# MEASURING PERFORMANCE OF THE PLANNING AND DESIGNING PROCESSES FOR THE UNIQUE PRODUCTS

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**ABSTRACT**: One of the key functions of management is performance management, with application both at organizational and individual levels. From idea to action and results is a real journey. And maybe the most used term in everyday life, to reflect the progress and results of this trip is "performance". The "performance" term may be used at several levels (like organizational performance, team performance), to express the general achievements (such as performance in sport) or to reflect a standard by which to compare variables between similar entities. In this paper the author presents an original way of measuring performance of the design and planning processes designed for industrial organizations producing unique products.
**KEY WORDS**: measuring, performance, planning, design, process.

## 1 PLANNING AND DESIGN CHARACTERIZATION THROUGH PERFORMANCE INDICATORS

In scientific management, performance is associated with two key processes: performance management and performance measurement. These two key processes cannot be separated from each other because the performance management is both a predecessor and a successor of performance measurement.

Performance management is central process linked to the performance. It reflects the approach that an entity has with regard to performance and includes sub-processes such as: defining the strategy (planning / setting of objectives), strategy implementation, training and performance measurement systems.

Performance measurement is a sub-process of performance management that focuses on identifying, tracking and communicating results, using performance indicators. It takes into account the evaluation results, while performance management refers to the start of action based on evaluation results and to ensure that the targeted results are achieved (***, 2014).

In all systems of performance measurement is necessary to identify performance indicators by which we can analyze the results.

Through a performance indicator can assess the extent to which certain requirements are met.

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So it can show us the limits of expected performance and can be represented like form such as:

- numerical when indicates the quantitative aspects (performance expected in relation to certain characteristics of products or a process parameters);
- awarded when indicates the expected qualitative aspects (eg. compliant / non-compliant; very small / small / medium / high / very high; Yes/No etc.).

In Total Management in the 21st century company (Harrington, 2001), the authors, on performance measurement process states that evaluation is essential. If you cannot measure, we can not control it. If we cannot control it, we can not manage and can not improve. Without evaluation, any outcome is a surprise. Assessments are the starting point of improvement, because its help us to understand where we are and to set goals for the future. Without them, the necessary changes and improvements are obstructed. For each of the basic processes must be designed *indicators of effectiveness (quality), efficiency (productivity) and adaptability (flexibility) and individual objectives* (Harrington, 2001).

A balanced assessment system must have the following characteristics:

- it reflects client`s program,
- it reflects management program,
- it reflects the contribution of those who carry out the work,
- reference levels can be achieved but requires the organization to make an effort,
- it is easy to use,
- it is made clear and understandable,
- it is related to the objectives and the future of the organization (Harrington, 2001).

When setting process indicators is important to note that the purpose is improving not the punishment. It is useful to consider all the indicators commonly used in the organization to see if there were any that would fit as a process indicator. A combination of 3 to 9 indicators allows evaluating the improvement better than one (Juran, 2000).

There are many considerations that must be taken into account when we establish process indicators in the first place, there must be a balance between the views. The view of the customer (external) must be balanced with those involved in the process (internal customer). Then, the 3 to 9 indicators should be a combination of indicators of efficacy, efficiency and versatility.

*The efficiency* - the extent to which the results of a process meet the needs and expectations of customers, in this case, the term "client" refers not only to the person receiving the product / service, but to all those who come into contact or will be affected its quality. Efficiency means the right result in the right place in the right time at the right price. We can see that it means more than quality. The efficiency indicators are:

- reliability;
- applicability;
- maintainability;
- promptness;
- appearance;
- the number of errors related to the number of items;
- the percentage of deliveries made on time;
- customer satisfaction.

*Internal efficiency indicators* show how well providers fulfill their obligations. Sometimes the external client does not know this kind of problems. As an example it can give:

- words that start with "re" (example: Rerun, repair, re-check, etc.);
- errors detected;
- changes required;
- interruptions.

*External indicators of efficiency* indicates how well the product or service meet the customer expectations. For example:

- delayed deliveries;
- number of applicants;
- the number of refunds under warranty;
- the number of documents prepared wrong.

The yield - reflects the amount of resources used to produce a product. The yield increases when fewer resources are needed to achieve a particular product. Examples of performance indicators:

- manufacturing cycle in relation to the number of items;
- processing time/ article;
- resources consumed / article;
- transactions per hour;
- tests per hour;
- reports / expert;
- made pieces / hour of work.

