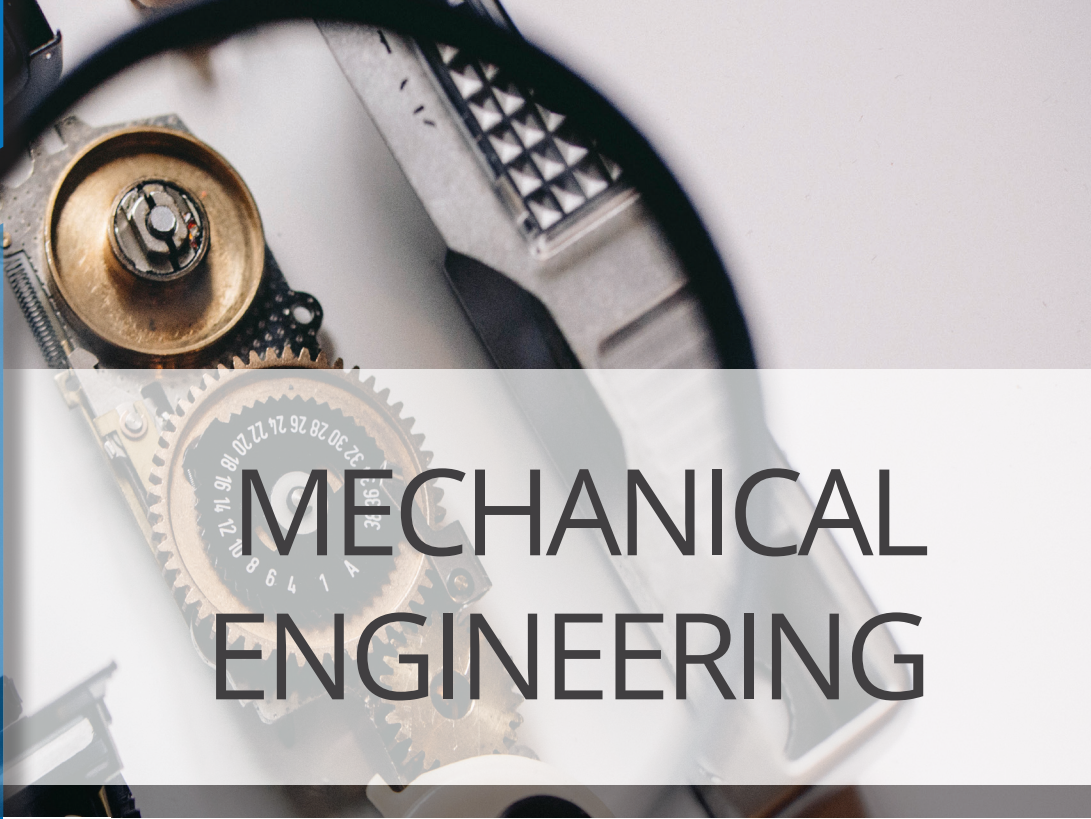


Interreg



Austria-Czech Republic

European Regional Development Fund



MECHANICAL ENGINEERING

Innovative
processes



UNIVERSITY
OF APPLIED SCIENCES
UPPER AUSTRIA



EUROPEAN UNION

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I. PROCESS, INNOVATION, INNOVATION MANAGEMENT

I.1. The Process

What is the process?

The process is a general term for the gradual flow of actions, states, activities or work.

There are more types of processes in the real world, so the term process is used in practice in various ways. Therefore, it is important to know the context of what process is being said, otherwise there may be misunderstandings. e.g.

- Business process (process as flow of activities and work)
- Production process (process as value creation, product)
- System process (process as running software)
- Production process (process as product creation)
- The process of technology (process as process of production or creation of something)
- Chemical process (process as chemical action)
- Thermodynamic process (thermodynamic process)
- The biological process (as a biological process)

Depending on behavior, the processes are divided into:

- Stochastic processes - these processes do not exactly know how they are going, the result can only be explained by probabilities
- Deterministic processes are those whose behavior is well known.

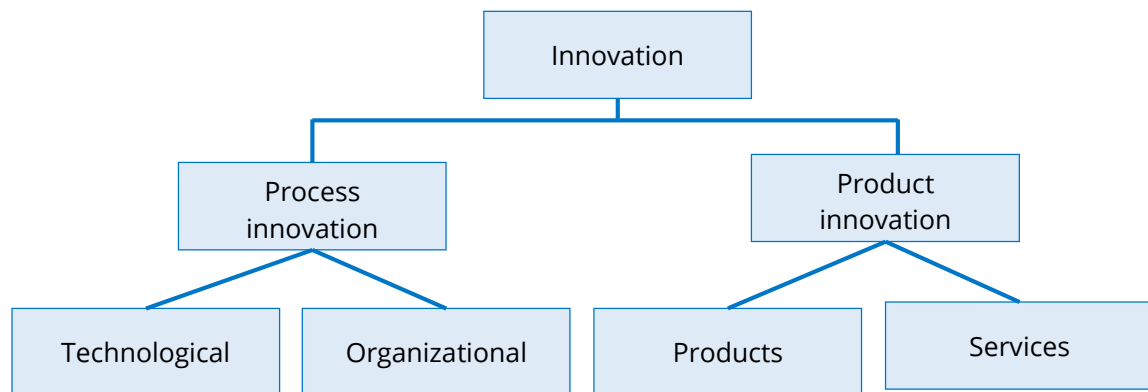
I.2. Innovation

What is the innovation?

Innovation means improvement. It represents a complex process from the idea, through development to eventual implementation. The result of innovations is an improved process, product, service or anything else.

Typically, the following types of innovations are distinguished:

- Product or service innovation,
- Process innovation,
- Organizational innovation,
- Marketing innovations.



Innovation in practice

- Innovation is a key driver of evolution for all organizations.
- With innovation, new products are introduced, improved and developed, increased work efficiency, cost savings, and quality improvements.
- Encouraging innovation in enterprises is an integral part of good management and part of quality management approaches (eg PDCA cycle, Six Sigma, etc.)

1.3. Innovation management

What is Innovation Management?

Innovation Management is concerned with introducing something new into the functioning and running of an organization / business or into the portfolio of its / its products or services. Innovation is closely related to quality management, and therefore the methods overlap with each other.

Innovative management methods

- Blue Ocean Strategy
- CAF
- DMAIC
- Deming's cycle (PDCA)
- EFQM Excellence Model
- Kaizen
- Quality rings
- Open Innovation
- Six Sigma
- TRIZ
- TQM – Total Quality Management
- User Centered Design

Deming's cycle (PDCA Cycle)

- Is a method of gradually improving, for example, the quality of products, services, processes, applications, data, in the form of repeated implementation of four core activities:
 - P** – Plan – Planning the intended improvement (intent)
 - D** – Do – Implementation of the plan
 - C** – Check – Verification of the result of the implementation compared to the original plan
 - A** – Act – Adaptation of intent and implementation on the basis of validation and implementation of improvements in practice
- **In practice**, it is used as a well-defined and cyclically repeating sequence of steps and activities in introducing innovation and improving quality primarily in production.

Six Sigma

- Is a complex method of management and is referred to as the philosophy the organization (enterprise) must accept.
- It focuses on continuous improvement (innovation) of the organization by understanding customer needs, by analyzing processes and standardizing measurement methods.
- It is a comprehensive, flexible management system that is based on an understanding of customer needs and expectations, disciplined use of information and data for management and decision making,
- Innovations are based on an improvement cycle in Six Sigma that focuses on finding weak spots and removing them.
- Objectives and Characteristics of Six Sigma
 - Maximize Profit
 - Effective use of resources and increased productivity
 - Reduction of support processes
 - Minimizing negative phenomena – defects, mismatches, losses, claims and costs

TQM (Total Quality Management)

- As a rule, it is not translated and the abbreviation TQM is used,
- Is a very complex management method that puts emphasis on quality management in all aspects of the organization's life. It transcends the quality management framework and becomes the method of strategic management and management philosophy for all the organization's activities.
- There are a number of different forms and interpretations of TQM, however common features can be read from the letters of its abbreviations:
 - **Total** – It involves the full involvement of all the staff of the organization
 - **Quality** – It is the concept of quality principles throughout the organization
 - **Management** – Principles merge with all levels of management and all managerial functions

These common TQM principles apply in different organizations and countries differently, depending on their social, cultural, personnel, legislative, technical and other conditions.

Analytical techniques applicable to innovation management

- Brainstorming
- Mental maps
- Pareto's rule
- SMART – Goal Design

1.4. Strategic planning

- Strategic planning is the systematic management of any organization / enterprise. It aims to mobilize and efficiently use all of its own resources and respond in a timely and correct manner to changes in the environment.
- The main benefit of strategic planning lies in the fact that:
 - Helps you to clearly understand the desirable directions of long-term development and focuses all efforts and resources on solving key issues,
 - Shows how best to prepare for the future development of external conditions, how to minimize the negative impact of threats and maximize the opportunities that may emerge in the future,
 - Creates an objective basis for decision-making on priorities,
 - Solves problems long and complex,
 - Enable optimal use of both apparent and hidden human and financial resources.

1.5. Strategic Plan

Strategic plan can be understood as an agreement to make further use of the current possible resources and to find a common program that we want to achieve gradually in our mutual cooperation. It is not so important how we will get to the recommended steps, which method of strategic planning we choose, but much more important is the common will to promote gradual steps that will lead to an improvement in the overall situation.

