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Technology

Abstract: The term technology is explained differently in different fields. In the operations management the most complete definition is that technology includes methods, means of work, production procedures, implementation by the user, as well as social relations, creative talent and sense for organization and management of knowledge in the direction of its useful application.

Keywords: Technology, organization, production.

1.1 Technology

Technology (Greek: *Tehne* = Technical skills, *logos* = science) is the application of science, a scientific method or material used to achieve the commercial or industrial aims. There are several definitions of technology:

- The United Nations Education, Social and Cultural Organisation (UNESCO, 1985) defines technology as: "*...the know-how and creative processes that may assist people to utilise tools, resources and systems to solve problems and to enhance control over the natural and manmade environment in an endeavour to improve the human condition.*"
- Technology is the process of converting the value of each utility (natural or semi-finished items) to other human use values by combining business operations with the operations of machines, other mechanisms, devices, facilities, etc. which can be mechanical, chemical, thermomechanical, thermochemical, electrical, electrochemical, biochemical, etc. The entire modern industrial production is based on modern technology.
- Technology is the application of scientific or any other knowledge in organization, including any tool, technique, product, process, method, organization or system of practical tasks.

The term technology is explained differently. Most authors see it as complete definition of operation management that includes technology of management, methods, means of work, production procedures,

implementation by the user, as well as social relations, creative talent and sense for organization and management of knowledge in the direction of its useful application.

Technology increasingly affects all aspects of social life. In order to survive the garment industry in the turbulent environment, it is necessary to meet customer requirements with respect to quality, price and delivery term. These criteria can be fulfilled only with the restructuring of existing production–business systems (PBS) by introducing modern technologies, changing forms of organization and participation of motivated workers. That not only changes the way goods are produced, but it also changes the manner in which the goods are distributed and promoted. Changes in technology create new markets, new products and new ways to create competitive advantage.

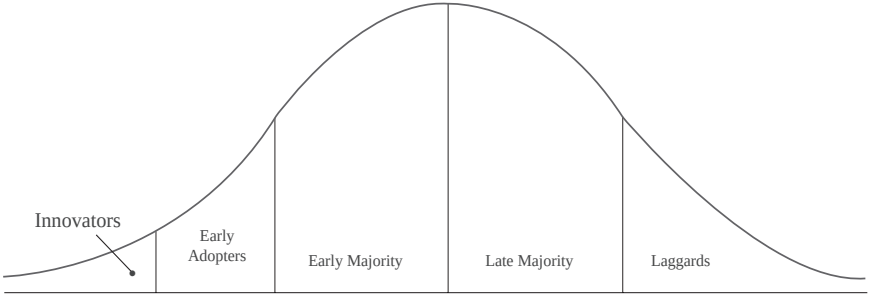
1.2 Cycle technologies

Adoption of technology is a common phenomenon that leads the industry through the life cycle of the industry. The life cycle of technology has seven stages:

(1) start, (2) invention, (3) development, (4) maturity, (5) uncertain, (6) slightly exhausted, and (7) obsolete.

The technology is not always accepted, even though it is a human innovation which involves generation of knowledge and processes in developing systems to solve problems and expansion of human capabilities. According to Moore theory (Moore, 1991) while accepting new technology, people can be divided into the following groups (Figure 1.1):

(1) Innovators – Enthusiasts for technology who want to be the first to test all technical innovations.
(2) Early adopters – Visionaries who are somewhat amazed at the new technology. They value the potential of products which could provide a competitive advantage for their organization.
(3) Abyss – The time gap in the acceptance of technology. It is situated between the early adopters and pragmatists.