*Adaptability (flexibility)* - the ability of a process or activity to respond to customer special requirements of today and to adapt to the tomorrow requirements or changes. Adaptability indicators are often ignored but they are important to achieving a competitive advantage. In the category of adaptability indicators are included:

- percentage of special orders received / shift;
- special orders percentage honored / shift;
- special orders percentage level employees.

*Financial indicators.* There is a group of financial indicators underlying evaluation systems of most organizations. For example:

- return on investment (RI);
- return on assets (RA);
- profit share in sales;
- the value of assets;
- annual sales;
- operating costs;
- added value by an employee;
- equity etc.

*Activity indicators.* There is also a significant group of non-financial indicators, related activities. For example:

- number of accidents / 10,000 hours;
- market share;
- the number of breaches of the rules of labor protection / month;
- the annual rotation rate of stocks (Harrington, 2001).

## 2 PERFORMANCE INDICATORS IN UNIQUE PRODUCT AND PROCESS PLANNING

In this part the author recommends some performance indicators based on his experience in industrial organizations and on his research in industrial field. So the recommended indicators that can be used in order to measure performance of the products and processes planning process are synthetically mentioned in table 1 and table 2.In these tables, as you can see, are listed the most important steps used in industry, especially in the automotive industry. For each of these stages, the author based on the research's performed, proposes a number of specific activities. For each activity is ascribed one or more objective, and for each objective is ascribed a performance indicator as follows. In the same time to analyze the unique

products is required to present the project cost and time spent for the design and planning processes.

## 3 PERFORMANCE INDICATORS IN DESIGNING UNIQUE PRODUCTS AND PROCESSES

The design of advanced performance products can be measured using indicators proposed in Table 3 and the design processes for measuring performance indicators may be used like those in Table 4.

Overall both for planning and design of advanced products and processes the best confirmation of their performance can be effective after the unique product manufacturing through development of performance indicators relating to the use of resources and performing the activities. These indicators are expressed in Tables 5 and 6.

**Table 1. Examples of performance indicators for unique products (UP) planning**

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| *Planning/ execution product* | Launching the development of the new product | 1.Increasing the product portfolio<br>2.Addapting product portofolio to the market requirements | 1. (Existent product number + new products)/ Existent product number<br>2. Clients satisfaction leve | 12 | 240 |
| | Team building | 1.100% covering project required specializations<br>2. covering the necesarry personeel | 1. Involved specialists/ Necesarry specialist<br>2. Involved specialists / Provided personeel | 2 | 40 |
| | Training the involved team | 100% instructed team members | Team members to be trained / Team members involved | 8 | 160 |
| | Inputs analysis, client specific requirements | Establishing all the product development | Established stages / Necesarry stages | 10 | 200 |
| | Plans elaboration emmergency preventive plans if applicable (if it is a case) | Zero non-conformities related emergency prevention | Number of non-compliance due to inadequate emergency prevention | 4 | 80 |
| | Elaborating the product planning quality graphic | All activites planning | Planned activities / Necesary activities | 8 | 160 |
| | Elaborating quality plan | Zero nonconformance establish resource needs and responsibilities | Number of non-compliance due to improper setting of resource needs and responsibilities | 16 | 320 |
| *UP design* | Elaborating the documentation for the unique product | 100% implementation in the technical documentation of input data | Transposed input / necessary data | 96 | 1920 |
| | FMEA project accomplishment | Estimation of project risk (criticality index C) | Real risk / risk estimates (Cr/Ce) | 96 | 1920 |
| | Elaborating informations for purchasing the supplies | 1.100% of requirements for compliance. materials supplied<br>2. Zero uninformed suppliers | 1. Compliance requirements for incoming material<br>2. Number of suppliers uninformed | 8 | 160 |
| | Elaborating the documentation | Development documentation for tests | Preparation of all necessary testing equipment | 24 | 480 |