- **It should meet the following criteria:**
 - Long-term (processed for a minimum of 4 years),
 - Systematic (maps all branches and disciplines),
 - Selectivity (defining priorities that are further developed),
 - Coherence (between the measures and the target groups concerned),

- Continuity (this is not a rigid document, it must be checked and modified),
- Openness (towards the needs and ideas of citizens),
- Reality.

1.6. Business strategy

Business strategy is one of the most important documents of each business that sets specific business goals for a longer period (3-5 years) and ways to achieve these goals.

Three key components can be seen under the concept of strategy:

- **Mission (mission) of the enterprise** - Short text intended for employees and external employees of the enterprise, which defines the business area and relationships with the company's partners;
- **Long-term goals (vision)** - for selected key performance criteria, it contains numerically and text-defined goals for the period over which the strategy is being developed;
- **Own strategy, which represents a temporally and factually interlinked set of changes (projects)** Whose successful implementation will lead to long-term goals.

2. COMPETITIVE ADVANTAGE, COMPETITIVENESS

2.1. Competitiveness

- The economic meaning of the meaning is the ability of an enterprise to achieve economic rents.
- Ricard's economic rent, which relates to rare resources, ie resources that are difficult to imitate competitors (for example, Unique location, long-term reputation, etc).
- Schumpeter's economic rent, which relates to innovation, is shorter in time, because innovations can be imitated.

2.2. Competitive advantage

The competitive advantage of organizations can arise from their size (property, scope, market position) or the ability to mobilize their intellectual capital, technological skills and experience, and create something completely new in offering their products or services.

This trend also contributes as a source of general economic growth. According to Tidda et al. (2006) innovation contributes in several ways:

- The strong relationship between market power and new products,
- New products help maintain market shares and increase profitability,
- Growth and influence of non-price factors (design, quality, individualization, etc.)
- Ability to replace obsolete products (shortened product lifecycle),
- Process innovation that has an effect on shortening production time and developing new products faster than competitors.
- It therefore follows that the innovation activity of an enterprise significantly affects competitiveness, which is based on inimitable skills and abilities. Achieving higher competitiveness through innovation results in products cheaper and of higher quality than competitors.
- If an organization is unable to keep up-to-date, it risks losing its way back and the

is taken over by other entities. J. Schumpeter (in Tidd et al, p.8, 2006) argued that entrepreneurs will try to use technological innovation - a new product or service, or a new process in their production - when they get a strategic competitive advantage. There will be competition that will not attack the profit margins or outputs of existing companies, but on their merits and their very existence.

2.3. Innovation and competitive advantage

- In terms of creating a competitive advantage, the phenomenon of innovation can be distinguished as three basic types of innovation:
 - Either the product and the services connected to it are changed,
 - Or the production and production capacity changes,
 - Or people and ways of working and driving change.
- At the beginning, emphasis is placed on the invention, from which the innovation will become the natural response, or vice versa, the innovation can be taken without prior invention.
- Jirásek, 2004 created the formula: "... *innovation generates innovations, which are the basic pillar of competitive advantage ...*".
- From the viewpoint of the historical development of the phenomenon of innovation to the professional public, combined with the creation of a competitive advantage, one can see the shift of thought.
- **One innovation attracts the other, complements and strengthens one another. It forms "clusters" of innovation. It is only when analyzing the context of these innovation clusters that the social demand for a new product value shows the competitive advantage and the progress of the business.**

2.4. Growth based on innovation

- The purpose of an enterprise is to create a customer. Therefore, a business organization has only two basic functions: marketing and innovation (business functions).
- The company must monitor the extent to which the products respond to today's customer needs.
- Four basic parallel business approaches:
 - Organizational rejection of products, services, processes, markets, distri-

channels, etc. that do not meet the requirement of optimal resource placement,

- The organization must perform systematic and continuous improvement,
- Reaping its successes,
- Organizing systematic innovations (creating a different tomorrow).

2.5. Innovation goals and strategies

The main factors influencing the innovation policy of all organizations are:

- Market globalization and innovation supply.
- (The issue of globalization now applies to all organizations. Communication technologies allow small businesses to operate internationally.)
- Work visualization, emphasis on shortening time and real-time operations.
- (Virtual work allows for high flexibility, but increases the risk of losing data, information, knowledge and entire innovation intentions).
- Challenges arising from interest for long-term sustainability and standardization.
- (Issues of long-term sustainability and standardization create borders for innovation proposals.)
- Distribution grid flexibility and new business models.
- (Reducing costs and maximizing flexibility also affects distribution processes and forces organizations to use multiple business models. Fast commercialization is based on the above-mentioned requirement to maintain innovation superiority and competitiveness.)
- Emphasis on fast commercialization of R & D results.
- Innovation must therefore be customer-centered and added value. From these goals, organizations need to develop their own strategies in line with their mission and vision.

2.6. Innovative strategies

- The organization's strategy provides a clear direction to behave and respond to the situation.
- Strategies allow you to meet your organization's goals and realize the vision and reflect its mission.
- Strategies can be most effectively generated on the basis of SWOT analyzes (field, organization, environment, etc.). Their conclusions are the starting point for direction. We must not forget that strategic management means not only the implementation of the chosen strategy, but also the constant correction and evaluation of individual objectives, benchmarks and SWOT.

2.7. Strategic management in general

- Based on various suggestions, they make variants of strategies.
- It chooses the direction (discipline, strategy) in which it will be implemented, formulate long-term orientation and behavior in its environment.
- It transforms vision and mission into a set of measurable goals and indicators.
- It suggests how to achieve these goals.
- Supervises the implementation of the chosen strategy.
- It then monitors development and performance, performs an audit, makes changes based on the current situation.

2.8. Hierarchy of strategies

- He basically answers questions who, how, and how much.
- The organization's hierarchy of strategies generally has the following structure:
 - Organization strategy,
 - Functional strategies (research and development, purchasing, sales, marketing, logistics, human resources, etc.),
 - Operational strategies (branches, factories, regional, etc.).

novative strategies belong in the hierarchy between functional strategies, but should appear in the functional strategies of all organizational units. As we already know, innovation is not just a question of science and research.

2.9. Innovative business

Innovative businesses are created in several ways:

- Business plan based on the result of research and development, a patented technological process, funded by a bank or venture capital,
- A business plan created with the support of a business incubator,
- Intra-company intra-company, respectively. Corporate venture,
- Spin-off firm (separating part of the organization from "mother"),
- Social enterprise (innovation in the form of a change in society).

2.10. Innovative organization / firm

- The innovation organization is characterized by a typical saying: "Our greatest asset is people."
- In this case, it is not a phrase, but a characteristic of an organization focused on creative activity. This organization uses synergies that are created in teamwork. They usually have a process (or flexible) organizational structure. Sometimes, the organization is also associated with an innovator (personality) who packs other creative workers around him.
- The concept of an innovation organization is closely linked to entrepreneurship. New innovation-driven business plans are created in high-tech disciplines such as nanotechnology, biotechnology, IT, semiconductors, and so on.

2.11. The innovative organization is characterized by

- Shared vision, mission and will to innovate,
- Process structure,
- Strong individualities (leaders = leaders),
- Effective teamwork (knowledge sharing),

- Continuous individual development,
- Barrier-free communication in all directions,
- All members of the organization are involved in innovation, and willing to accept changes,
- Pro-innovation culture (climate),
- Learning organization.

3.COLLECTION OF INFORMATION, CREATIVITY

3.1. Collection of information, sources of information ideas, incentives for Innovation

External environment

- Customers
- Suppliers
- Competition
- Consultants, V & V institutions
- Schools, universities
- Professional publications
- Internet
- Exhibitions, fairs, specialized seminars and conference
- Patent databases
- Advertising agencies
- Investors
- Media
- Authorized testing laboratories, Certification agency
- Government institution
- Public sector
- Legislation
- Globalization

Indoor environment

- Own Science and Research
- Technical departments - design, construction, technology
- Production departments (production, provision of services)
- Marketing and sales
- Logistics (purchases and deliveries)
- Warranty and post-warranty service
- Owners

3.2. Definition of creativity

- Creativity is a process that results in a new object that is useful and satisfies needs in the appropriate time and environment.
- Creativity is a continuous process by which one combines and recombines his past experience and knowledge in such a way that he finds new progress, arrangements, and relationships that better address the identified problem.
- A creative solution is a solution to a serious problem. A hard problem is a problem that has no obvious solution.
- In relation to defining creativity, let's stress the difference between solving tasks and solving problems.
- Task solving is a goal and a method to achieve it. Solutions are used to define algorithmic procedures.
- Only identifying and partially targeting the problem is known, but we do not know how to achieve it.
- Creative solutions are based on knowledge, but knowledge alone does not guarantee problem solving when statically applied.
- Creativity is more based on the way knowledge is transformed, how much they are.