1.1 Acceptance of technology.

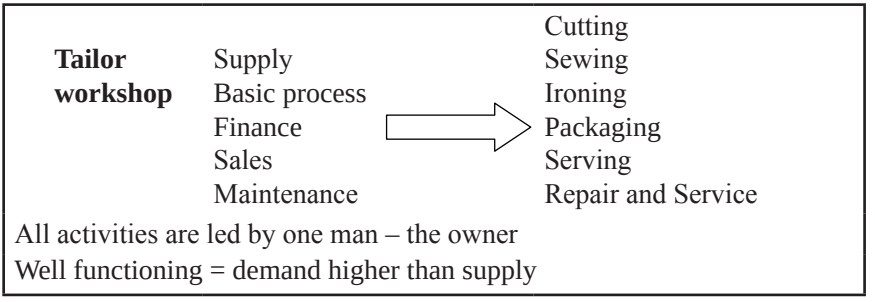
(4) Early majority pragmatists – People who do not like to gamble with new and innovative technologies, but are willing to give priority to technologies tested. They represent the beginning of the mass market.
(5) Late majority pragmatists – Conservatives, they represent approximately one third of the market. They do not like discontinuous innovations and believe more in tradition than in progress.
(6) Laggards – They are not interested in high-technology products.

1.3 Technology and organization

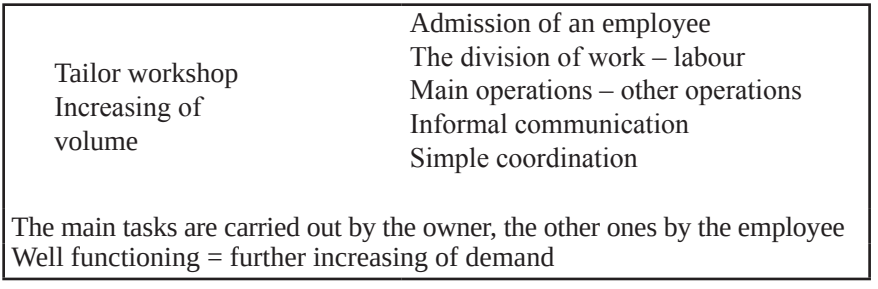
Technologies are – considering the products – different, as well as organizations. To make production technologic, every technology must require a certain way of organization.

Organization refers to functions, machines and people in workspace. Operating within a production means having good control of functions. Function refers to the man–machine interface, and organizational structure to the plant relocation and groups of people who occupy it. Organizational structure tells about the way the work is done and must be in accordance with technology.

L. Greiner (1972) developed a theory of the life cycle of the organization, which is widely accepted in the organizational literature and management practice. According to this theory, companies that grow pass through five stages of development, each of which ends with the crisis of organization: foundation and early growth, direction, delegation, co-organization and collaboration. Figures 1.2–1.6 show the stages of development from tailor workshop to large company.



1.2 Tailor workshop.



1.3 Tailor shop with increase volume of work.

Further increasing of volume	Admission of new workers (ten) Group production A large number of contacts Appointment of managers
LARGE WORKSHOP	- New division of labor – Production - Coordination ⟹ Other functions - Training - Specialization
Well functioning = further increasing of demand	

1.4 Large workshop.

ENTERPRISE Organization	Organizational structure Technology and the study of work - Specialization - Tipization - Standardization - Preparation – production – quality - Organizational function - Centralization
Growth of demand of all products	

1.5 Production – business system.

LARGE COMPANY New organization	Divided into three product lines: - Women's wear - Men's wear - Children's wear
	Management company "from a distance" - Diversification - Control performance - Empowerment of factories - Decentralization - Autonomy - Relations among the leaders
Profit growth Further diversification	

1.6 Large company.

1.4 Technology and production

Production is the transformation of organizational resources into products. Production technology is a way of making the product, which determines the maximum amount of product from a given combination of inputs.

Classification of technology can be different, depending on the technological phase in question:

- techniques that are used in a production process,
- properties of materials,
- different skills that are required in the production process,
- degree of continuity of operations,
- degree of automation and
- degree of interdependence of business systems.