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| | for unique product trials | | | | |
| | Background note Development / Feasibility Study | Product feasibility analysis | Confirmation or rejection of product fesability | 16 | 320 |
| | Elaborating the documentation for the UP process | Preparation of all necessary equipment for the UP manufacturing process | Equipment ready for manufacturing of UP/ Equipment required for manufacturing of the UP | 16 | 320 |
| | UP Control Plan Development | Identification of all elements necessary for compliance monitoring and control planning | Monitoring and control elements developed / Monitoring and control elements necessary | 8 | 160 |
| *UP Execution* | Checking supplied products | 100% of requirements for compliance. materials supplied | Purchased product / product request | 6 | 120 |
| | UP execution | 100% framing in the scheduled consumption | Achieved consumption / planned consumption | 48 | 960 |
| | UP verification | 100% framing into the quality parameters | Qualitative parameters achieved / qualitative parameters plan | 8 | 160 |
| | UP trials | 100% framing into the technological parameters | Achieved technical parameters / technical parameters plan | 16 | 320 |
| | Internal Standard for the UP Development | Zero non-conformities due to manufacturing process of the new product | Number of non-compliance due to failure of new product manufacturing process | 24 | 480 |
| *UP* Validation | UP | 100% fulfill requirements of product documentation | Requirements fulfilled / planned requirements | 4 | 80 |
| | Elaborating the documentation for launching the UP in production | Prepare all necessary equipment to manufacture the UP | Equipment ready for manufacturing of UP / equipment required for manufacturing of UP | 96 | 1920 |
| | | | **TOTAL** | **526** | **10520** |

**Table 2. Examples of performance indicators for unique products planning**

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| *Implementation planning process* | Training team involved | 100% team members trained | Trained team members / team members involved | 8 | 160 |
| | Analysis of data entry, customer specific requirements | Setting all stages of process development | Steps established / steps necessary | 12 | 240 |
| | Development of preventive | Zero non-conformities related | Number of non-compliance due to | 4 | 80 |

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| | emergency plans (if applicable) | emergency prevention | inadequate emergency prevention | | |
| | Graphic Design product quality planning | Improving activities | Planned activities / Activities necessary | 8 | 160 |
| | Development of Quality Plan | Zero nonconformance establish resource needs and responsibilities | Number of non-compliance due to improper setting of resource needs and responsibilities | 16 | 320 |
| | Management analysis | Zero non-conformities identified in the analysis stage of development stage | Number of non-compliances identified in the analysis stage of development stage | 8 | 160 |
| *Designing technological processes* | Development of technological documentation | 100%implementation in the technical documentation of input data | Transposed input data / data necessary | 96 | 1920 |
| | Development of packaging technology | 100% employment in resource planning | Resources used / Planned resources | 16 | 320 |
| | Development control plan | Identification of all elements necessary for compliance monitoring and control their activities planned | Monitoring and control elements developed / Monitoring and control elements necessary | 8 | 160 |
| | Development of matrix characteristics | A description of all characteristics that may affect safety or regulatory compliance, installation, operation, product performance or subsequent processing of the product | Features identified in the planning process / Features identified in complete the process | 16 | 320 |
| | FMEA making process | The risk estimation process (criticality index C) | Real risk / Risk estimates (Cr / Ce) | 96 | 1920 |
| | Evaluation of environmental aspects (if applicable) | Identification of all environmental impacts associated | Environmental impacts identified / Anticipated environmental impacts | 4 | 80 |
| | Management analysis | Zero non-conformities identified in the analysis stage of development stage | Number of non-compliances identified in the analysis stage of development stage | 8 | 160 |

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| *Validation of technological processes* | Documentation development for supply products, equipment and TDCD | 1. 100% Compliance with the requirements of documentation for supply<br>2. Zero uninformed suppliers | 1. Degree of compliance with the documentation requirements for supply<br>2. Number of suppliers uninformed | 70 | 1400 |
| | Development Plan equipment location | Optimal placement of all equipment | 1. Planned equipment / equipment necessary<br>2. Number of nonconformities arising from placing equipment on schedule<br>3. Planned equipment / equipment located | 28 | 560 |
| | Development flow for non-complying products | 100% control of nonconforming product | Number of non-compliance due to inadequate control of nonconforming product | 12 | 240 |
| | Supply and validation products supplied | 100% supply products complying with documentation | Purchased product / product request | 24 | 480 |
| | Insuring the equipment | Providing all necessary equipment as planned | Equipment provided / needed equipment | 4 | 80 |
| | Insurance TDCD | Providing all TDCD as planned | TDCD provided / required TDCD | 4 | 80 |
| | Infrastructure insurance | Ensuring the necessary infrastructure as planned | Infrastructure provided / Required infrastructure | 2 | 40 |
| | Positioning equipment | Location of all equipment necessary | Installed equipment / Equipment necessary | 80 | 1600 |
| | HR insurance | Ensuring the necessary human resources as planned | Human resources provided / Human resources required | 4 | 80 |
| | Commissioning and implementing UP, the first sample | Compliance with all planned activities | Activities conducted / Planned activities | 240 | 4800 |
| | Development Control documentation (UP, the first sample) | Ensuring that all activities related process objectives | Met objectives / Targets planned | 16 | 320 |
| | Perform tests/trials ZERO series | 100% compliance with the planning parameters | Test parameters / Parameters plan | 32 | 640 |
| | Measurement | 100% validation of | Measurement systems | 8 | 160 |