3.3. The Difference Between Analytical and Creative Thought

Analytical thinking

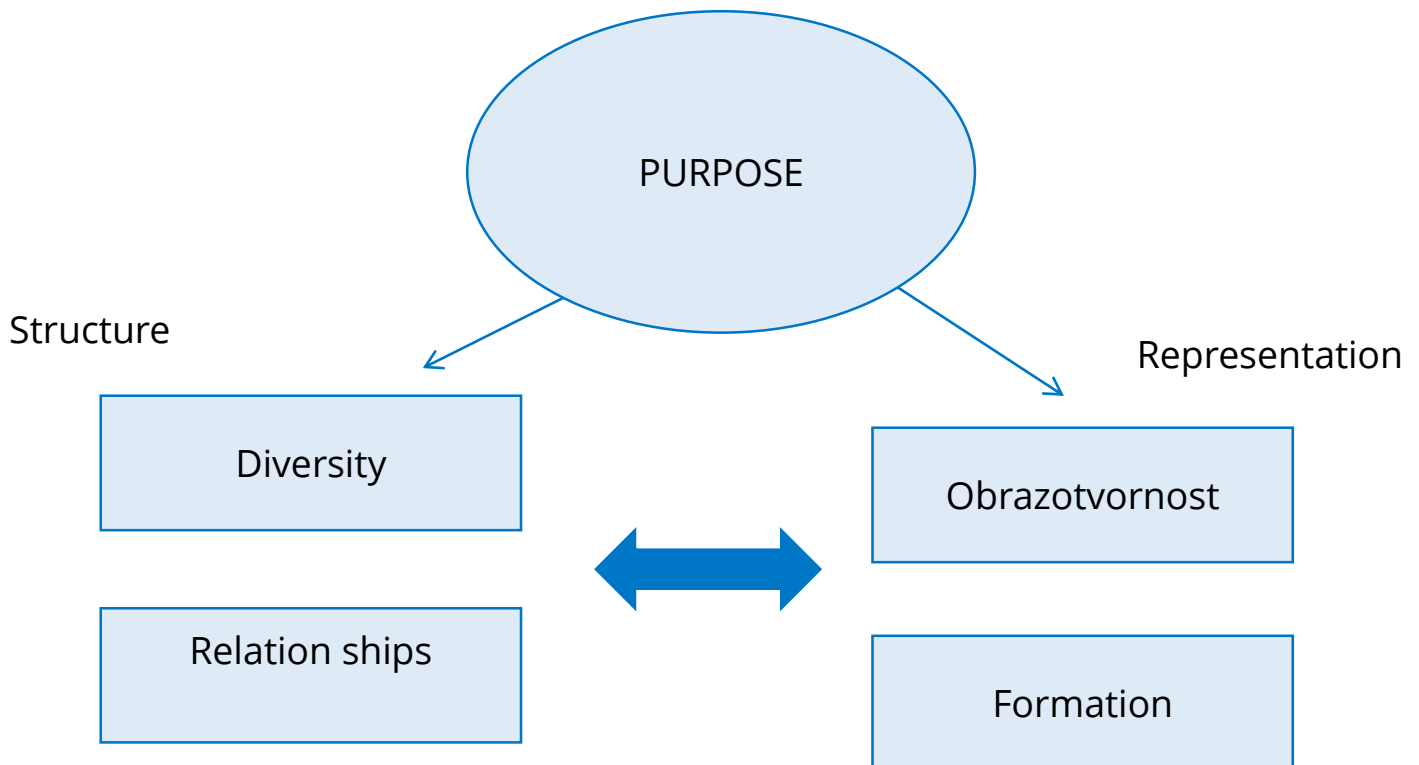
- logic
- Individual responses
- Convergence
- Vertical procedure
- finding the solution

Creative thinking

- imagination
- Cumulative responses

- vergence
- Lateral procedure
- Generating solutions

3.4. A model of creativity



3.5. The stage of the creative process

Despite the diversity of individual creative solutions, 4 typical phases of the creative process can be distinguished.

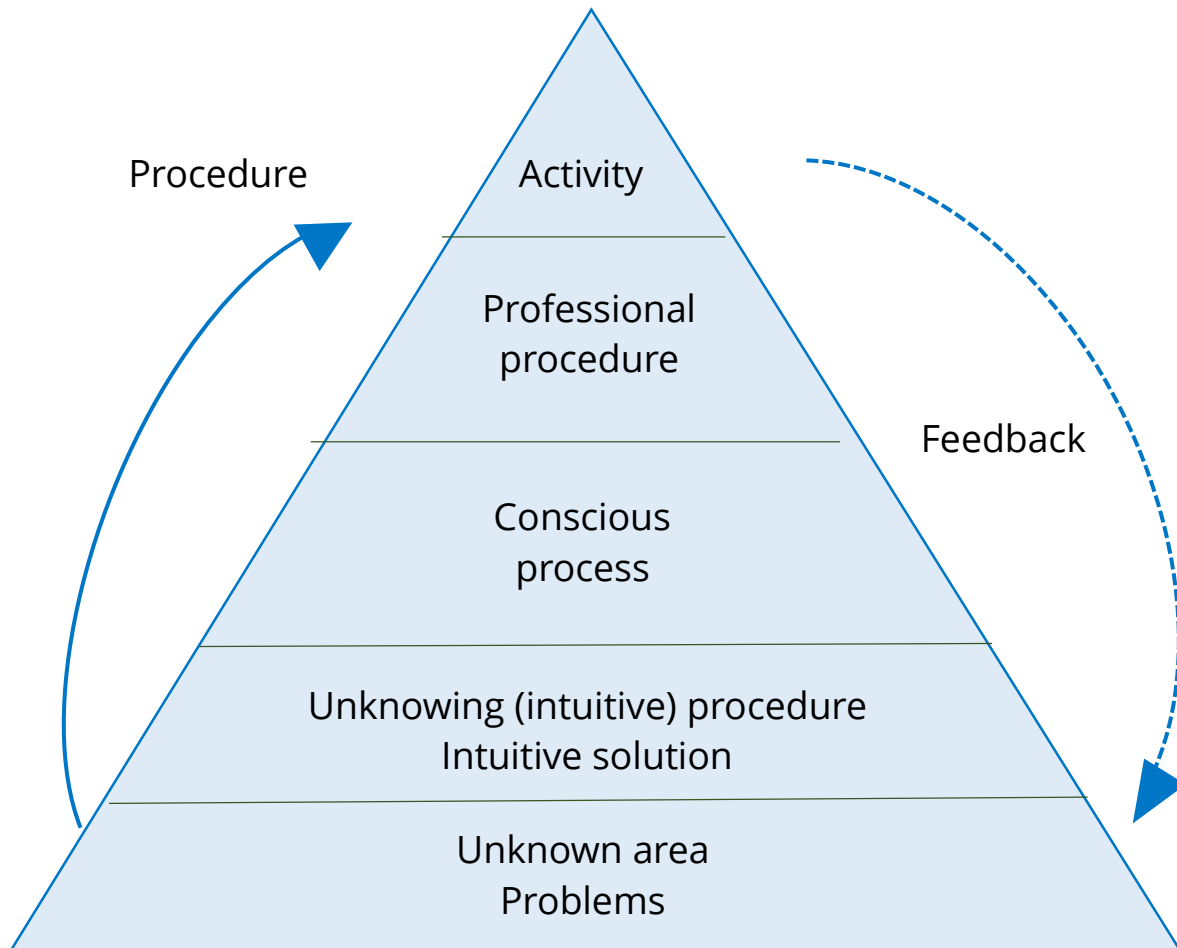
Preparation - It's a careful consideration of the problem and a clear specification of the goals. Is associated with gathering and analyzing the necessary information.

Incubation - A typical sign of problems is that it can not be solved at once. The solving effort is combined with breaks. However, apparent pauses lead to unconscious activity (spontaneous analysis, factoring, new attitudes, etc.) under strong motivation.

Enlightenment - Create an idea that solves the problem or illuminate the path that can be solved.

Verification - Assessing the correctness of the solution and its application.

The stages of the creative process express how, from an unknown area and intuition, gradually progresses to awareness and professional realization



3.6. KAIZEN - Innovation Innovation Initiative

- The best known method of involving workers in continuous innovation is the KAI-ZEN method. This formerly Japanese method is currently an integral part of the work initiative in most advanced businesses.
- KAI - improvement (everything can be improved, each product, technological process, work activity, production system)
- ZEN - Improving is constantly, responding to every new possibility, change of conditions, new information and every worker can take part in it.

- Kaizen means improving customer focus production, improving all processes in the value chain of business activities, while reducing costs. Its basis is the mass initiative of workers supported by an effective motivation system.

Important KAIZEN System Application Principles

- Any improvement, though not very important, should be taken into account.
- KAIZEN is open to everyone. All workers can participate in the improvement process.
- Before any improvement is introduced, they must be accurately analyzed taking into account the existing state and possible positive or negative effects.
- Management has two main tasks - creating and maintaining standards and improving them.
- Work team preference, support for participation and employee initiative to solve problems.
- Improve search with team meetings. Important single preparation and holding of the meeting, as well as the selection of the topic and ensuring the implementation of the adopted solution.
- Knowledge of the current state of production, problems and business objectives, navigation of the improvement process to areas that make up bottlenecks.
- Strong support from business management. Kaizen is built on bottom activities but requires strong support from above.
- Creating organizational prerequisites for improvement.
- Motivation of employees - participation in success. Material and financial evaluation of good solutions.
- Promoting improvements that can be quickly evaluated and implemented and do not require high investment.

4. INNOVATIVE OPPORTUNITY

4.1. Innovative Opportunities

- Once the opportunity analysis shows if the idea is feasible and meets the conditions of potential success.
- The process of identifying an opportunity can be likened to looking for golden grains. If we compare the innovative ideas with sand, sifting through the network is a search for opportunities.
- This process confirms statistical data on the so-called discarding of new innovative ideas.

4.2. Sources of innovation opportunities

Unexpected events:

- Unexpected success
- Unexpected failure: Conflicts between people's ideas and a market that does not accept it. We made too many changes and the customer did not accept it.
- Unexpected external event: radically changes views on development. E.g. War in Iraq - suddenly there is a great need for gas masks. An unexpected event generates a request for something new to conceive.

