

VALUE ANALYSIS OF THE TECHNOLOGY OF FURNITURE PRODUCTION

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INTRODUCTION

Hungary has become a member of the European Union. A market of approximately 500 million people has opened up to Hungary. At the same time, the Hungarian market has opened up to EU companies. A furniture manufacturer and trading ltd. wished to implement a technological development in order to increase its competitiveness. It received funding for the development from the EU. The company management decided to accomplish the development by applying Value Analysis in order to create an effective technology.

(Ferenc Nádasdi – László Gallai (1), 2008); (Ferenc Nádasdi – László Gallai (2), 2008); (Nádasdi, F. - Dr. Vámosi, K., 2016)

VALUE ANALYSIS OF THE TECHNOLOGY OF FURNITURE PRODUCTION

The main characteristics of the furniture factory

The business scope of the company is diversified; it deals with the manufacturing, distribution and delivery of furniture. It has a wide range of products; it mainly offers mid-range, high quality, but affordable furnishings. In addition, it also endeavors to satisfy individual needs. It has a reseller network covering the entire territory of Hungary and it satisfies customer demands nationwide with its own shops. The company has altogether 11 stores. The management has a dual task: besides improving quality, it has to ameliorate its production and operations. The company's management expects that solving these tasks will increase revenue and profit.

The goal of the project

As a result of the stricter expectations towards the product, product development based on consumer demands, a need for increasing competitiveness and the increasingly accelerated technology changes, a continuous analysis of the technical and economic parameters of technological processes is important.

Main goal: improving the market position of the product

Sub-goals:

- better compliance with user and manufacturer needs
- elimination of quality problems arising from production
- reducing operational costs
- reducing operation time
- reducing the material and energy consumption of the technology
- improving the capacity utilization of the main manufacturing process or equipment
- replacing heavy physical work
- improving health, safety and environmental protection

The subject of the project

The subject of our value analysis is the process of furniture production. The main raw material is the prelaminated particle board, which is created by pressing decor paper (which was impregnated with resin) on the plain particle board by thermal pressing. Resin ensures the tenacity of the product in the requisitioning during usage; and in addition to that, a wide selection of decor paper offers unlimited opportunities for the fantasies of the furniture designers, architects and interior designers. This raw material is being cut to sizes by a computer numerical controlled cutting machine following a pre-defined pattern. After splitting/cutting, the semi-finished products are being transferred into the CNC machining center, where the possible kerfs, roundings and drills are being performed, which secure the matching and appearance of the final product. During the next step, edging of the pieces takes place; this operation eliminates cut edges and creates a pleasing look. At this point, all the different furniture components are finished. Afterwards, there are two options: workers produce ready-to-install furniture from the complicated/large, difficult to assemble pieces, and these are laid up in the warehouse in this form; while the simpler, smaller pieces of furniture are transferred to the packaging department. Here they are placed in cardboard boxes, thus creating the so-called flat-pack furniture products. Flat-pack products are piled on pallets and they are stored this way. (Stewart, R. B. 2005)

INFORMATION ABOUT THE TECHNOLOGICAL PROCESS

The following chart summarizes the operations of furniture production and its equipments:

Chart 1. The operations and devices of the technological process

Furniture production		
Splitting phase	Phase of other workings	Phase of packing and assembly
Machinery	Machinery	Machinery
Fork-lift	Machining center	Nailer
Stackable container cart	Multi-borer	Pallet lifter
Beam saw		Furniture welding cart
Waste storage container		
Material handling cart Furniture trolleys		
Operations	Operations	Operations
M ₁ hauls to machine	M ₇ does the machining	M ₉ fixes
M ₂ stores material	M ₈ drills together	M ₁₀ transports product
M ₃ places on machine		M ₁₁ transports product
M ₄ cuts to size		
M ₅ stores waste		
M ₆ stores material		

Source: (Nádasdi, F. - Dr. Vámosi, K., 2016)

DEMAND ANALYSIS

The authors decided that it is expedient to analyze the product itself as a first step. Thus, it can be avoided that the product might contain unnecessary functions and costs. Based on our experience, it often happens that it is necessary to collate technological changes with product design as well.

Customer demands towards furniture are the following:

1. Should be of the right size
2. Can be easily packed
3. Drawers should be easy to slide
4. Should be aesthetic
5. Should be durable
6. Should be easy to move
7. Should be easy to ship/transport
8. Should be wear-proof
9. Should be fashionable
10. Should be safe
11. Good value for money
12. Acceptable price
13. Easy to install
14. Environmentally friendly
15. Recyclable
16. Should be of the right color

The second step of the demand analysis is the analysis of the expectations towards the production/manufacturing process. What and how do we have to work up during the manufacturing process in order for the demands towards the product to be completely fulfilled? The main element of the production process is technology; therefore, our analysis covers this area.

