THE INCREASING OF METALLURGICAL ENTERPRISE ELASTICITY BY USING POLYVALENCE SKILLS OF WORKERS

Present market situation forces metallurgical enterprises upon continuous adapting to new trends. Therefore, every enterprise must have disposable workers with wide competences who are able to qualitatively realize different kind of tasks. With workers of that type enterprises are able quickly to initiate new solutions. This also makes possible formation of the structure of employment with laborers existing on internal market without necessary frequent, capital- and time-consuming looking for help on external market. In this paper a method of kilter of workers skills by constructing and using polyvalence training system is presented.

Key words: *metallurgical enterprise, skills of workers, polyvalence training system*

Povećanje elasičnosti metalurških poduzeća uporabom polivalentnih vještina djelatnika. Trenutna situacija na tržištu prisiljava metalurška poduzeća da se stalno prilagođuju novim trendovima. Zbog tog poduzeća trebaju imati radnike s takvim kvalifikacijama i vještinama koje će im omogućiti da kvalitetno realiziraju različite zadatke. S takvim radnicima poduzeća mogu brzo pokrenuti nova rješenja. To također omogućuje stvaranje structure djelatnika kojih ima na domaćem tržištu pa nema potrebe da se poduzeće svaki trenutak okreće vanjskom tržištu i tako troši vrijeme i kapital. U ovom radu je prikazana metoda registriranja liste vještina radnika stvaranjem I uporabom polivalentnog sustava obrazovanja.

Ključne riječi: *metalurško poduzeće, vještina djelatnika, polivalentni sustav obrazovanja*

INTRODUCTION

According to the assumptions of the resource school, attaining and maintaining a competitive prevalence by an organization is effected by offering unique products in a unique, non-imitable manner. This theory implies a very important role of innovations, and thus the weight of properly qualified and flexible workers, as the innovation process requires a coordinated collaboration of various, mutually complementing competencies [1].

The human resources of an organization are an asset that should be developed by constant investment. In the current market reality, workers are a basis for creating a competitive prevalence and a source of features that distinguish the organization against the background of competitors. Declining market trends and a necessity of undertaking adaptive actions by enterprises compel them to built a self-learning organization.

One of the basic problems faced by an enterprise on the labor markets is increasing mobility of human resources. So, it becomes a primary issue for the enterprise to find methods rather to engage people of the highest qualifications to ensure great development potential for the enterprise than to hold back this mobility.

The effects of human resources mobility include widening of workers' competencies. Often, this process leads to a situation, where the skills and qualifications of particular individuals significantly extend beyond the framework of single work posts, thereby creating a possibility of smooth transfer of workers between selected work posts. This ability of carrying out two or more work tasks differing in terms of quality is described by the term polyvalence.

The proper use of workers with polyvalent skills by the organization should translate into benefits, including: an increase in the quality of manufactured products, a reduction of the costs of employee recruitment and selection process, as well as an increase in the flexibility of responding to unfavorable trends within the internal labor market.

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DEFINING THE PATHS OF WORKER MOBILITY

The conducted investigation covered a selected department of one of Poland's biggest metallurgical works. Analyses were conducted on a population of 512 people. A starting point for the investigation was the creation of competency portfolios for particular job posts. These portfolios contained a whole set of qualifications, skills and personality features which, from the organization's point of view, are essential for the correct performance of activities associated with the production process. So, they defined a whole set of features that should characterize an employee so that he or she can efficiently function on their specific work stand.

At the same time, the valuation of job post was carried out by the analytical-point method. The aim of this action was to obtain the actual hierarchy of job posts in the investigated organization. During analysis, weights were used in order to take account of the assumptions of the personnel strategy defined for the organization. Principally, this applied to such items, as:
- increasing the role of the adequate education of hired workers (the consistence of the education profile with the specificity of the organization's functioning),
- increasing the role of the experience and knowledge of employees in connection with the complexity of technological processes carried out and increased focus on the activity of employees (proposals for innovations, increasing effectiveness),
- enhancing the safety of work and improving the work conditions.