Inconsistency of facts: Inconsistencies often arise from a competitive environment, where, in particular, due to the entry of new products, the view of the products is changing. Maybe decide what to do with such products. Management must decide whether to remain faithful to the product (loyal product)

- The demand for the product grows while sales volume stagnates or falls,
- People misunderstand the nature of the problem,
- The discrepancy between the expected values and expectations of customers,
- The contradiction in process logic is based on the knowledge of processes.

Innovation based on the need for a process: Lack of interdisciplinary understanding of innovation

Changes in the sectoral or market structure: each sector is developing at a different pace.

Demographic changes: Impact on what will be bought, who will buy it and what quanti-

sions on quantities. It's a business issue with a profit.

Changes in the world view: at any given time, the priority is another hierarchical layer of human values, the timing problem. If there is a layer of people who are rich, it is a space for creating certain products that are designed for these people.

New knowledge: Innovation of the highest degrees. The question of knowing new relationships that were not used in products. It can be a new idea. E.g. Bird flu - an effort to create a kind of vaccine. Whoever succeeds in this is commercial success - who will be the first.

4.3. Typical structure of the innovation opportunity evaluation study

- Business Idea: Identified the need and the way it is implemented, transforming the idea into a product or service, resources, information, research and development issues.
- Opportunity evaluation: market potential, resources, potential competitiveness, performance, risks.
- Conditions for successful implementation: compliance with business strategy, acceptability of risk factors, possibility to take advantage of novelty of idea, estimation of consequences for the company in case of success and failure.

4.4. Methodological process of evaluating innovation opportunities

- Reviewed Ideas: Is the idea clearly formulated?
- Sorting ideas into groups.
- Selection of the rating system or Processing your own rating system.
- Performing ratings.

When choosing a rating system and an opportunity, consider the following factors:

- Functionality,
- Completeness and accuracy,
- Reliability,
- Own performance,
- Good application.

4.5. How to analyze innovative opportunities

- Market potential: Determination of the market segment and its overall capacity, estimate of market development, estimate of market share, estimate of sales volume of production, estimate of price level and tendency of its development.
- Resource requirement: identifying the individual resource components and their proportions, estimating the cost of individual resources and the total investment intensity to initiate the implementation of the innovation, the cost of realizing the opportunity, estimating the need for additional resources for the operation and development of the business, the security method, the risks related to the resources.
- Economic efficiency: liquidity flow, estimated total profit for the life of the new business, return on capital invested, time to profitability, development of the company's capital structure.
- Competitiveness:
 - Identification of the most important competitors,
 - Determination of the assessed competitiveness parameters,
 - Comparison of expected parameters with competitors' parameters.
- Time advantage:
 - Ideas arrive late / the market is already occupied /,
 - Ideas come prematurely / the market is not yet ready for acceptance /.
- Feasibility study: The results of the evaluation of the opportunity are processed in the official document - the basis for obtaining the loan, the investor.

4.6. The following factors should be considered when selecting a rating system and an opportunity

- **Functionality** - Allows you to find good ideas, organize them according to your preference, and eliminate inappropriate ideas.
- **Completeness and accuracy** - Affects all important factors, eliminates uncertainty when deciding.
- **Reliability** - There is protection against introducing systematic errors into the rating process.
- **Effectiveness** - Enables fast and relatively low cost ratings.
- **Good Applicability** - The rating system is comprehensible, manageable and modified according to current conditions.

4.7. Typical methodological testing tools:

- **Control question method** - A set of questions is used, which has proven to be effective in similar conditions
- **The method of comparison and organization of ideas** - a set of evaluation criteria, significance, determination of the values of individual criteria, determination of order of importance of ideas
- **Investment methods** - banks and other investment organizations have a defined number of criteria defined and their limit values, which are required from funded projects.

5. CUSTOMER, CUSTOMER COMMUNICATION

5.1. Defining a customer

- According to the standard ČSN EN ISO 9000, the organization or person receiving the product can be considered as a customer.
- Therefore, each organization can define two groups of customers, no matter what activity they are concerned:
 - external,
 - internal.
- Internal customers can be assigned not only to employees of the company but also to the owner who can use the outputs as additional input into their processes.
- External customers include intermediaries (subscribers who may not be final consumers) and final consumers of products and services.
- Proper definition of a target audience is a key activity that greatly influences the success of innovation.

5.2. Communication with a customer

Measuring customer satisfaction is the most important criterion in fulfilling the "feedback" principle. This principle is one of the most basic principles of an efficient management system. Information channels allow communication with the customer and provide information about the expected needs of customers and how they meet the needs of the organization.

5.3. Defining customer requirements: Required; Extended; Attractive

- The CSN EN ISO 9000 standard states: "Organizations are dependent on their customers and therefore need to understand the current and future needs of customers, meet their requirements, and try to anticipate their expectations."
- Kan's Model - This is a method of mapping customer requirements. Structured

help characterize different characters and clarify unclear questions.

- The model is easy to understand and usable. The model believes there are 3 types of customer requirements that affect his / her satisfaction.
 - Necessary customer requirements - if the requirements are not met, the customer will be dissatisfied. On the one hand, the customer enforces the product he wants, on the other hand, but meeting the requirements does not increase the satisfaction. Customer considers requirements as the basis.
 - Extended customer requirements - requirements are directly proportional to customer satisfaction. They increase functionality or quality, increasing customer satisfaction. The price depends on the requirements.
 - Attractive customer requirements - When meeting these requirements, customer satisfaction increases, willingness to pay even higher costs.

5.4. Innovation incentives

- Priority customers
 - Sees the need for innovation long before the product comes into the market
 - They often invent products and services themselves, for example, when they discover a lack of product
- Group of enthusiasts
 - End customers who invent various product innovations, b-software versions
- Use these contacts to get information:
 - How products are used by customers
 - What problems customers encounter and how they deal with them
- Collect customer suggestions for editing existing products
- Innovation incentives can be based on
 - collection of feedback,
 - consumer interest groups

- Surveys and questionnaires
- Some companies collect ideas from customers by becoming customers themselves.

Harley Davidson: "Managers take part in races and ride on motorcycles produced by the company. They see their products through the eyes of their customers, understand them better and use feedback. "

5.5. Customer Test - Concepts of a New Product

- Preliminary determination of the potential of innovation in the market.
- One of the inputs for the feasibility study.
- We will provide selected customers with the specification, drawing, picture, model and ask them to know if the product has raised their interest,
 - Whether (and why) would prefer it to competing products,
 - Whether they will be interested in the product (and at what price),
 - How the product could adapt more to their needs.

5.6. Deciding on realizing themes

- Decision making is one of the most important and most important activities of managerial work.
- Decision-making forms part of the workload of managers at all levels of management.
- The decision-making process can be divided into certain interdependent activities that take place in a time sequence and are called stages of the decision-making process.
- These stages consist of:
 - Defining (identifying) a decision-making problem, which is often based on detecting a deviation of the actual state from the desired state, Planned,
 - Analysis and objective and comprehensible formulation of the problem and definition of the target state,
 - Creating possible solutions to the problem,

- Establishing evaluation criteria,
- Analysis of variants, determination of impacts, consequences and effects of individual variants,
- Choosing the most optimal variant, that is, the one that best meets the goals of the solution,
- Realization of the chosen variant,
- Controlling the results.

6.DECISION MAKING METHODS

6.1. 6 Hats

The method divides the thinking process and uses analogy to colors and / To colorful hats. First you need to create a map and then find your way.

6 hats represent different roles (rules) of thinking:

- A white hat (neutral) means a clear target, facts, numbers and information. It can be likened to a computer that only provides answers to questions and information.
- Red hat means seeing red, emotions and feelings, intuition. It moves the problem further or stops quickly.
- The black hat is characterized by the "devil advocate", criticism, pessimism. It searches for errors, mistakes, points to risks and dangers.
- Yellow hat represents sunlight, clarity, optimism, positive and constructive approach, opportunity. It is the opposite of a black hat, looking for and exploring the positive consequences.
- Green hat means creativity, fertility, provocation, sowing seeds of new ideas. Creative thinking seeking alternatives, beyond the limits of existing ideas, generates new concepts and insights.
- The blue hat represents moderation and control, conducts and reflects. It defines the subject, synthesizes, forms a choreography of thought.

6.2. Brainstorming a Brainwriting

- The basis of these methods is the open discussion of a group of people (best representing different views and views).
- The central rule is not to criticize and to talk, listen and further develop the ideas that are most debated.
- The purpose of both methods is to create the widest set of ideas, suggestions and ideas related to the problem.
- Brainstorming is a discussion with a designated moderator that directs and leads

- Brainwriting in the form of brainstorming. The advantage is the elimination of negative interactions between the members of the discussion.
- The method has the following rules:
 - The six-member groups run by the moderator enter the problem and each member of the group submits three ways to solve three ideas in five minutes, three ideas.
 - It is advisable to write each idea on a separate paper or to prepare a form with three sections.

After a few minutes, papers are moved one by one, and the previous ideas recorded on the papers unfold

6.3. Design for Manufacturing and Assembly (DFMA)

Is a method and a set of tools that optimizes and reduces costs, either of an existing or a new product. DFMA means that the products are manufactured in such a way as to reduce their production. DFMA makes it possible to analyze alternative production and assembly concepts and to search for new, innovative solutions. Includes feature analysis, structure analysis, product structure design, component design, evaluation and selection.

6.4. IRM and Value Analysis

The IRM Practical Planning and Communication Tool, where future requirements and the number of ways to meet them are identified. It is more of a strategic method. There are two approaches: back to the request and forthcoming from the idea. It includes the following parts:

- General understanding of the related challenges
- Collective visions
- Map Making - Search for spaces and synergies between the current situation, visions and goals.