Note: 'Manufacturing' is a wider concept than 'technology'; however, our research capacity provided this opportunity.

Demands towards technology are the following:

1. Should be flexibly customized
2. Should yield the exact size
3. Should secure quick transition
4. Should provide impeccable appearance
5. Should result in a quality product
6. Should be economic
7. Maintenance should be transparent
8. It must not have adverse effects on the environment
9. It should make the product suitable for distribution on the market
10. Should be easy to install
11. Should be easy to pack
12. Should be easy to transfer without any damage
13. Should be easily storable

(Bolton, James D. et al, 2004),(Bytheway, Charles W. 2007)

FUNCTION ANALYSIS

First, we have defined the functions of the product, then of the technology starting from consumer / user demands.

FUNCTIONS OF THE PRODUCT:

F1: Provides visual experience

F1.1 Conforms to environment

F1.2. Provides a pleasing shape

F2: Provides storage space

F2.1. Has the right dimensions

F2.2. Has closure and opening

F3: Ensures easy usage

F4: Ensures quality

F4.1. Ensures maintainability, cleaning

F4.2. Has longevity

F5: Ensures expected appearance

F5.1. Delivers the expected color scheme

F5.2. Conforms with the place/ambience

F6: Ensures transportability

(Clancy, D. F. - Dennis L. M. 2004), (Kaufman, J. J. - Woodhead, R. 2006)

Certainly, these are general functions which emerge in case of furniture. Further functions might arise in case of each product (Figure 1.).

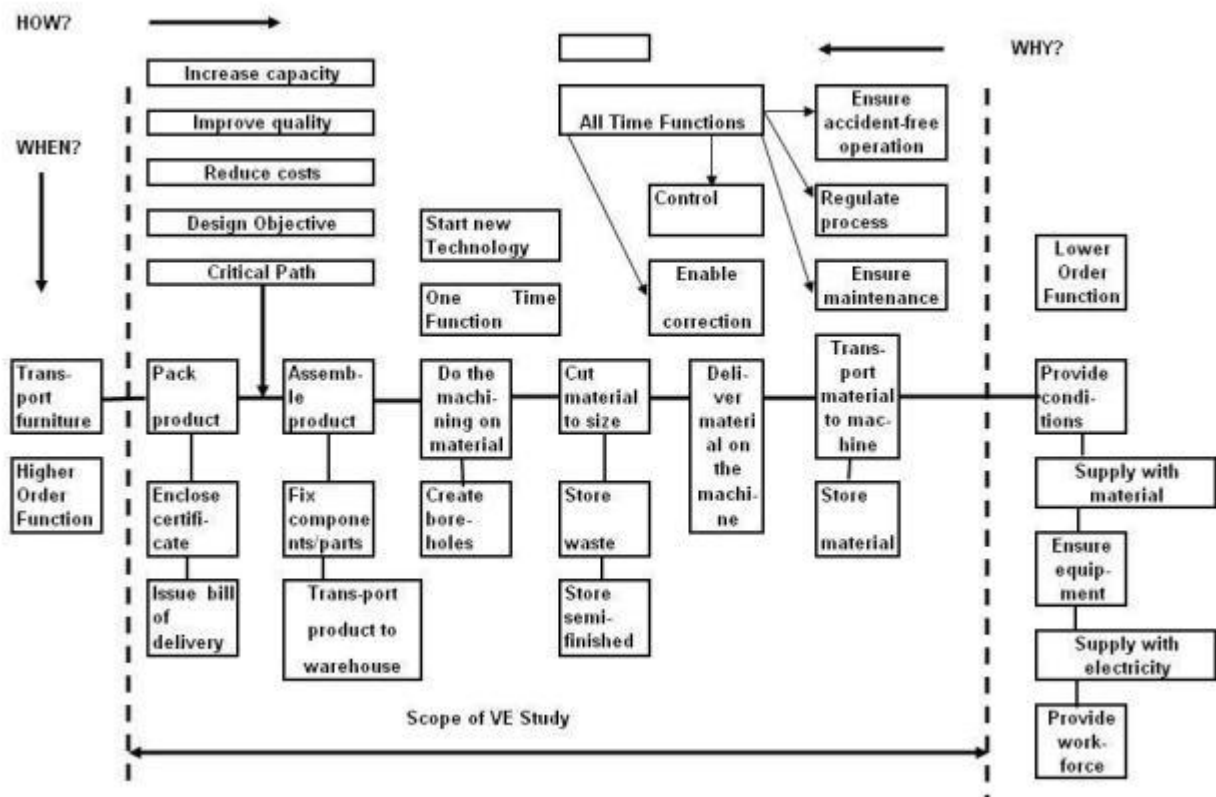


Figure 1. Shows the functions of the technology.