Information collected at the stage of creating competency portfolios and job post valuation, in combination with the analysis of technological processes and organizational structure, became a basis for defining the paths of worker mobility. These paths represented a whole set of workers' displacement possible to be accomplished in the organization under study. At this stage of investigation, specific paths were subjected to analysis based on several criteria. The aim of this process was to reject those displacements, which might have been unfavorable to the organization. A general scheme of proceeding at this stage of analyses is presented in Figure 1.

Defining the worker mobility paths provided bases for the determination of priority of training specialties, which would be consistent with both the broadly understood interest of the organization and the stable and targeted development of employees.

CREATION
OF THE POLYVALENT TRAINING PROGRAMME

One of the main problems during the creation of the polyvalent training programme was fitting specific work-

ers (their qualifications and personality features) to the developed directions of extending competencies. The undertaken analyses aimed at the fullest possible adaptation of the intended activities to the potential of particular workers, the avoidance of investing in those individuals who had already attained the top of their capacities, and the identification of workers with the greatest development potential, whose competencies should be extended.
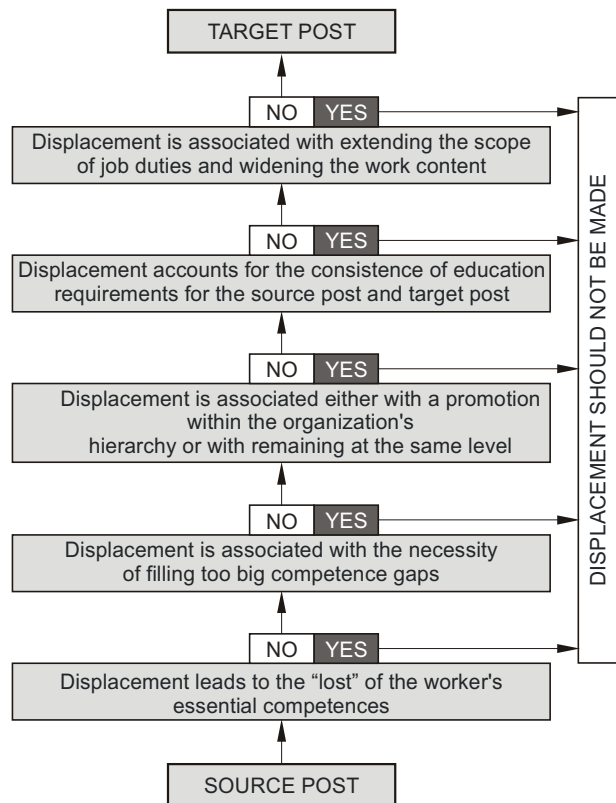

Figure 1.   **General scheme of proceeding in the process of job post competence portfolios**
Slika 1.   **Opća shema postupanja u procesu ustrojstva udjela kvalifikacija za neko radno mjesto**

All activities at this stage can be divided into several parts:
1. Making the assessment of workers. The normal distribution method was employed here, based on the assumption that the employees of the analyzed organization unit are a sample representative of the whole population. This assumption allows all people employed in the organization to be ranked according to the adopted criterion as per the scheme shown in Figure 2. The main criteria used for the assessment were: the productivity, development potential and self-dependence of the analyzed workers.
2. The determination of the actual workers' competencies important from the point of view of the enterprise's organizational structure and carried out production pro-
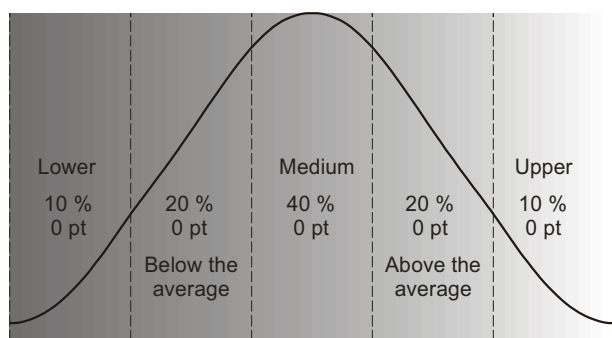
Figure 2. **The method of making the assessment of the workers by the normal distribution method**
Slika 2. **Metoda procjenjivanja radnika metodom normalnog raspoređivanja**

cesses. The creation of the portfolios of workers' competencies was effected based on available documentation and interviews held with immediate superiors.