Value analysis is historically the oldest discipline in the field of value engineering and has inspired the creation of value management itself. Value analysis is a well-designed set of

the purpose of which is to search for and design solutions to improve the functionality of the object to be analyzed in order to increase its effectiveness. This is an application method that perfectly reflects an existing object.

6.5. „Six Sigma“ and TOC

- „Six Sigma "is a quality management system that uses advanced statistical methods. It serves to reduce variability and improve production processes. Developed in Japanese companies.
- TOC (Restriction Theory) is an approach to reducing production completeness. It is a commonly known method, based on the fact that each system (enterprise) has its own constraint or narrow place.
- Advantages TOC:
 - Its key idea is the statement that each system has at least one constraint in itself. If this was not the case, then the system would achieve its goal indefinitely.
 - It provides a methodology for finding and using efficiently. By focusing on the weakest article, quick and real benefits are achieved.
 - They try to manage company constraints so that the constraints do not cause losses.

6.6. IDEO

The creative method of the idea is based on the theory of creative thinking of designers, artists, etc. The central element is brainstorming and visualization of the idea. The method has become the basis of the popular "design thinking" stream, or designer thinking. Another important feature is the teamwork of people with many different disciplines.

The brief procedure can be described in five phases:

- Understanding the market, customers and technology.
- Observing current and potential users in real-world conditions and situations.
- Visualization of new concepts and new customers who could use them using prototyping, models and simulations.

- Evaluate and fine-tune prototypes in a series of quick iterations.
- Introduction of a new concept and its commercialization.

6.7. Stage-Gate

Approach characteristic of science and research. It is used to systematize and accelerate the evaluation of the results of Science and Research.

Process "Stage-gate":

- Finish the laboratory tests and make sure the product meets the requirements.
- Test the product in a semi-rig and make sure it is fully compliant.
- The semi-pilot product is provided for testing to selected customers.
- Then an overview of all the information is made to make sure that the product is fully compliant or to provide additional resources (raw materials, machines, etc.)
- After we make sure that the product can be manufactured, we will start preparing the final sales plan.

It is important to ask why someone should buy a new product or why should it welcome innovation? Assessment should be a matter of knowledgeable, but also of people with an understanding of other contexts.

7. TREND ANALYSIS

7.1. Rules for promoting innovation in the EU

- At present, public aid for innovation is authorized by Commission Regulation (EC) No 800/2008 of 6 August 2008 declaring certain categories of aid compatible with the common market in accordance with Articles 87 and 88 of the EC Treaty (General Regulation On block exemptions).
- This new (general) state aid regulation in EU countries is based on the Community framework for state aid for research, development and innovation (Official Journal of the EU 2006 / C 323/01).
- Both of these rules are built on the above-mentioned principles of public support on the basis of identified market failures.

7.2. Switzerland

- According to the Global Competitiveness Index 2007, 2008, Switzerland is ranked second.
- The best results from all the countries surveyed are achieved by Switzerland in the indicator of the quality of research institutions and in the level of R & D expenditures in the corporate sector.
- In 2004, these expenditures reached 2.2% of GDP, which is one of the highest figures in OECD countries.
- It is also worth noting that private R & D expenditure accounts for around 70% of total R & D expenditure in Switzerland.
- Switzerland is significantly ahead of other European countries in patent activity where it reaches over 300% of the average.
- Switzerland's high research, patent and innovation activities are based on the strong industrial tradition of the country and a significant representation of the world's pharmaceutical industry, for which there are typically high investments in new drug research.
- This reflects the fact that the Swiss innovation system is primarily based on corporate sector investments in research, development and innovation, and in limited government intervention through direct support instruments.

7.3. Germany

- Germany belongs to the traditionally technologically advanced countries and ranks among European innovation leaders. In the International Competitiveness Competitiveness Index 2007 - 2008, Germany ranked 5th.
- Among the factors, Germany is well appreciated especially in the area of intellectual property protection, access to education and research services, anti-trust policy effectiveness, professional management of companies, availability of state-of-the-art technologies, the quality of research organizations and the amount of R & D spending.
- A more detailed view of innovation performance:
 - Patent activity to approximately 250 % of the EU-27 average,
 - High employment rates in high-tech industries and turnover from innovative products.
- One of the important advantages of Germany's innovation system is the high corporate R & D expenditure, as confirmed by the international comparison of the European Innovation Scoreboard. These expenditures reached almost 1.8% of GDP in 2008, which is the highest in the EU-27 after Sweden and Finland.

7.4. Finland

- Finland is among the countries that have long been at the forefront of competitive charts.
- Finland has ranked sixth in terms of the Global Competitiveness Report 2007-2008.
- According to this assessment, Finland is ranked among countries whose economic growth is based on the application of innovation.
- Finland is among the countries with the largest total R & D expenditure, which in 2005 exceeded 3.5% of GDP.
- Corporate R & D spending, which exceeds 70% of total R & D expenditure in Finland, is much higher, which is much more than the EU-27 average.

- Public spending on R & D is well above the European average (more than 150% of the EU average), which is also reflected in significantly above-average public support for R & D and innovation in enterprises.

CONTENT:

- Promoting innovation - general approaches and tools
- Overview of R & D policies in selected countries:
 - Finland
 - Switzerland
 - Germany
 - Austria
 - Denmark
 - Great Britain
 - Ireland

7.5. Innovative and modernizing business strategies

At present, the state's efforts to improve the environment for the development of entrepreneurial activities (especially for innovative growth-oriented enterprises and start-ups) are evident.

For example:

- Creation of on-line information systems for enterprises that provide information related to innovative entrepreneurship, allow entry into databases, ease of use in valid legislation, standards, etc.;
- On-line business consultancy (eg in connection with business, licensing, export, etc.);
- Systemic simplification of public support for SMEs (unification of programs) and reduction of administrative burden both on the part of entrepreneurs (applicants for aid) and on the part of public support providers (creation of a one-stop shop);
- Changes to legislation that stimulate the creation of a pro-innovation environment (eg technology transfer in public research institutions and its strategies).

8.PRODUCT ANALYSIS

8.1. Product and service definition

The product can be defined as follows:

- The product is anything that can be offered on the market, what gets attention, what can be used for consumption, what can satisfy the desire or need.
- The product is a manufactured estate with objective and subjective features that are manipulated to maximize the appeal of goods to consumers who buy items and to satisfy their needs.
- We can define the product / product as everything we can offer to buy, to use for consumption - what the PPO (needs, requirements, expectations) of potential and existing customers meet.

The term service as an economic category is defined as:

- The kind of product that is the essence of activity-performance and value is determined by the utility it brings to the consumer as a result of the desired change. There is no ownership transfer in the production of services.
- When defining the term "service", we are usually dealing with the term "product". It is the result of an activity that has value for the customer as it satisfies its needs. We also understand the job as a service, in which we distinguish the following items as the final product:
 - Process (creation, delivery, provision).
 - And the result (process).

8.2. Analysis of product demand for target groups

There are different methods of analyzing and synthesizing market information to which products and services are directed.

However, clear conclusions must be drawn from the market analysis on the following factors in particular:

- Sizes of supply and demand,
- The needs and characteristics of target entities (potential customers),

- The importance of competition, respectively. Alternative to meeting established needs.

The analysis must answer in particular the following questions:

- Who is the target customer or User services and products?
- How high demand for services can be expected?
- What are the alternatives available to the target user to realize their needs?
- How high is the client willing to pay for the product?

The analysis of the current offer must answer in particular the following questions:

- Is there competition, the market share of competition?
- How challenging is the transition from one provider to another?

8.3. Marketing strategy

The marketing strategy must include:

- The mission of a given product or service - it is a presentation of basic activities and functions in relation to the market respectively. Potential project users.
- The main strategic goal - the state to be achieved through the implementation of services.
- Selected strategies - Selected diagrams for how the main goals are to be achieved.

8.4. Marketing mix

"Marketing mix" is the relationship between the intended product and the market from four basic aspects (four "P"):

- The product ("CO" - the resulting product or service) - description of the products and services and specification of the needs for which the product should serve.
- Price (Price and pricing policy) - The decision for which prices will be provided for each product and service.
- Place ("KDE" - Place of Products or Services) - A description of the distribution routes that products and services receive from the provider to the consumer.
- Promotion ("JAK" - Promotion - Communication mix) - a detailed description of all

cation channels used in the promotion of services.

The decisions contained in each of these points are to a large extent influenced by the decisions of the previous point.

8.5. Product requirements specification

Contains detailed information needed to create the product design. These details should be specified for each function of the system, to meet the characteristics listed below in the product's qualitative characteristics.

Requirements can be categorized into, for example:

- Function requirements
- Performance requirements
- Property requirements (attributes)

Basis for specifying requirements

- Understanding of user needs
- Knowledge of business processes and rules
- Analysis of used documents

High Quality Specifications

- Completeness (to include all requirements)
- Consistency (irreconcilability - individual requirements must not contradict each other)
- Parameterization of requirements (quantitative and qualitative attributes are assigned to requirements)
- Categorizing users
- The same level of detail (if necessary, it is possible to structure the document to other levels)
- Controllability

Types of requests

- Functional requirements represent a basic subject of the system and are measured by specific means such as data values, logic and decision algorithms. Functional requirements specify what the product should do.
- Non-functional requirements are behavioral characteristics that have defined functions such as performance, user, etc. Non-functional requirements can be assigned to a particular measurement method. This example provides examples

fication of non-functional requirements. Non-functional requirements specify what features a product should have.

