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Quality research methods as a factor of improvement of preproduction sphere

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ABSTRACT

Purpose: A new approach for quality improvement of preproduction sphere in production company with usage quality research methods has been presented.
Design/methodology/approach: The possibility of usage of quality research methods are connected with improvement of preproduction sphere of organization. Interdependence of the quality control and quality research methods in preproduction sphere and management processes has been taken into account.
Findings: At the present time the enterprises should integrate management system in preproduction sphere and their continuous improvement with quality management, knowledge management and intellectual capital. Such kind of strategy will enable to achieve success for these companies.
Research limitations/implications: Described quality methods in preproduction sphere and quality analysis of product modernity can be employed in companies, in which quality control has been implemented.
Practical implications: Averaging Quality Rating method can be used in companies for estimation of quality index of product modernity. Usage of this method can improve functionality of preproduction sphere.
Originality/value: Describing and comparing modernity of product inside company with usage Averaging Quality Rating method has been presented. This method is a propose of new lifting strategy of effectivities and efficiencies activities of preproduction sphere.
Keywords: Quality management; Quality research methods; Averaging Quality Rating method

1. Introduction

Quality Management and Quality Assurance are important part and parcel of market competition in today's of economy transformation condition. So pursuit of wide understood success through prism of quality is the key factor of company management [1].

Innovation, variability, development of computerization, prevention of spoilage occurrence in productive process and optimization this process influence on increase consciousness, that quality of final product it isn't of production process, but effects a lot of processes and activities connected with formation and possession of product [2].

Experience of UE nations, USA nations and Japanese nations shows, that in present moments maintenance the high level of quality of design process, as and the productive processes without wide usage quality research methods in area of quality control is impossible. Utilization and use quality research methods assure of continuous optimization of processes, reduce costs, as also the achievement of high level of quality across prevention of defectiveness.

In this paper selected problems, connected with usage quality method on preproduction sphere have been presented. And also suitable examples of quality estimation quality index of modernity product in Polish companies have been given.

2. Evolution of modern quality control conception

For long time period organization of productive process of product was conditional on individual workers skill. Project function, productive function and final quality control function was concentrate in one worker. Work and also responsibility for product quality between many individual workers has been divided together with development of productive technology [1].

Such situation caused the need of control introducing with taking advantages of quality research methods in preproduction and production sphere of company. The present idea of quality control is completely different from classical idea, which founds, that if quality has to be good - the production cost will be high [1,3].

According to prevalent yet opinions, the good quality can be achieved only by final quality inspection to finish product. This idea didn't prove correct in practice, because the final control doesn't assure quality supervisors. These situations have to take place in inside of production process [4].

The present idea of quality founds, that organisation staff beginning from highest management should pay more attention on quality. After detection of mistake in production process, the product should be seen again to the preceding stage or completely eliminated [2]. The present idea of quality depends on change of quality approach strategy. At present, special pressure puts on "prevention strategy " which take place "detecting strategy". This strategy is focus on improvement of each element of process. This process is understood not only as productive process but also as activities. The input and output elements of this activities has been exactly defined (fig.1) [2,4,5].

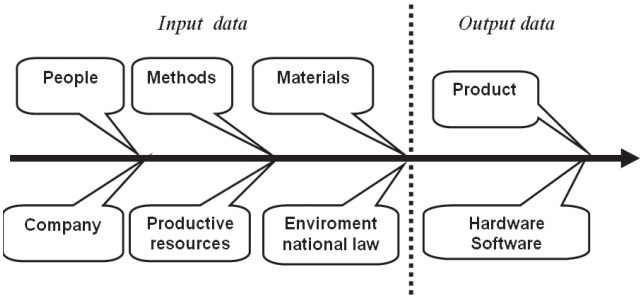

Fig. 1. Organization of process as a transformation the input and output elements [5]

Manufacturing processes can be controlled in a number of different ways, ranging from highly sophisticated, high bandwidth machine and process control systems, to rather passive process monitoring [6].

3. Quality control in preproduction sphere of company

Preproduction sphere of product existing contain first of all acquisition of diversified information content. The information should be so complete and detailed as to make enable designing of product. This product have to come up future's customers expectations [7].

The basic problem in range of quality typical for preproduction sphere are first of all [8]:

1. The information system about quality product, relating the both the project office how and the company, which will produced a final product.
2. Competitiveness of own product.
3. Organization structure of company, which will produced a final product.
4. Modernity of product.
5. Quality investigation of new project design (constructional and technological aspects).
6. Purchase, qualified suppliers.

Method for assurance and controlling quality preproduction sphere must meet the following requirements [8,9, 10]:

1) The quality research method must enable project managers to elucidate and structure the needs and expectations of the client. Quality is considered by many as a measure of the client's satisfaction. Overall client satisfaction can be decomposed into a quality criteria hierarchical structure.

2) The method must be capable of assessing and aggregating lower level quality criteria into higher level quality objectives. This might prove to be quite difficult in the case of qualitative criteria necessitating subjective evaluations.

3) The method must provide a means of assessing the planned and earned quality of the project end product throughout its life cycle. Quality features and characteristics are achieved in a progressive and cumulative fashion as the project is being executed. The method must therefore link the project activities to the quality attributes of the project end product.

4) Finally, the quality research and control methods should provide measures of quality deviations to enable project managers to initiate corrective actions early. Indeed, the longer it takes to detect and correct quality deviations, the more it costs to have the work redone. Because deviations can be due to randomness in the data, a threshold between the expected quality level and the estimated quality level must be established. Exceeding the threshold should initiate corrective actions. Consequently, quality deviations should be traced to specific project activities.