Source: (Nádasdi, F. - Dr. Vámosi, K., 2016)

The method of Value Analysis has been utilized during technology design. Defining functions and function costs enabled the putting up of an efficient technology.

The furniture factory has become more economic and more productive by utilizing the new opportunities which the new machines provide and by introducing the new technology. With the increase in size accuracy, a layman can assemble the products; they do not require the expertise and the routine of a carpenter. This fact made the production of flat-pack products possible, which are being sold in a semi-finished condition in cardboard boxes. As a corollary to the flat-pack formation, the utilization of warehouses has improved to a great extent. The improvement of technology resulted in extra capacity, which enabled the development and design of new products which have their places in the production.

PRIME COST VS. FUNCTION COST

At times it happens that an intense professional debate sparks off between the engineers developing the technology and the value analyst expert during choosing certain function carriers. For instance, there are two kinds of solutions when polishing some surfaces. One of them is using sandpaper. The sandpaper is fixed upon a rotating disk. The other solution is the usage of a milling cutter, which polishes the surface to be machined to be smooth with a rotating motion. Both solutions can eventuate in a good result. Technologists preferred sandpaper, referring to its low prime cost. Namely, that 1 m² sandpaper costs 0,1 USD, while a milling cutter costs 20 USD. However, on a m² surface to be machined, the use of sandpaper was 10 times more expensive than using the milling cutter.

Value Analysis does not use the expressions 'cheap' or 'expensive' and/or 'component'. Value Analysis uses the expression 'Function cost', or rather that is what it defines and it suggests a decision during which it should be taken into account!

VALUE ANALYSIS OF THE TOOLS OF FURNITURE PRODUCTION TECHNOLOGY

We have analyzed the tools which are necessary for the operation of the equipments in the design of the technology. We have set the following goals when choosing the tools:

- Eliminating quality problems arising during production
- Reducing operational costs
- Reducing the material and energy consumption of the technology
- Improving capacity utilization of the main production process and equipment
- Enhancing productivity

We have examined the following groups in the field of tools based on basic commodity:

- Diamond tools
- CBN cubic boron nitride
- PCD polycrystalline diamond
- Composites
- Coated tools (Titanium nitride TiN; Titanium carbonitride TiCN; Ceramics Al₂O₃)

The comparison of the tools was carried out with the help of function analysis.

The functions of the tools (highlighting woodworking chisels):

F0 Disintegrates material

F1 Improves the quality of the work piece

F11 Ensures edge quality

F12 Ensures cutting quality

F2 Easy to replace

F2.1. Reduces downtime

F2.2. Fits perfectly to equipment

F3 Enhances work safety

F3.1. Ensures silent mode

F3.2. Protects body parts

F4 Has longevity

F4.1. Resists abrasion

F4.2. Resists deformation

We ascertained after executing the function analysis and determining function costs that the prime costs of diamond-based tools are the highest. At the same time, the longevity of the diamond-based tools is several times more than that of the other tools. When using diamond-based tools, downtime is significantly reduced, and machining of the components results in better quality than in the case of working with other tools. Company management decided for applying diamond-based tools and their decision was based on Value Analysis.

EXPECTED RESULTS

The company can realize the improvement of product quality, the full compliance with consumer and manufacturer demands, a growth in capacity, a reduction in costs, and the widening of both the domestic and the international markets by implementing the new technology.

SUMMARY

The application of Value Analysis in furniture production draws up some feasible suggestions, upon which company management and their experts have not thought of before. The implementation of the suggestions might improve the position of the company in the market; in Hungary and in the world market we find some companies which may squeeze out this company from the market. Therefore, it is of crucial importance to apply Value Analysis; which facilitates the utilization of new opportunities, and which fosters the keeping and improving of the company position. Company management chose those opportunities from the suggested technological solutions, which the company resources could afford. (Miles, L.D., 1972), (Sato, Y. - Kaufman, J. J., 2005)

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