- Project constraints determine how the end product can be applied in the real world. For example, a product needs to use a particular interface or use existing hardware, software, or business, it must fit into a set budget and be ready for a predetermined date.
- Project incentives are business-related forces. For example, the product's purpose is a project stimulus as well as all stakeholders in a project - of which each project participates for various reasons.
- The project questions determine the conditions under which the project will be developed. We include these requirements in our requirements so that we can provide you with an overall picture of all aspects that contribute to the success or failure of the project.

8.6. Product value for the customer

- KOTLER, in his Marketing Management publication, Philip defined customer value as consumer value added, which means the difference between the total consumer value (the set of benefits the consumer expects from the product or the service) and the total consumer price (the set of costs the customer has to spend).
- Value is always a subjective matter, as it is more about how the customer perceives the product or service than it could be determined by the seller objectively. This perception of the product compares the customer with what he has to sacrifice, to pay.

The process of providing value

- Choice of value. This is a phase that must take place before any product is created. Marketing needs to segment the market, select a suitable target market, and find a market place for the value offered. Segmentation, focus and market placement are the core of strategic value marketing.
- Providing value. Marketing must at this stage decide on the product's (product) benefits, pricing, and distribution of each.
- Communication of value. The task of this phase is to use the power of personal sales, sales promotion, advertising and other tools to report and then promote the product.

8.7. Values circle

The circle of values expresses what we and our business provide to our customers and what they do to our business.

- **Company - customer:**
 - Product, quality, sales promotion, consulting, service packages, ...
- **Customer to the company:**
 - Financial reimbursement, loyalty, loyalty, recommendations, ...
- **Company - Employee:**
 - Backstage, security, job opportunity, reward, motivation, protective work aid
- **Employee- Company:**
 - Knowledge, plans, loyalty

8.8. Phase of the value process

- It is the endless process of constantly revealing the value of the product or service to the customer;
- Adaptation of the company, in particular the marketing strategy of these findings;
- Creating the desired value (or not only required, but also anticipated, or beyond expectations, innovative, creative);
- Customer feedback feedback and on-the-fly fact-finding, implementation and implementation into business processes;

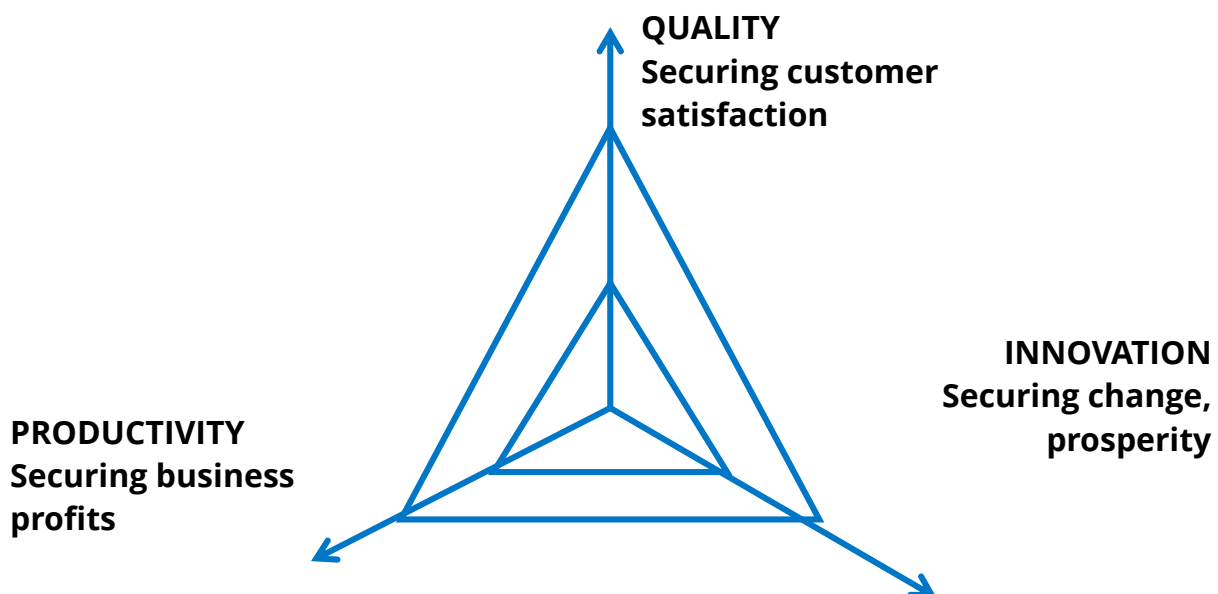
If an enterprise does not recognize and do not apply the principles of value management, it can not survive in today's very strong competitive environment.

9. PRODUCT INNOVATION

9.1. Preparation and planning of new products

The dominant position of a product in the business is that it is a means of meeting the needs of customers and by selling products is the income from business. New products are generally considered to be "life-giving blood of business".

Strategic factors for product innovation



The importance of careful preparation and product planning is also underlined by these factors:

- High competition on the market for all kinds of products,
- Constantly accelerating innovation cycles,
- Great product variability potential,
- The impact of products on productivity, quality and competitiveness of business,
- The product is an integrative component of business activities,
- The complexity and risks of developing new products.

In business, the importance of products is often underestimated. The reason for business failure is often the lack of credit, ownership relationships, old machines, management, and so on.

The primary causes of failure are:

- Products do not meet customer needs,
- The products are material and energy-intensive and have high labor,
- Products are poor, obsolete, uninteresting, poorly available, etc.,
- Products are produced by obsolete technology and uneconomic.

9.2. Classification of products

Products are classified according to several characteristics. Product type identification is needed to understand system relationships in business and development management.

- Product Domain Competence: It speaks about the constructional kinematic ties of the main technology, areas of use, standards, and so on. For example: electro technical products, tools, automobiles, production machines and the like.
- Use of the product for example consumer products, component manufacturing equipment, etc.
- Product life: Short and long-term consumption products, seasonal products.
- Technological characteristics: Classic products, high-tech products.
- Manufacturing Mode: Bulk, serial, custom products, standard / special products.

Depending on the level of product differentiation:

- Category - defines the main function.
- Form - defines important features,

Depending on the relationship to the product range, we distinguish it:

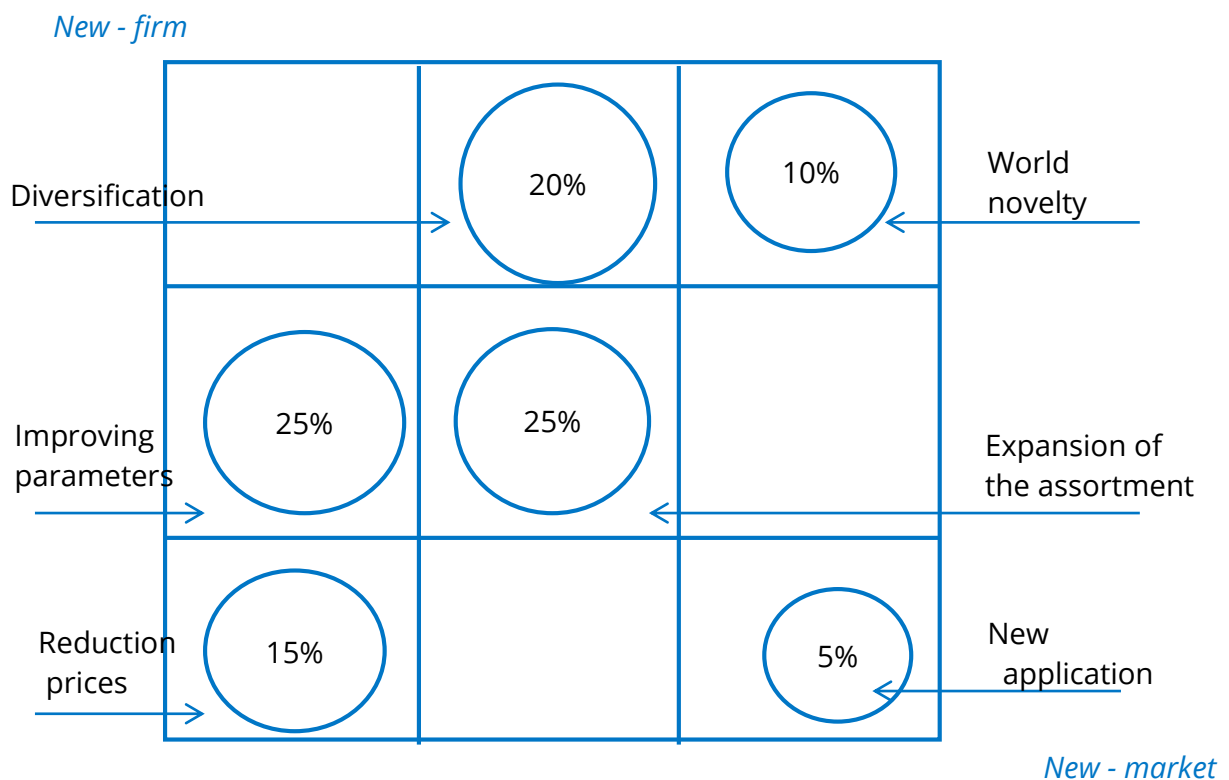
- The basic product - a representative that meets the customer's expectations and acts as a standard.
- Extended product - features additional features.
- Production line - a set of products of a given group with certain characteristics.
- Potential product - future product with improved parameters.