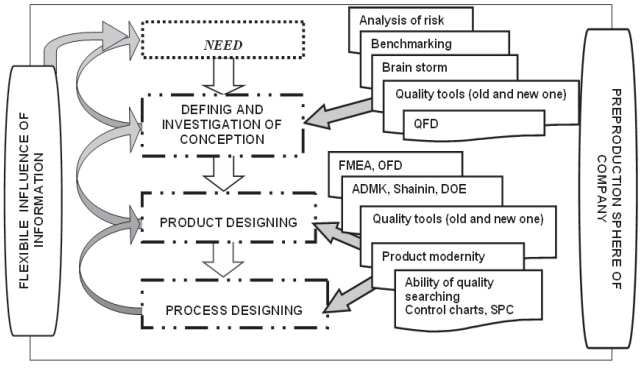

Fig. 2. Usage quality research method in preproduction sphere of company

In area of marketable competition usage quality research methods are a part and parcel high potential of scientific and searching. This potential described relation between problems and reasons. Utilization quality methods, techniques and tools on the each stage of creating final product, especially in preproduction sphere, it is recipe for company success (fig.2) [11,12,13].

In the planning and project stage, such quality tools as benchmarking, brain storming, ADMK (Analytical Choice of Constructional Materials), QFD (Quality Function Deployment) can be use in transformation of customer requirements on technical requirements and preference formulating. FMEA (Failure Mode and Effect Analysis) can be use for estimation prospective problems relay to given project, saving time during product designing, through elimination incorrect approach [14, 15].

Quality analysis of product modernity enable company to make identification repeated negative effects, which should be corrected.

4. Analysis of product modernity as a quality tools of preproduction sphere in company

One of the basic quality problems for preproduction sphere in organization is product modernity. The modernity is a economic symptom of quality process, product and also symptom of the newest achievements of technical progress and industrial design.

Table 1.
Steps individual criteria and their quality factors for solenoid valve

	Criteria and their quality factors
A	MODERNITY OF CONSTRUCTION SOLUTION
1	safety
2	efficiency
3	simplicity
B	PRODUCTION TECHNOLOGY
1	industrial safety
2	new technology
3	process capacity
C	EFFICIENCY OF UTILIZATION
1	esthetic
2	functionality
3	working precision
4	stability
5	operational reliability
D	PRODUCT ECONOMICS
1	designing cost
2	producing cost

The comparing the modernity of semi-finished product or final product has great meaning on stage of new solution projecting. Designer's intention is improvement existing product. For describing and comparing modernity of product inside company use Averaging Quality Rating method, which was found by Romuald Kolman. The essence of quality analysis of product modernity in proposed method consist of few stages [7]:

- Designing - Quality Standard of Organization System with usage universal scale of unity relative states
- Calculation – Discriminantes of criteria through relativation of absolute states.
- Calculation – Groups discriminantes.

For calculation of groups discriminantes should be known Averaging Quality Rating method. The general proceeding in realization of Averaging Quality Rating method is following [7]:

- Dominated discriminant rated has been calculated –, this discriminant allows for significance dominance individual criterions.
- Index of totals significance has been calculated
- Maximum and minimum of index of totals significance has been determined.
- Modulus of significance individual ratings has been calculated.
- At last step is calculation cumulative quality index of product modernity.

After achievement this stages of calculation product modernity depends on search optimal level of product quality.

5. Own research

One of the company target is pursuit of obtaining more and more product modernity. Taking under consideration the fact, that large majority of final products have been produced on the basis of possessing license, changes cannot be implement. This situation and activities should be lead in own product of companies. The solenoid valve 199Z has been good example of product modernity. This solenoid valve is a product one of the leader of polish market. This company keeps continuous contact with own customers and collects requirement and opinions about their product. Customers complaints: premature otherheating of coil, core otherheating

Related to customers problems company deiced to improve this valve. The solenoid valve 199Z has been modernized in two groups of problems:

1. *Construction solution*: safety, efficiency, simplicity, ergonomics accommodation.
2. *Utilization:* functionality, esthetic, operational reliability, working precision, stability.

The solenoid valve appearance has been change also. After them company has been guided many laboratory tests in new one version of solenoid valve; and also superfluous elements has been eliminated. This valve has been called solenoid valve 199P. Averaging Quality Rating method has been used for describing and comparing modernity of solenoid valves, that is calculating cumulative quality index of product modernity. At first steps individual criteria and quality factors has been given in table 1.

After usage universal scale of unity relative states and calculating: dominated discriminant rated, index of totals significance, modulus of significance individual.In table 2 calculation cumulative quality index of product modernity has been counted.

Obtained results confirmed, that a new solenoid valve 199P is high quality and fulfils customers requirements. This features are results from additionally criteria, which are compare of valve modernity.

Table 2.
Cumulative quality index of modernity solenoid valve.

quality index of modernity solenoid valve	solenoid valve 199 Z	solenoid valve 199P
J_D [0.00....]	0. 536	0. 616
J_D [%]	53.6 %	61.6 %

6. Conclusions

Summing up over consideration, it was found necessity of existing a need of self-perfection on all stages in preproduction company sphere. Usage of quality research methods in preproduction sphere in Polish companies permits on avoidance of occurrences of productive defects already in the first stages of product cycle, which helps in elimination of source their formation. Describing and comparing modernity of product inside company and used for it Averaging Quality Rating method making easy planning of product.

Utilization of modernity of product in economic individuals testifies to orientation of aim and also creation of products quality - qualities controlled by customers [11,12]. Professor R.Kolman opinion is right [6]: " …It seems not correct to call preproduction sphere "background area", because this is a place when we start to create whole of productive activities…" This idea is particularly clearly in quality control process, where preproduction sphere became of beginning quality programming of processes and of entire development company.

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