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Increasing human resource efficiency in the production process

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Abstract

In the production process many problems of human resource management are solved using the technical, conceptual and native skills of the managers. However, if the manager decisions are based on actual data which are analysis by efficient techniques and tools, a higher success and better results can be achieved.

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1. Introduction

Positive results in production activities are obtained by applying a series of methods, instruments, techniques etc, with a direct effect on the increase of the production capacity, the volume of products delivered, turnover and the company's profit. All of these factors rely on the human resources in the company.

This paper aims at presenting methods and means to intervene in the activity of the production staff in a Romanian company, leader in electrostatic field painting.

It is desired to combine production management with human resources management in view of obtaining positive results, the increase of the production capacity, of the volume of products and implicitly their quality [12], directly by motivating the workers, an effect of the use and application of quality instruments.

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2. Theoretical foundations

For the analysis of the efficiency of an activity, the results obtained are compared to the effort invested in it. This comparison is valid in the case of human resources as this essential element represents a source of costs that is really important. Currently more and more companies are confronted with the necessity to increase productivity and they have limited resources. The least exploited means of increasing productivity is the improvement of work quality, of information, of the capital and the ways in which factors combine [5]. In the process of work performance evaluation individual and social performances are assessed.

The effectiveness of a group is the capacity of the group to fulfill the tasks assigned to them and to allow its members to obtain satisfaction following collective activities. The factors that influence a group's effectiveness are:

- the group's characteristics (size, composition);
- the task to be carried out;
- the environment(al) (factors) outside and inside, including resources allotted to the group or the recognition of its presence and activity.

Internal or variable factors are represented by those aspects of the group's activity which can be directly controlled and theoretically modified in a short time, so as to raise performance levels or human satisfaction levels. They can be modified to increase effectiveness (e.g. management style, processes and procedures adopted by the group, including task functions, maintaining social relations, motivation and group development) [8].

The term „*performance*” refers to a special accomplishment in a field of practical activity. Work performance is associated with a series of factors that interact at company level: skills, personality features, value systems, physical qualities, interests, motivation, age, sex, education, cultural horizon, working social environment, salary and reward system, training system and control, enterprise policy, work methods. Out of the many factors that influence performance a special role is played by motivation.

An increase in work productivity can be achieved in many ways:

- *Training and improvement of human resources.* The training and improvement process manifests itself on the long term by raising the level of culture and knowledge of the human resources, their technical and professional training in accordance with working needs and the skills of the human resources [3]. This aspect represents the main way of self-capitalization and development of the human factor, of making superior use of the creative and anticipative potential of the individual. A great role is played by the perceptiveness and adjustment speed together with a quick reintegration of the human resources in other activities. Improvement leads to an increase of production.
- *Automation, using robots and promotion of new techniques.* The processes which use automation, robots and promote new techniques represent essential coordinates of contemporary technical progress. They attract a raise in productivity as they ensure higher productivity for the same amount of work spending favoring the diminishing of other expenses on products and generally savings.
- *Production renewal.* This process targets the improvement of constructive, functional, aesthetic, ergonomic features in view of ensuring a high level of quality, with implication over the increase of work productivity [10].
- *Offering material incentives.* This represents the conditioning of income depending on work results. Of special importance is a system of distribution that will determine correctly the size of each worker's wages, establishing their contribution to the total amount of work. Any lapse in this area unfavorably reflects upon the incentive scheme and brings about the disregard of fundamental economic correlations, specifically that between the increase of work productivity and the increase of salaries.

Bearing in mind the fact that the number of workers is a quantitative factor of increasing production, limited by the existing resources at a given moment and the fact the work productivity is a qualitative factor both micro-economically and macro-economically it is very relevant which of the two preponderantly influence production. While an increase in work productivity ensures little work expenses, increasing staff numbers produces proportionally more expenses.

The working yield does not depend only on the material conditions of the production. The quality of the work force also plays an important role. In this context, the continuous improvement of staff training is an essential condition for the efficient use of human resources [7]. Compared to unskilled labor or lower level work, the highly

qualified work yields greater productivity in the same time. Recent research has highlighted that there is a very strong correlation between the level of professional training and general culture at large and workforce productivity.