9.3. How to prepare a new product

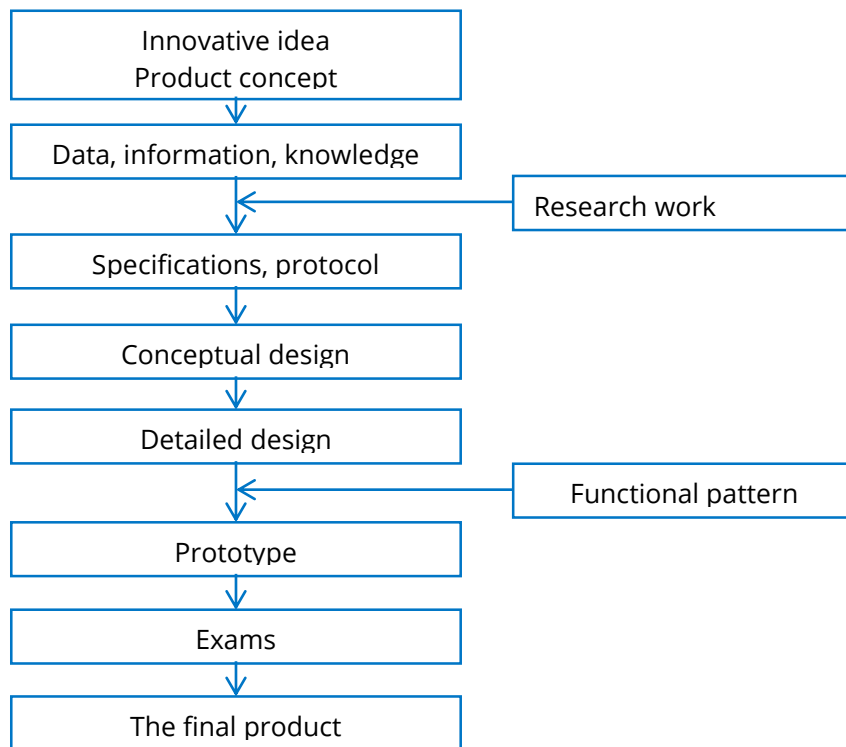
As an example of the methodology for preparing new products, we classify them according to Crawford C.M., (1996):

- Making Production Ideas
- Product concept
- Testing the concept
- Protocols development (product specification)
- Prototypes of the product
- Testing prototypes
- Pilot products
- Serial products
- An important characteristic in the preparation of product innovation is the location of the innovative project according to the market position and the level of novelty.

Inclusion of product innovation



Overall process of preparation of the innovated product



9.4. Stages of Product Innovation - Product Specifications

There are two borderline product specification cases

- The specification is unambiguously given - An example is the unambiguous customer order for custom-made products. The specification is limited to checking the reality of the parameters, respectively. Their changes within the established limits.
- Specification is completely indefinite - Typical example of significant innovation. In this case, the specification may be the most important phase of product creation.
- In order for the specification to meet the objectives, it must touch upon all attributes of the product, i.e. the specification of the parameters:
 - Functional
 - Economic
 - Technological and material
 - Legislative
 - Marketing
 - Developing countries

9.5. Design of the product

The construction of a product is sometimes mistakenly considered to be a complete development because a large amount of work is concentrated in this phase. Typically, a conceptual design and a detailed design of the product are distinguished.

Typical conceptual design solutions:

- Product structure - basic shapes and main parts and their relationships,
- Function distributions and their main carriers - materials, components, dimensions, strength calculations,
- Functional diagrams,
- Energy transfer, power movement,
- Spatial arrangement,
- Principles of control and control,
- Physical models to verify principles.

Typical detailed design solutions:

- Components, elements, nodes
- standardization,
- Dimensions, shape, tolerance,
- Technology,
- Accuracy, dimensional circuits,
- reliability,
- materials,
- surface finishes,
- Service, pooling.

9.6. Testing of product development

Like other areas, testing and testing are undergoing a dynamic development, driven by:

- Shortening the time of developing new products,
- Reducing test and test costs,
- Enriching tests with new attributes (eg environmentalism, safety, comfort of use),
- Reduce the risk of uncovered product weaknesses throughout the life cycle,
- International compatibility of tests and certification,
- New testing technologies (personal infiltration of information and communication technologies).

Stages of the innovation cycle Testing function

Product idea	Validation of the functional principle Obtaining basic knowledge for conceptual solutions
Product concept	Determination of the main product parameters Deciding on solutions Information for implementation decisions
Product development Constructional solutions	Data for detailed design, support for solutions of strength, dimensional, functional, operational and other characteristics
Prototype	Validation of an innovative solution Information for product improvement and technological preparation of production
The final product	Tests prescribed by the customer, respectively. Standards
Production	Tests to improve technology Preparation of continuous innovations
End of product life	Product recycling information

9.7. Competitiveness of innovative products

Evaluating and improving the product's competitiveness is associated with a large number of attributes (tens to hundreds of complexity). For analysis purposes, it is necessary to implement 3 product attributes:

- Product function (customer relationship)
- Product characters (product-related)
- Benefits (relationship to business as a whole)

Functional parameters of the product:

- by versatility
 - Product-specific (speed, volume, ...)
 - Universal (life, reliability, price)
- by product line
 - Basic - determining functions
 - Additional - additional values to basic functions
 - Supporting - are not essential to the existence of the product but improve the market potential for product existence but improve market potential

Product Marketing Parameters:

This set of parameters creates the initial conditions for future product sales. Typical examples:

- Price cap and modifier for different customer segments (product image, personality traits)
- Influence on the distribution system (delivery time, instead of modification)
- Product execution (low, average, production, top level)
- Style (the impression of the product on the customer)

Technological parameters of the product:

- Material intensity
- Invested investments
- Energy intensity
- Technology
- Production
- Mountable
- Impact on capacity utilization
- Proportion of standardized parts
- Manipulability

10. INNOVATION OF PRODUCTION SYSTEMS

10.1. Methodological aspects

The production system is a structured set of resources whose function is to transform the inputs (raw materials, semi-finished products, energy, ...) into desired outputs (products and services).

Main Components:

- Objects on which the required transformations are made (material, components ...),
- Active agents (operators) that perform the transformation, i.e. humans, machines, apparatus, physical environment,
- Processes through which changes in shape, dimensions, configuration, locations, ...,
- Inputs and outputs, i.e. components, connections with the environment,
- Material, energy, and information flows that create the overall architecture of the system and connect its components to the whole,
- Auxiliary components that are not directly involved in outputs, but provide system operability (maintenance, tools ...),
- Space and time as the inevitable attributes of each system.

It is important to distinguish between system variants for planning innovations in manufacturing systems. The basic classification is:

Production objects

- Material-intensive production
- Processing
- Customer production
- High-tech production

Dominant technologies

- Changing the shape, dimensions and properties of the materials
- Structure change, technological processing and assembly
- Position change and orientation (logistics)
- Processing of information (services)

Production volumes

- Piece production
- Serial production (production in thousands of pieces)
- Mass production (10 thousand and more)

Branch affiliation and production

- Production of transport equipment
- Machinery and equipment
- Manufacture of consumer goods

Complexity and assortment

- Component specialization
- Aggregate specialization
- Product specialization
- Diversified production

10.2. Main tasks for innovations in the production system

- Determination of the total production capacity of the system.
- Capacity division into functional units or technological units
- Design of transformation processes (technology).
- Specification of means of production (technology, people) for the implementation of technology in individual components.
- Specify what will be produced and what to buy.
- The overall layout of the system, inputs, outputs, material, energy and information flows

Some other important parameters of the production systems

- Level of automation
- Continuity of processes
- Level of standardization

- Level of specialization management
- Ecological impact

10.3. The process of innovation of production systems

Phase of creation

- Analysis of requirements and setting of specific objectives.
- Solving the transformation processes.
- Determining the capacities of the production sources.
- Detailed analysis of operations, procedures and technology.
- The spatial arrangement of production.
- Organization and production control.
- Project documentation.

Implementation phase

- Preparation of Infrastructure Spaces and Networks.
- Deliveries of technical equipment and assembly.
- Integration of the production system.
- Revival of work and exams.
- Preparation of staff, training.
- Trial operation.
- Continuous operation, maintenance and development.

10.4. Technology innovation

Technology is defined as a set of processes, patterns, rules and habits used in the production of different types of production in any sphere of production. Technology essentially determines ways to convert raw materials, materials and semi-finished products into finished products for the market.

The main components of the production system:

Technological processing

- Change of geometric, physical and other properties of production objects (sequence of object changes).

Manipulation

- Change of place, orientation and fixation of objects (material flow)

Management, information management

- Activities related to coordination, synchronization and optimization of production (information flow).

Innovation requirements for modern customer-oriented production are:

- A significant increase in productivity and quality
- Savings in consumption of resources (labor, materials, energy and capital)
- Flexibility of the production system
- Environmental research and use of recyclable materials
- Prerequisites for high working culture (elimination of heavy, dangerous, monotonous and otherwise inappropriate work)
- Innovations at the operational level of the technological process
- Exploiting the potential of globalization
- Orientation to low-waste and energy-saving technologies

10.5. Operational innovation

Elimination of critical operations

- Operations in which poor quality products are produced
- Long-time operation causing non-synchronism
- High cost operations
- Operations often causing failures and production downtime

Optimization of operational procedures

- Sequence of loop operations
- Minimum production costs
- Integration of technological, manipulative and information components in the technological process

10.6. Innovation based on automation and greening

Automation is a process in which the physical and mental activity of a person is replaced by the action of technical means. More recent definitions consider automation to be a technology that uses program instructions and devices to perform the given processes, while information feedback ensures the correct execution of instructions.