3. The selection of workers it showing the highest effectiveness and development potential. This action made it possible to indicate, for particular work posts, the maximum number of individuals employed at those posts, who could be enrolled to the polyvalent training programme. At the same time, the minimum employment buffer enabling the organization to efficiently respond to unfavorable trends in its possessed human resources (illnesses, accidents, unplanned departures) was determined. This made it possible to indicate the minimum and maximum numbers of workers, whose competencies could be extended, with assigning concrete numbers to the training specialties defined earlier (Table 1.).

Table 1. **Fragment of the summary describing the investigated organization's capabilities in polyvalent worker training**
Tablica 1. **Dio sažetog opisa potrebnih vještina za polivalentno obrazovane radnike u poduzeću podvrgnutom ispitivanju**

Post description	Number of workers assigned to the post	Number of workers nominated for polyvalent training	
		min	max
Mill Operator (Rolling Mill Division)	12	2	4
Overhead - Crane Operator (Rolling Mill Division)	23	8	12
Charger (Furnace Division)	15	2	4
Operator (Furnace Division)	4	3	5
Fitter (Furnace Division)	8	2	2
…	…	…	…
Overhead- Crane Operator (Rail Finishing Department)	21	6	10
	Total	93	132

At the stage of determining the workers' reserve and polyvalent training needs, a part of posts was excluded from analyses. Strategic posts were shifted beyond the scope of investigation because of the very broad scope of knowledge and work content assigned to them. Another factor was the wish to avoid competency conflicts and difficulties within human resources management. Having very high-competency workers available within the organization's structure, but placed on low-demanding posts, could have produced in those people:
- a reduction of work motivation,
- a stress or work discomfort,
- a tendency to questioning decisions of their superiors with a similar or identical competency portfolio; or
- an increased susceptibility to offers by other employers.

The creation of a polyvalent training programme for any organization should be based on rational premises. The determination of needs for polyvalent workers at too high a level would mean high costs associated with the delivery of training. At the same time, a considerable part of competences acquired by the workers would never be utilized by the organization.

The determination of the optimal number of polyvalent workers, done within the investigation, was performed with the use of the linear programming method. A starting point at this stage of investigation was the determination of a maximum number of qualitatively differing competences that may be possessed by a single worker. It was assumed to the investigated organization that one worker may possess competences that enable him or her to fulfill three different work tasks, at a maximum. So established threshold allows, on the one hand, a high flexibility of employment to be obtained; whereas on the other hand, it does not cause an unjustified and excessive extension of workers' qualifications by those domains, whose future utilization would be doubtful.

Based on this assumption, the following three categories of worker ranking were adopted:
a) workers with one type of qualifications ($C1$); from analyses, it was assumed that the minimum number of workers of this category should be 200, while the maximum number should not exceed 400;
b) workers with two types of qualifications ($C2$); the minimum was determined at a level of 80 people, and the maximum at 120;
c) workers with three types of qualifications ($C3$); the minimum number of workers in this category was determined at 20, and the maximum number at 50.

At the same time, seven possible variants of the organization's demand for particular category workers were established (Table 2.). According to the assumptions, the first variant defines the demand only for workers of cat-

egory $C1$, the second variant solely for workers classified in category $C2$, and so on.

Table 2. **Matrix of polyvalent training variants**
Tablica 2. **Matrica varijanti polivalentnog obrazovanja**

		Possible variants of employment structure (qualification categories)						
		1	2	3	4	5	6	7
Ranking categories	C1	X			X	X		X
	C2		X		X		X	X
	K3			X		X	X	X

Based on so defined demands, equations describing the number of workers assigned to particular ranking categories were derived. These equations take on the following form [2]:

$$x_1 + x_4 + x_5 + x_7 = C1$$
$$x_2 + x_4 + x_6 + x_7 = C2$$
$$x_3 + x_5 + x_6 + x_7 = C3$$