3. Increasing human resource efficiency in the production process – a practical application

This study was made within the company SC Allcolors Serv SRL in România, which has as an objective the Decoration and cover of metallic surfaces Electrostatic field painting. The company has managed to make a name on the Romanian market as one of the most important companies in this field of activity, a fact proven by the high number of collaborators that ask for its services.

The basis of the study is the monitorization made on a group of people working in the workshop where stickers are applied to products. This monitorization is represented as data in the form of graphs, histograms, diagrams etc.

Based on the data collected, analyses were made in order for decisions to be made to intervene and help personnel in the workshop find solutions to avoid or prevent the generation of faults in the future, respectively to increase production efficiency by applying measures to improve the activity of the human resources [2].

At the beginning of the year 2012, in the sticker application workshop, upon the management's initiative a pilot project was started. Its aim was to reduce the costs of sticker application operations with the help of newly hired staff coming from the rural localities bordering the company.

The decision aimed at obtaining small costs for the sticker application service, an important part of which was made of transportations costs to and from the company. Both categories of costs are influenced by the human resource and have been considered as decisive when signing contract with various customers.

At the initial launch time in the company the sticker application on products was made by unskilled workers from the rural area. The total cost of the service (Fig.1) had the following structure:

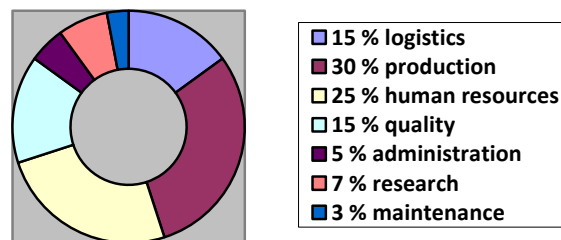


Fig.1. The total cost of sticker application operations at 31.01.2012 – unskilled workers from the rural area

Most of the hired staff (86%) had an average of 10 classes of schooling, were house workers or had qualifications in the agricultural field, thus no experience in the required field.

In order to achieve the set financial goals, the company's management initiated the project of cost reduction in the sticker application workshop, drawing the attention of the human resource in the workshop on the project. After the project was implemented, it was noted that the price quota of this service could be improved (20%) to the profit on each order, as a result of the improvement in staff training following intensive sessions the workers attended.

In the case of the decision to work with qualified and experienced staff, the costs of recruitment, logistics and wages would have gone far beyond the permitted level, leading to a financial loss of aprox. 15% of the profit, if there was going to be a profit, its value reaching only 5%.

In this case, the total cost of the service (Fig.2) had the following structure:

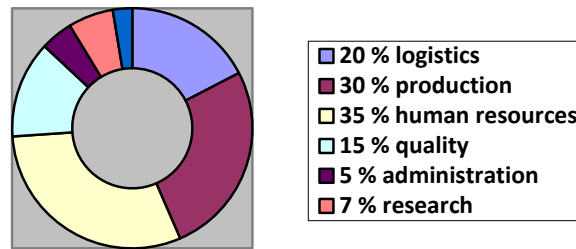


Fig.2. The total cost of the sticker application service per product at 31.01.2012 – qualified staff from the urban area

This had a strong impact on the decision to hire unskilled workers from the rural area to the detriment of skilled personnel from the urban area.

In order to reduce total costs of the decoration application and not to jeopardize the targeted level of profit, the project was applied in the only department that could significantly influence this thing: the production sector, in the process of sticker application. This objective could not be reached without the openness and sustained efforts of the human resources. Improving the qualification and incentive schemes offered to human resources [1] had resulted in an increase of productivity.

The steps taken in order to reach the set objectives were the following:

- Training and improving human resources. The staff attended qualification sessions and improvement sessions delivered by the company's specialists, the costs being minimal and not influencing the price of the product.
- Automation, using robots and promotion of new techniques. New and innovative techniques were used in the field of sticker application to make it easier to position them, to avoid the appearance of non-conformity due to missing stickers, wrong positioning or air bubbles under them.
- Production renewal. Original working tables used in the process of sticker application were replaced by better, more ergonomic ones, helping increase the speed of application, making application easier and decreasing staff wear.
- Incentive schemes. After production monitoring, respectively every lot, product, people monitoring, a reduction of costs with non-conformities and their logistics was achieved.