Numerical control of machines (NC and CNC), industrial robots and automatic manipulators, flexible transport systems and their integration into automated cells, systems and plants represent the most important direction of innovation of production systems.

The benefits of automation are:

- Reduce labor
- Stability of quality
- Increase management level
- Synchronization of operations
- Material and energy savings

10.7. Low-waste and energy-saving technologies

Saving materials

- Use of new materials (non-efficient, cheaper, with higher performance and better recyclability).
- Use of noble materials (alloyed, heat-treated, composite) with lower weight for given functions.
- Use of semi-finished products with better initial properties (eg precision castings).
- Using technology with tool and product savings.
- Recycling of waste directly into the production process.
- Renovation of tools and worn out equipment components.
- Reducing the share of irreparable confusion.

Energy savings

- Selection of materials and technologies taking into account the energy demands.
- Load control, automatic shutdown of machines, etc.
- Reduction of friction (cutting fluids, lubricants) thermal insulation, etc.
- Waste heat utilization for technological processing.

II. BUSINESS PLAN

II.1. Project implementation plan

The implementation phase begins with the decision to accept the project, followed by the elaboration of the technical documentation, the negotiation and conclusion of the contracts, the own investment construction and the start up of the production unit. All these phases contain tens to thousands of sub-activities and activities that need to be intertwined and coordinated.

- The plan for the implementation of the project should primarily specify
- Activities to be secured
- Terms in which activities need to be completed
- Persons responsible for implementing individual activities
- The resources that the implementation of activities will require
- Results to be followed by individual activities
- Relationships and activity dependencies
- Activities that are critical to project success and need attention

II.2. Syllabus of business plan

- The business plan (PZ) is a key part of the project - it should describe with sufficient persuasiveness all the important points of the project. Therefore, it should be the guiding principle both for applicants and for those who will decide whether or not to accept the project.
- The recommended business plan is designed to provide the assessor with an answer to all questions that are relevant to the evaluation of the project. The CA should not contain the data that will be required in the application (project identification data, etc.), but the applicant should refer to them in the relevant chapters.
- The PZ should not exceed 30 content pages.

A) Brief summary of the project content

- up to 3 pages (the most important facts, including the description of the project location)

B) Need for and relevance of the project

- The focus of the applicant's activity in terms of technological excellence of products
- Site of the project,
- The expected level of innovation of R & D results
- Does the project have a relationship to protecting or improving the environment? Will the project lead to regeneration of "brownfields"?
- Description of the current position and form of the Applicant
- Description of the Applicant's innovative process and its historical development

C) Applicant's readiness to implement the project

- The feasibility of the project in relation to the description of the investment projects and their financing carried out by the applicant in the past 3 years, the nature of the organization organization of the project implementation
- Characteristics of subsystem functions
- List of all acquired tangible and intangible fixed assets for R & D from project funds in relation to the budget of the project, including specification of their technical parameters and the expected maximum price
- A list of planned non-investment expenditure
- Way of ensuring qualified human resources
- Technical feasibility of the project implementation, continuity of the stages of the solution
- Partnering for the project
- Description and classification of the existing research capacity (R & D department) in the Applicant's organizational chart, the method of its management
- The reason for the foundation or extension and the expected benefit for the Applicant

D) Contribution of the project to the further development and competitiveness of the applicant

- The planned type and number of VIK results (research solutions leading to new products and processes, realized results of R & D in the form of innovations, prototypes, procedures, patents, licenses) and clearly defined changes in technical parameters to existing R & D results in relation to their implementation and applicability to Market
- Quantification and logical justification of the economic benefit of the project solution for Applicants,
- Future VIK involvement in external commercial co-operation
- The impact of the project implementation on the applicant's future development including potential economic and non-economic benefits

E) SWOT project analysis and response to weaknesses and threats to the project

F) The basis for the bonuses described in the selection criteria

12. SERIAL PRODUCTION AND MARKETING, PRODUCT LIFECYCLE

12.1. Serial production and marketing

Production is a decisive factor in the success of the business. It is an article that must bring the ideas of designers and technologists "to transform" into reality. If the production does not work properly, an enterprise can not compete. Production thus becomes the strategic weapon of every business, and as the company can use this strategic weapon, it decides to a great extent about its success or failure.

- Manufacturing is the purposeful activity of a person in which production inputs are transformed into production outputs.
- Production inputs are production assets such as raw materials, energy, materials, and semi-finished goods that enterprises use in their production processes.
- Outputs are products which are either used for manufacturing as manufactured goods or are consumed as consumables.
- Products used for further production are intermediates, respectively. Semi-finished products, products intended for consumption are final products.

Each production is represented by 5 basic elements. They are:

- Object of production - products,
- Production executives - workers, machines, tools,
- Methods - means and ways to implement activities,
- Place - where the activities will be implemented, where and where the results of the production will be transported,
- Time - time course and duration of activities.

12.2. Types of production

The type of production means the sum of the technological features of the production resulting from the characteristic features and the technical and economic function of the manufactured products.

The criterion for defining the essence of each type of production is the degree of repeatability, resp. The degree of constancy of the product manufacturing process over a period of time.

We know these 3 types of production:

- Mass,
- Serial,
- Piece.

Mass production type

For enterprises with mass production are considered enterprises where the production of one or a small number of products produced in large quantities prevails. These enterprises have a high repeatability (the highest of all types), a high degree of stability of the production program, and the use of special production facilities for one type of product.

Serial type of production

Serial production is the most common in companies. It is characterized by making multiple products in succession in a limited number (series) on the same or different production facilities.

The main features of series production can be summarized as follows:

- The product, in its nature, resembles a product of mass production, while in the production of a limited quantity, the individuality of the product can be emphasized and more flexible to market requirements.
- The technical preparation of the production is similar to mass production, but it is not so detailed in terms of the width of the assortment and the range of production.
- The division of labor is applied to a lesser degree than to mass production, as shown by the universality of the work of the workers.
- The level of labor productivity is also lower.

- The production process is organized more complexly and costly.
- Products are made in batches and parts of products are put into production in batches.

Depending on the degree of repeatability, we divide serial production into

- Large-volume,
- Medium-range,
- Small-series.

Piece type of production

The basic feature characterizing piece production is the unrepeatability of individual types of products and works, or repeatability after a certain longer time interval.

Piece production is characterized by these individualities:

- Individual finished products differ from each other, each product represents a new kind of response to the imagination user.
- Due to the above mentioned characteristics, each product requires a separate technical preparation of production, which is very demanding, extensive and costly.
- Frequent replacement and adaptation of workplaces, or modification of machines, place increased demands on time consumption and work interruption.
- Workers carry out diverse jobs, leading to their versatility, requiring a high degree of qualification.
- The lowest technical level of production.
- High costs associated with material storage and high production progress.
- Irregular use of production facilities.

Placing the product on the market

- The regulations in the supervisory competence of the CTI regulate the marketing of products, in particular Act No. 102/2001 Coll., On general product safety, and Act No. 22/1997 Coll., On technical requirements for products.

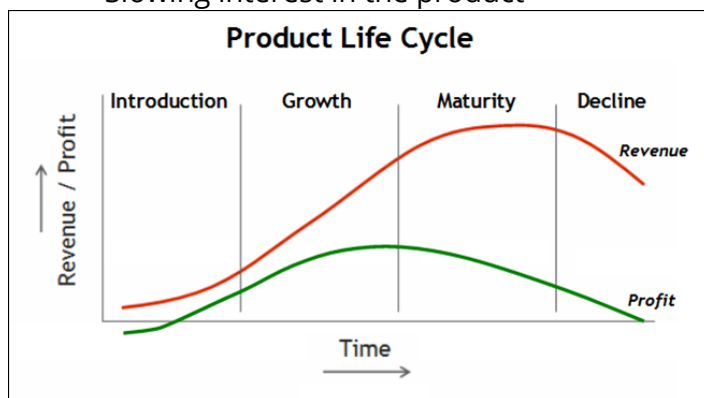
12.3. Product lifecycle

The product lifecycle is used in two meanings:

- Product life from raw material extraction through production and use to disposal as waste. - LCA (we do not focus on it in this presentation).
- The "life" of the product in the enterprise from the product launch phase to the downside of product interest and withdrawal from the market.

The life cycle of the product graphically describes the S-curve

- Product introduction
- Growth of interest in the product
- Cognition of interest and product maturity
- Slowing interest in the product



Product introduction

At this stage, we place the product on the market.

- Of course, costs are greater than revenues.
- At this stage, we can choose the right market entry strategy for our product from:
 - Strategy of quick revenue collection
 - Strategy of slow revenue collection
 - Fast penetration strategy
 - Slow Penetration Strategy

Growth phase

- The product is getting more and more at this stage, and we are invested in producing and maintaining product popularity.

- Customers who have purchased our product are expanding their advertising by recommending it to their friends. This form of advertising is the best for the company because it is the most effective and nothing is worth.
- At this stage, the price of the product changes only to sellers who used low prices as a lure in the previous stage.
- At this stage, we are financing the modification of our product.

Phase of maturity

- It is characterized by a constant increase in sales or their decline → the amount of sales stabilizes.
- This phase is usually the longest in the "life" of the product.
- The market is overwhelmed by our product, we react by lowering the price so that our product can be afforded even by those who have not yet gotten it.
- It is good to publish a new ad campaign to remind our product again.

Phase of product attenuation

- This is not a short-term revenue cut, but a long-lasting revenue-reducing trend.
- At this stage, production is no longer going on, but stocks of products in the warehouses are not liquidated.
- These are used by the company as spare parts for service repairs of already sold products. These products are recommended to store about ten times the product life.