| Stage | Activity | Objective | Performance indicator | Time alocated (ore) | Designed cost (lei) |
|---|---|---|---|---|---|
| | systems analysis | measurement systems | used / Validated measurement systems | | |
| | Perform process capability studies | Identification of all narrow places | Tight places identified / Planned tight places | 96 | 1920 |
| | Validation technologies, equipment and TDCD | 100% compliance requirements of product documentation | Requirements fulfilled / Planned requirements | 8 | 160 |
| | Management analysis | Zero non-conformities identified in the analysis stage of development stage | Number of non-compliances identified in the analysis stage of development stage | 8 | 160 |
| *Validation UP* | Preparing Files for Approval Process for Production of parts | All parts for approval production | Approved parts / Components planned | 16 | 320 |
| | Preparing File for Advanced Product Quality Planning | Regulating all stages of product development to meet customer requirements | 1. Steps used / Stage regulated<br>2. Regulated stages / Phases planned | 16 | 320 |
| | Validation UP | 100% compliance requirements of product documentation | Requirements fulfilled / Planned requirements | 8 | 160 |
| | Design detailed documentation for UP (product documentation, technology, control) | Prepare all necessary equipment manufacture for production | Manufacturing equipment ready for production / Manufacturing equipment needed for production | 64 | 1280 |
| | Management analysis | Zero non-conformities identified in the analysis stage of development stage | Number of non-compliances identified in the analysis stage of development stage | 8 | 160 |
| | | | **Total** | **1048** | **20960** |

**Table 3. Examples of performance indicators used in unique product design**

| Stage | Objective | Performance indicators |
|---|---|---|
| Develop design theme | 100% implementation in the technical documentation of input data | Transposed input / necessary data |
| Feasibility study | Product feasibility analysis | To confirm or refute the product feasibility |
| Develop drawings | 100% implementation of technical documentation in drawings | Drawings made/necessary drawings |

**Table 4. Examples of performance indicators used in process design**

| Stage | Objective | Performance indicators |
|---|---|---|
| Process definition | Compliance with the requirements | Implemented the requirements in the project/ necessary requirements for project |
| Define limits of process | Highlighting project activities in define limits | Define limits / real limits |
| Setting process activities | Defined of necessary activities for objectives achievement | Define activities / necessary activities |
| Planning process activities | Process efficiency | Planning activities / necessary activities |
| Developing a monitoring and control elements | Compliance with the plan | The monitoring and control elements developed/ The monitoring and control elements necessary |

**Table 5. Performance indicators related to resource utilization**

| | | Performance indicators |
|---|---|---|
| Resource | Time | Effective time of implementation / planned time of implementation |
| | Material | Quantity of material used/ Quantity of material planned |
| | Financial | Effective cost / cost planning |
| | Information | know how gained |

**Table 6. Performance indicators related to the achievement activities**

| Activities | Objective | Performance indicators |
|---|---|---|
| For design | 0 non-compliance caused by a improper design | Number of non-compliance caused by a improper design |
| For planning | 0 non-compliance caused by a improper planning | Number of non-compliance caused by a improper planning |

## 4 CONCLUDING REMARKS

In conclusion, the organization is an expression of the maturity date and the extent to which the organization uses a formal (documented) "performance indicators". Through this the organization sets certain "performance benchmarks" and draws up ways to achieve this performance, thus increasing "awareness" of his acts.

## 5 ACKNOWLEDGEMENTS

This work was supported by the strategic grant POSDRU/159/1.5/S/133255, Project ID 133255 (2014), co-financed by the European Social Fund within the Sectorial Operational Program Human Resources Development 2007 – 2013.

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