Thus, the results obtained in 2012 after monitoring of the staff and faults have created the following situation:

Table 1. Results obtained in 2012 after monitoring of the staff faults

Month	Flaws operator 1			Flaws operator 2			Flaws operator 3			Flaws operator 4			.....
	Sticker missing	Sticker with air bubbles	NOK applied sticker	Sticker missing	Sticker with air bubbles	NOK applied sticker	Sticker missing	Sticker with air bubbles	NOK applied sticker	Sticker missing	Sticker with air bubbles	NOK applied sticker	
January													
February	4	3	0	0	1	0	0	0	0	2	2	0	
March	42	9	0	8	4	0	0	0	0	0	0	0	
April	3	0	0	1	1	0	0	0	0	0	0	0	
May	1	1	0	1	1	0	0	0	0	0	0	0	
Total pieces	50	13	0	10	7	0	0	0	0	2	2	0	
TOTAL	63			17			0			8			.....

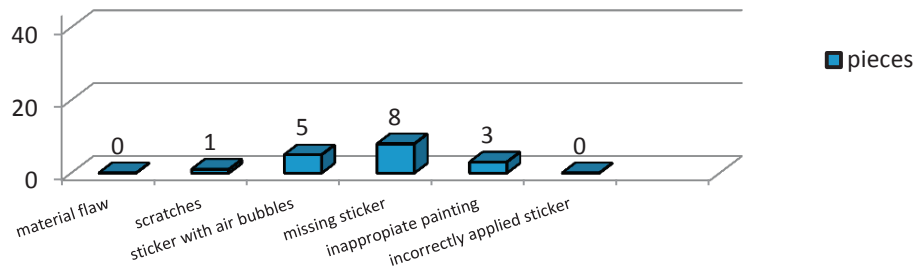


Fig.3. Asymmetric frequency histogram of an operator who executed a small number of defects

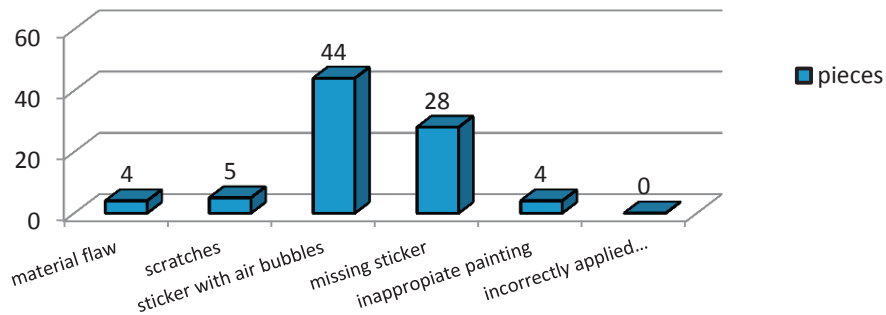


Fig.4. Asymmetric frequency histogram of an operator who executed a high number of defects

After the company's management implemented 4 interventions, in 2013, special results were obtained, the situation being as follows (Table 2):

Table 2. Results obtained in 2013 after monitoring of the staff faults

Operator	Operator 1		Operator 2		Operator 3		.....	Operator 12		Operator 13	
Flaws	Missing sticker	Sticker with air bubbles	Missing sticker	Sticker with air bubbles	Missing sticker	Sticker with air bubbles	.....	Missing sticker	Sticker with air bubbles	Missing sticker	Sticker with air bubbles
10.05.2013	0	0	0	0	0	0	.....	0	0	0	0
14.05.2013	0	0	0	0	0	0	.....	0	0	0	0
16.05.2013	0	0	0	0	0	0	.....	0	0	0	0
17.05.2013	0	0	0	0	0	0	.....	0	0	0	0
20.05.2013	0	0	0	0	0	0	.....	0	0	0	0
21.05.2013	0	0	0	0	0	0	.....	0	0	0	0
22.05.2013	0	0	0	0	0	0	.....	0	0	0	0
23.05.2013	0	0	0	0	0	0	.....	0	0	0	0
24.05.2013	0	0	0	0	0	0	.....	0	0	0	0
27.05.2013	0	0	0	0	0	0	.....	0	0	0	0
29.05.2013	0	0	0	0	0	0	.....	0	0	0	0
	0	0	0	0	0	0	.....	0	0	0	0

As a result of the initial project implementation a total elimination of non-conformities can be seen and implicitly an elimination of costs generated by faults, this situation leading directly to a reduction of production costs and an increase in productivity.