Productivity is a measure of the success of a business in relation to resources used. Productivity is not only dependent on compliance of technology and organizational structure. The relationship between technology and structure depends on the type of production, too. We distinguish the following types of production: unit production, serial production, mass production, process production and flexible production. The basic characteristics of these productions are

(1) Unit production
- single product for a known customer by order,
- requirement of high knowledge and skills of making products,
- a number of different operations without the correct order,
- implementation of universal tools and equipment,
- unpredictability of the optimal size of inventory,
- direct control of business operations,
- large number of workers of different qualifications,
- complicated linking and synchronization of operations (a source of inefficiency),
- planning and control are expensive and complex (because of uniqueness), and
- expensive and inefficient compared to other types of production.

(2) Serial production
- production of products or parts of products (series), with standardization of products and sequence of operations,
- main problem is the choice of optimal size of the series,
- fixed number and sequence of work operations,
- universal tools and equipment, grouped by type,
- large stock of raw materials located in the workshops,
- workers of different qualifications, but with a smaller range of qualifications than with unit production,
- a great need for planning and short production cycles (source efficiency) and
- delays due to waiting for the completion of the previous working operation (source of inefficiency), which is removed by the introduction of mass production.

(3) Mass production
- production of a large number of standard products,
- standardized capital-intensive technology,
- uniform product of average quality,
- specialized and line sorted equipment (conveyor belt),
- standardized inputs, methods of operation and working,
- narrow range of qualifications and a small number of operations per worker,
- simple planning and control of business operations,
- effort and flatness of work (a source of inefficiency) and
- requirement of mass market, but changes in demand lead to combining mass produced standardized products in many variations.

(4) Production process
- continuous production of products,
- integrated production technology and continuous flow (processing of petroleum, chemical industry, cement production),
- capital-intensive production,
- mechanized and automated equipment,
- a small number of workers,
- the problem of planning supplies o raw materials, which is important to avoid interruption of production and
- self-regulation and high efficiency.

(5) Flexible manufacturing
- automated production of small series of products, without manual intervention,
- although this technology is expensive, it provides speed, high quality, less inventory, the possibility of rapid changes, manufacturing different products and zero defect,
- differentiated product of high quality,
- production according to the contract (by order)
- teamwork of multi-qualified workers,
- more variants of basic products and
- electronic data exchange of subcontractor brings better coordination of work

Unlike massive production, single and process productions are poorly structured and are flexible, which is achieved by a small division of labour and increased group activity, increased liability in the "role playing" and decentralization in decision-making. Flexible technological production process is an optimal model of production that enables easier and quicker adjustment to small series, to a large number of different models, different sizes and patterns, to the request of a saturated market, consumers' change of taste and to the production of different goods by using the same technological process.

According to James Thompson (James D. Thompson, 1960), technology does not unconditionally bring about the strategy of behaviour, but allows the selection of strategies for reducing uncertainty. Thompson differs:

(1) Long-linked technology – this is characterized by gradual interdependence of operations, as in mass production line. Because of the need for efficiency in this technology, the flow of operations goes according to the "Just in Time" principle, and great emphasis is given on the organization in which management controls the input and output. Long-linked technology is highly standardized and carried out in specialized serial schedule. The characteristic of this technology is moderate complexity and formalization.
(2) Mediating technology – this has a partner dependence as its characteristics, where the partners do not have to be directly dependent on each other, but are only in connection with the process of transforming input into output. Inefficiencies in this case are performed only when one side wants cooperation. The characteristic of this technology is low complexity and high formalization.
(3) Intensive technology – this technology is marked by high complexity, low formalization and high flexibility. Usual answers to different series of possibilities are given. Therefore it is not always possible to give a correct answer, due to the nature and variety of problem (e.g. in laboratory).

The efficiency of these technologies varies depending on the type of technology usable in plants. That is especially important nowadays in the situation of integrated production.

In the short term PBS has to use up the technology applied, while in the long term it can introduce a more efficient production technology in order to reduce the amount of input needed to produce a certain quantity of output.

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