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IMPORTANCE OF THE PROPOSAL LAYOUT FOR INCREASING COMPETITIVENESS ENTERPRISE

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Abstract: *At the present time, when the whole world is in economic crisis, and most companies are facing reducing demands for their products, the competitiveness of an enterprise must be boosted. In particular, this means improving a firm's competitive advantages, such as low price, flexible delivery time, and of course, all the while maintaining the required level of quality. One way of achieving competitive advantage is to design a suitable spatial arrangement for the company (layout). This article focuses on analyzing the parameters of layout options and their impact on the competitiveness of the manufacturing enterprise. The goal is to find parameters of the layout, which will positively affect the competitiveness.*
Key words: *layout, costs, delivery time, quality*

1. PARAMETERS OF BUSINESS COMPETITIVENESS IN TERMS OF LAYOUT

Enterprises are continually trying to increase their competitiveness. Key concepts are price, quality of products, diversity of products offered, flexibility of response and decision and continuous production. It is necessary to understand everything in context, and hence layout design is one of the options. But layout cannot affect all areas, and it affects the majority of areas only partially. Layout can affect the price of the product, production time and product quality, and partially the flexibility of responding to and making decisions. It cannot affect the diversity of products offered (Líbal, 1998).

1.1 Quality

Quality is currently an indispensable part of everyday life. A suitable layout can in some way affect the quality of the product.

- **The risk of damage during handling** - in order to avoid damage, it is necessary to propose material flows clearly, simply and, in relation to the volume transported, over the shortest distance.
- **The risk of damage during storage** - when designing the storage area the appropriate location must be determined, and the effects of weather, production technology and risk of injury from handling equipment must also be taken into account.
- **Risk of reduction in production quality** - we must locate individual workplace stations so that they do not adversely affect other workplaces.
- **Workplace Ergonomics** - is an integral part of the design layout of the production area. Working conditions must be modified with regard to human comfort and safety.

1.2 Delivery times:

Delivery time is another important parameter affecting the competitiveness of the company. The firm must respond flexibly to market developments and adapt its production to requirements. Appropriate layout design can be achieved by a decrease of production time, which is composed of two types of times.

- **Production times** - these times 'add' value to the product. In many cases, they cannot be reduced, because they are given by the production technology.
- **Non-productive times** - these times 'do not add' value to the product, but they are indispensable for producing the product. The time of handling is mainly dependent on short and well-arranged material flow, which is achieved through optimization of transport routes.

1.3 Cost:

If we want to keep the business competitive, it is necessary to produce products at a sufficiently low cost. Production costs can be divided into two groups, namely the cost of technological operations and the cost of non-technological operations (Tupa & Basl, 2006).

Cost of technological operations - These costs are directly associated with the production. They are based on manufacturing processes, production technology, production machines used and their parameters. This area is not affected by the layout design (Philips, 1997).

Cost of non-technological operations - In terms of the layout they are primarily operating costs which can be divided into the cost of 'handling' and 'manufacturing'. An optimally designed layout makes it possible to reduce these costs (Philips, 1997).

- **Cost of manipulation** - material handling accounts for 90% of the total length of time from the time of production (Horváth, 2000). Our task is to achieve the best possible performance of the transport of material at the lowest cost. Of course we must take into account the cost of handling equipment and associated costs of operating, maintainence, staff, etc.

(1)

Where is the cost for manipulation [€], is wage worker serving technology for manipulations (if necessary) [€], is depreciation of handling equipment [€], is maintenance costs and service material handling technology [€], is other costs [€], is energy consumption or fuel [kWh/m, l/m, etc.], is length of transport routes/year [m], is average price of energy or fuel [€/kWh, €/l, etc.]

Shipping Costs moving units:

— (2)

Where $C_{t.u.}$ is cost of the transit unit [€], R is transmission rate of one meter [€/m], r is length of transport routes [m], $N_{t.u.}$ is number of units shipped [pc].

- **Cost of production areas** - costs of production areas are given by the overall size of production areas. These costs include capital costs, energy costs, maintenance costs, costs of inspection and the cost of paying taxes. Layout can reduce these costs (Roubal & Kleinova 2007).

$$C_{area} = R \times A \quad (3)$$

Where R is rate (electric power, maintenance, etc.), A is Area size [m²].

2. LAYOUT PARAMETERS AFFECTING THE EFFICIENCY OF THE PRODUCTION PROCESS

The layout is basically the design of the spatial arrangement. The most important parameters are therefore the length of routes, size of production areas and shape of the production areas. Appropriate layout can affect these parameters to some extent.

Length of transport routes - the routes between the various production units, which should be from a logistics and cost point of view as quick as possible, but should also meet the requirements of occupational safety and ergonomics.The length of transport routes directly affects the transport performance and it is therefore necessary to optimize the distance between workplaces in the production system to achieve the shortest distances.

Total production area – the whole area of the manufacturing system which is used to ensure the production processes. It can be divided into three groups.

- **Production areas** – areas in which the workplaces are located.
- **Areas for logistics operations** - areas which do not create value for the product, but are almost indispensable for production.
- **'Empty' areas** – areas that are not currently used, but are ready for further development by the firm.

3. CONSEQUENCES OF A CONCRETE LAYOUT SOLUTION

Adjustments to parameters such as length of transportation routes or size of manufacturing space achieve certain changes in areas such as cost, delivery time and quality.

3.1 Parts affected by the size of the area

- **Consumption of energy** - energy costs are associated with the operation of manufacturing space relative to the size of the total area.
- **Tax** - a tax on property associated with the size of the total area.
- **Investments in production areas** - the cost of construction, reconstruction and expansion of manufacturing areas. The costs reflect the investment through depreciation rates.
- **Wages for maintenance staff and production workers** - calculated on the basis of hours worked, rates and numbers of workers.
- **Maintenance support** – it is necessary to organize the location of machines, ensure good access to all parts of the production system and thus allow for easy maintenance.

3. 2 Parts affected by the length of transportation routes

- **Investments related to the acquisition of handling equipment** – the cost of the investment in the acquisition of handling equipment are reflected through depreciation rates.
- **Cost of operation of handling equipment** – (see section 1.3) costs associated with the operation of handling equipment that are directly proportional to the length of transportation routes and working hours.
- **The intensity of the flow** - Q is the unit material transported per unit time (tonnes per hour, units per shift, etc...).
- **Transport performance** - the most characteristic quantity for layout, is given by the technical product specifications (weight, size and shape of the unit), length of routes and time section (e.g. tonnes per week).

$$P = Q_m * r \quad (4)$$

Where P is transport performance, Q_m is intensity of flow [TU/time], r is length of transport routes [m].

- **Length of non-technological times** - depends on the optimal distribution of production workplaces and the efficient use of transport performance, so that handling times are as short as possible.

3.3 Other parts affected by changes to the layout

- **Visual control over the operations and activities** - clearly structured system of workplace and location of checkpoints provides easy control and troubleshooting of problems in workplaces.
- **Work safety** – emphasis on the man - machine - material - energy – environment interaction. These arise from safety standards.

4. CONCLUSION

Layout is the most prominent expression of the organization of a production system. As outlined in the paper, it affects the cost, delivery time and quality of a product. We can therefore say that the best design layout can affect to some extent a firm's competitiveness. A layout proposal must respect a number of conditions which arise during the design process of the production system. The most effective way to address layout is by designing it in parallel with the design of the production system.

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