4. Conclusions

In the analysis of the phenomena and processes that take place during the use of human resources it must be mentioned that they represent the main production force of a company for the following reasons:

- Human resources are the only production factor capable of creating new values; the human potential is the only creative potential, not only from an economic point of view, but also spiritually, scientifically. The generation of new ideas put into practice in products, technologies, management methods, new administrative solutions etc are features that pertain exclusively to humans.
- Human resources produce and reproduce the objective factors of production, playing a decisive role in the process of transformation of nature into consumer goods.
- Human resources decisively influence the effectiveness of using material and financial resources. Practice shows numerous examples of technically and financially similarly endowed companies obtaining considerably different results.

It can therefore be concluded that human resources constitute the creative, active and coordinating element of economic activities in every company.

In the activity of every economic unit, efficiency is realized within an objective structure where the human factor represents a huge workforce not homogenous in structure, with participants having different qualifications, specializations and hierarchic positions. At the same time every person brings their own aspirations, a multitude of social experiences that are inserted into the fundamental relations created in the flow of production.

The irrefutable importance of human resources has been emphasized recently due to factors that impose in the economic life, among which are: an increasingly sharper competition on international level; the complexity and increasing size of organizations; a slower economic growth or the decline of markets for certain industrial branches; the intensity of training and workforce qualification; increasing preoccupations towards promotion and work satisfaction; modifications in the workforce value; demographic changes on the workforce market.

The emphasis on the role of human resources in the production process and on the increase of economic efficiency should not lead to an under-evaluation of material, financial and human resources.

A systematic conception of activities carried out inside of a company means an approach to human resources which is independent of the other resources, starting from the fundamental objectives that need to be achieved by the participation of all the categories of resources, from their essential connections. An overload on human resources to the detriment of the others will affect the company's dynamic balance, which is a condition for its functioning and efficient development.

References

- [1] Armstrong M. A Handbook of Personnel management Practice. ed ke-5. London: Kogan Page Limited; 1995.
- [2] Chung KJ, Liu SD. Some observations an effects of random defective rate and imperfect rework process on economic production quantity model. In: *Journal of Statistics and Management Systems*, vol.13, Issue 3; 2010, p. 479-484.
- [3] Garcia-Quevedo J, Mas-Verdu F, Polo-Otero J. R&D human resource in firms: What determines the educational level required? In: *Applied Economics Letters Journal*, vol.18, Issue 16; 2011, p. 1537-1540.
- [4] Herbert D, Curry A, Angel L. Human Resources Management: gendered terrain? In: *The International Journal of Human Resource Management*, vol.10, Issue 2; 1999, p.180-200.
- [5] Juran JM, Gryna FM. *Quality Planning and Analysis*. New Delhi: Tata Mc. GrawHill Co. Ltd.; 1995, p.55.
- [6] Richard OC, Johnson NB. Strategic human resources management effectiveness and firm performance. In: *The International Journal of Human Resource Management*, vol.12, Issue 2; 2001, p. 299-310.
- [7] Nafukho FM, Hairston N, Brooks K. Human Capital theory: implications for human resources development. In: *Human Research Development International Journal*, vol.7, Issue 4; 2004, p. 545-551.
- [8] Prado JC. Beyond quality circles and improvements teams. In: *Total Quality Management Journal*, vol.12, Issue 6; 2001, p. 789-798.
- [9] Stahl M. *Total Quality in a Global Environment*, Boston: Blackwell; 1995.
- [10] Tague NR. *The Quality Toolbox*, Second Edition, American Society for Quality, Quality Press, Milwaukee, Wisconsin; 2004

- [11]. Tang TLP, Tollison PS, Whiteside HD. The effect of quality circle initiation on motivation to attend quality circle meetings and on task performance. In: *Personnel Psychology*, Vol.40; 1987, p. 799-814.
- [12] Wilkinson A. Downsizing, rightsizing or dumbsizing? Quality, human resources and the management of sustainability. In: *Total quality Management & Business Excellence Journal*, vol.16, Issue 8-9; 2005, p. 1079-1088.