO.320-00/102 -Sales realization record	

Process goals measuring results 510 - bauxite ore:

Process characteristics IQ_p	IV_i	IT_i	
88	1.16	23	Process characteristics values
100	0.9	10	10
90	1.0	20	9
80	1.1	30	8
70	1.2	40	7
60	1,3	50	6
50	1.4	60	5
40	1.5	70	4
30	1.6	80	3
20	1.7	90	2
10	1.8	100	1
			Process characteristics rating scale
9	7	9	Grade O
3	4	3	Ponder P
27	28	27	Points= OxP
Total points			82
30	40	30	100% max goal value
Goal accomplishment percentage			82%

factors of their significance from 1 - 10 (Ponder P) and 5. Total process quality grade, as percentage of set goal achieved.

The examples shown are based on parameter analysis of single processes was done by measuring key performance indicators through the analysis of four connected processes (surface production of the bauxite ore, supply, sales and maintenance of the mechanization) in a time span of one month. It can beseen that during a certain time period, the total quality of business can be managed. Acting on Key Performance Indicators, it is possible to take actions and initiatives that can correct some noted deficiencies. By monitoring key performance indicators from the view of business process effectiveness and efficiency, they can warn of possible irregularities in earlier phases of the business. It is possible to proactively take actions to avoid or diminish negative performance with respect to indicators in the financial perspective and the entire business.

As presented on Tables 2, 3, 4 and 5, the results of key performance indicators measurement of observed

Table 3. Results of key performance Indicator measurements of process 330 – supply.

Quality process characteristics 330 - supply			Process goals measuring results 330 - supply
Purchased products quality index	**Timely purchase index**	**Supply cost index**	
$IQ=101-\frac{\sum_{i=1}^{3} F_{ti}\times n_i}{N}$ where: *IQ* - quality index of purchased products in given period F_{ti} - quality factor of entry product delivery compared to quality n_i - shipments number with the same significance factor for the given quality *N* - total delivery of entry products in a given period	$IB_n=\frac{UV_n^1}{N}$ where: IB_n - timely supply index UV^1_n - number of delayed supplies of input products in a given period *N* - total input product deliveries in given period	$IT_n=\frac{UT_n}{V_p}\times 100[\%]$ where: IT_n - supply cost index UT_n - total supply cost in given period V_p - sale value in a given period	see below
Data sources - F_{ti}, n_i, *N*: QO.330-00/108 - Supply realization record	- UV^1_n, *N*: QO.330-00/108 - Supply realization record	- UT_n: QO.330-00/108 - Supply realization record - V_p: QO.320-00/105 - Sale realization record	

F_{ti}	Delivery quality
1	For deliveries accepted without or with minor deficiencies
50	For deliveries accepted with significant definienciencies
100	For rejected deliveries

Process goals measuring results 330 - supply:

Process characteristics *IQ*	*IB*$_i$	*IT*$_n$	Process characteristics values	
68	0.9	20		
100	0.5	5	10	Process characteristics rating scale
90	0.6	10	9	
80	0.7	15	8	
70	0.8	20	7	
60	0.9	25	6	
50	1.0	30	5	
40	1.1	35	4	
30	1.2	40	3	
20	1.3	45	2	
10	1.4	50	1	
7	6	7	Grade O	
5	2	3	Ponder P	
35	12	21	Points = OxP	
Total points			68	
50	20	30	100% max goal value	
Goal accomplishment percentage			68%	

processes show that the percentage of goal achieved is: Process 510 - bauxite production 82%; process 330 – supplies 68%; process 320 - sale 74% and process 720 - mining and construction mechanization maintenance on the digging sites 83%.

Through analysis of key performance indicators for the joint-stock enterprise during the observed time period, we can gain valuable information on the current status of single processes.

We can perform additional analysis, and use the results as the basis for corrective actions in case of bad business or continuation of the initiative in case of business that was better than planned. The reverse connection is created towards the organizational units responsible for process realization and management of the company. Based on the presented segment of the balanced scorecard model - the perspective of internal processes, the implementers of the process can, through revision and improvement of initial decisions, positively influence the further development of the business, which means that the balanced scorecard model application, as a connection between strategies and actions, helps the company to learn and continuously improve.

CONCLUSION

The establishment of a quality management system in a joint-stock company includes executing a project that will

Table 4. Results of key performance indicator measurements of process 320 – sale.

<table>
<tr><th colspan="3">Quality process characteristics 320 - sale</th><th rowspan="2">Process goals measuring results 320 - sale</th></tr>
<tr><th>Sold products quality index</th><th>Timely sale index</th><th>Buyer contact realization index</th></tr>
<tr>
<td>

$$IQ = 101 - \frac{\sum_{i=1}^{3} F_{ti} \times n_i}{N}$$

where:

IQ - sold products quality index in a given period
F_{ti} - quality factor of deliveries output products compared to their quality
n_i - number of deliveries with the same significance factor for determined quality
N - total number of deliveries for output products in given time

<table>
<tr><th>F_{ti}</th><th>*Delivery quality*</th></tr>
<tr><td>1</td><td>For deliveries done without or with minor deficiencies</td></tr>
<tr><td>50</td><td>For deliveries done with significant definienciencies</td></tr>
<tr><td>100</td><td>For rejected deliveries</td></tr>
</table>
</td>
<td>

$$IBI_n = \frac{UVI_n^1}{N}$$

where:

IBI_n - timely sale index
UVI^1_n - number of delayed product deliveries in a given time
N - total number of product deliveries in a given time
</td>
<td>

$$IK_n = \frac{PK_n^1}{N}$$

where:

IK_n - buyer contact realization index
PK^1_n - number of realized contacts in a given time
N - total number of planned contacts in a given time
</td>
<td>
<table>
<tr><th colspan="3">Process characteristics</th><th></th><th></th></tr>
<tr><td>IQ</td><td>IBI_n</td><td>IK_n</td><td></td><td></td></tr>
<tr><td>76</td><td>0.32</td><td>0.9</td><td>Process characteristics values</td><td></td></tr>
<tr><td>100</td><td>0.1</td><td>0.5</td><td>10</td><td rowspan="10">Process characteristics rating scale</td></tr>
<tr><td>90</td><td>0.2</td><td>0.6</td><td>9</td></tr>
<tr><td>80</td><td>0.3</td><td>0.7</td><td>8</td></tr>
<tr><td>70</td><td>0.4</td><td>0.8</td><td>7</td></tr>
<tr><td>60</td><td>0.5</td><td>0.9</td><td>6</td></tr>
<tr><td>50</td><td>0.6</td><td>1.0</td><td>5</td></tr>
<tr><td>40</td><td>0.7</td><td>1.1</td><td>4</td></tr>
<tr><td>30</td><td>0.8</td><td>1.2</td><td>3</td></tr>
<tr><td>20</td><td>0.9</td><td>1.3</td><td>2</td></tr>
<tr><td>10</td><td>1.0</td><td>1.4</td><td>1</td></tr>
<tr><td>8</td><td>8</td><td>6</td><td>Grade O</td><td></td></tr>
<tr><td>4</td><td>3</td><td>3</td><td>Ponder P</td><td></td></tr>
<tr><td>32</td><td>24</td><td>18</td><td>Points = OxP</td><td></td></tr>
<tr><td colspan="3">Total points</td><td>74</td><td></td></tr>
<tr><td>50</td><td>20</td><td>30</td><td>100% max goal value</td><td></td></tr>
</table>
</td>
</tr>
<tr><td>**Data sources**
- F_{ti}, n_i, N: QO.320-00/105 - Sale realization record</td><td>- UVI^1_n, N: QO.320-00/105 - Sale realization record</td><td>- Information system</td><td>Goal accomplishment percentage: 74%</td></tr>
</table>

result in a system and processes that are in accordance with the current international standard (ISO, 9001:2008), in comparison to which the company will be graded and certified.

The time dimension of the performance grade, determining measures and changes and their realization is equally important as well as the questions of what is measured, how they are measured and which actions are taken.

Quality approaches are constantly changing for achieving greater satisfaction of the buyers, final consumers and other interested parties for the products, services or business systems. This change is illustrated by the trend in the changes of standard quality definition that, besides products and services, includes other elements of business and business systems, and includes not only the demand of the buyers, but all parties. Thus, quality becomes a central factor in the theory and practice of management. With the application of information systems, or electronic recording of certain parameters, easy and quick availability of data was established and their analysis for obtaining relevant new information for the performance management process. Data that is electronically recorded can be easily analyzed, partly for the analysis and presumption of the surrounding changes but even for the calculation of Key Performance Indicators (of the whole organization, business units, working groups, individuals and reporting). KPI monitor and control information system, preventive and control actions, are solutions that can be applied to the performance management of the organization.

Further research should be directed to monitoring, neasuring and managing business results in a complex company for the other three perspectives:

Table 5. Results of key performance indicator measurements of process 720 - mechanization maintenance.

Quality process characteristics 720 - maintenance			Process goals measuring results 720 - maintenance
Maintained mechanization incompetability index	**Mechanization setback index**	**Maintenance cost index**	
$$IN_{om} = \frac{B_{nom}}{B_{uom}} \times 100[\%]$$ where:	$$IZ = \frac{\sum_{i=1}^{n} T_z^i}{\sum_{j=1}^{m} T_r^j} \times 100\,[\%]$$ where:	$$IT_o = \frac{UT_o}{V_p} \times 100\,[\%]$$ where:	
IN_{om} - maintained mechanization incompetability index B_{nom} - number of incompetabile maintained mechanization in a given period B_{uom} - total number of maintained mechanization in the same period N - total number of input product delivery in the same period	IZ - setback index T^i_z - setback time of i mechanization (corrective and preventive) n - total number of mechanization that was in setback in a given period T^j_r - available time of j mechanization = number of working days x 7,5 x burden coefficient Burden coefficient is experience data m - total amount of available machanization	IT_o - maintenance cost index for a given period UT_o - total cost of preventive and corrective maintenance including services V_p - sales value in a given time	
Data sources - Information system: 1. Working account 2. Exam paper	- Information system: 1. Repair account 2. Failure card 3. Preventive activities plan	- Maintenance cost records Book records: 1. Service provider invoice 2. Sales records	

Process characteristics				
IN_{om}	IZ	IT_o		
24	2,6	3,1	Process characteristics values	
10	<1	<1	10	Process characteristics rating scale
20	2	2	9	
30	3	3	8	
40	4	4	7	
50	5	5	6	
60	6	6	5	
70	7	7	4	
80	8	8	3	
90	9	9	2	
100	>10	>10	1	
9	8	8	Grade O	
3	4	3	Ponder P	
27	32	24	Points = OxP	
Total points			83	
50	20	30	100% max goal value	
Goal accomplishment percentage			83%	

1. Financial perspective.
2. Consumer perspective.
3. Innovation and learning perspective.

According to the balanced scorecard concept, measurement of key performance indicators for the joint-stock company need to be included.

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