The determination of the optimal decision can be reduced to solving the function maximization problem:

$$f(x) = x_1 + x_2 + x_3 + 2x_4 + 2x_5 + 2x_6 + 3x_7 \rightarrow \max$$

with the following limiting conditions:

$$x_1 \geq C1_d$$
$$x_2 \geq C2_d$$
$$x_3 \geq C3_d$$

$$x_1 + x_4 + x_5 + x_7 \leq C1_g$$
$$x_2 + x_4 + x_6 + x_7 \leq C2_g$$
$$x_3 + x_5 + x_6 + x_7 \leq C3_g$$

$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 = n$$

where:

g - upper limit,
d - lower limit,
$x_1, x_2, x_3...$ - possible variants based on Table 2.

As a result of linear programming carried out, the following values were obtained: x_1=385, x_2=105, x_3=35, x_4=0, x_5=0, x_6=0, x_7=15 - which enabled the determination of the number of workers assigned to particular groups on the levels: $C1 = 395$, $C2 = 90$, $C3 = 29$.

Thus obtained values allowed the specific number of workers to be assigned to the previously developed training variant. Detailed information concerning the directions of development of competences are given in Table 3.

Table 3. **Fragment of the summary related to the directions of worker development within polyvalent training**
Tablica 3. **Dio sažetka usmjeravanja radnika unutar polivalentnog obrazovanja**

Post description	Number of workers assigned to the post	Number of workers nominat polyvalent training
Mill Operator (Rolling Mill Division)	12	
Mill Operator- Ganger (Rolling Mill Division)		4
Overhead-Crane Operator (Rolling Mill Division)	23	
Operator (Furnace Division)		2
Bridge Operator (Rolling Mill Division		4
Bridge Operator (Section Finishing Division)		4
Cycloping Operator (Section Finishing Division)		2
Charger (Furnace Division)	15	
Furnace Operator (Furnace Division)		2
Dispatcher (Section Finishing Division)		2
Operator (Furnace Department)	4	
Furnace Operator (Furnace Department)		2
Bridge Operator (Rolling Mill Division)		2
Charger (Furnace Division)		1
Fitter (Furnace Division)	8	
Furnace Operator (Furnace Division)		2
…	…	…
Overhead-Crane Operator (Rail Finishing Division)	21	
Bridge Operator (Rolling Mill Division)	33	4
Bridge Operator (Section Finishing Division)	28	4
Dispatcher (Mining Linings Division)	1	1
Dispatcher (Rail Finishing Division)	1	1
Total		132

SUMMARY

The proper carrying out of the polyvalent training programme requires several analyses and assessments to be made. The organization should perform the accurate examination of job posts, the assessment of workers, and the review of available documentation related to conducted technological processes. However, the benefits resulting from undertaking such actions will be by far greater than the incurred outlays. First, the organization's flexibility of responding to unfavorable trends in its human resources will significantly increase. The organization will obtain a capability of quick and cheap filling vacancies on particular work posts. In addition, these actions will not entail the high costs that would be necessary in the case of resorting to external labour markets and carrying out recruitment and selection processes.

The analyses preceding the actual process of creating the polyvalent training programmes may also bring several advantages to the organization. First, the data collected at the stage of job post evaluation can be used for updating remuneration and motivation systems, as well as for improving the methods of work performance and organization. Secondly, the performed worker assessment enables the division of the whole population of workers into several categories, depending on their development potential, possessed skills, self-dependence or effectiveness. This allows accurate addressing of training activities to relevant workers. Additionally, it is possible to use this information for the processes of replacing workers with inadequate competences. Third, the organization obtains a possibility of the clear and accurate determination of the real competences of its employees. This may result in the identification of new opportunities for making use of specific individuals. And finally, by creating career paths, the years-long planning of the development of particular employees and the organization as a whole becomes real.

The current market situation is characterized by a high variability of the organization's environment. Changing market realities compel enterprises to undertake even newer initiatives aimed at, among other things, a better fulfillment of customers' needs, or a more effective fighting with competitors. One of the methods for meeting these requirements is to have polyvalent workers within the organization. Polyvalent - means those, who will be able to meet the growing demands of customers and flexibly adapt to changing realities.

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