

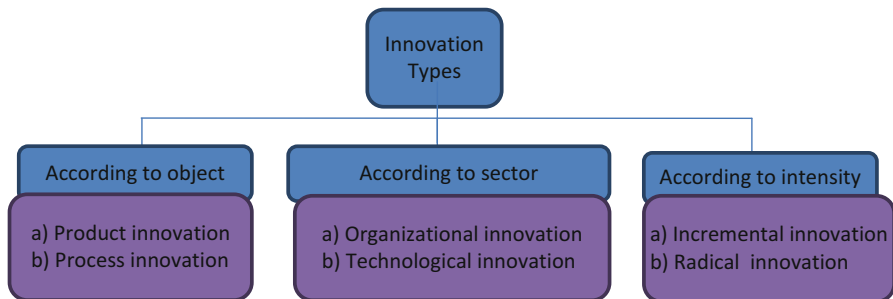
to England for that purpose. Returning to the USA, he found Isaac Singer to have stolen his patent and having set up a thriving business of sewing machines.

Innovation is therefore the product of the nineteenth century, not of the twentieth century, while invention has existed since primitive times. The driving force was to envisage the opportunity to create new industries, such as the electric railway by Edison. In the twentieth century innovation became the heart of technological effort through systematic organization and institutionalization of applied research in laboratories of Research and Technological Development.

2.3 Types and Characteristics of Innovation

2.3.1 *Types of Technological (and Non-technological) Innovation*

The types of innovation vary depending on the object, the sector it refers to, the scope or its intensity. These types are not independent one from the other. There exist though some recognizable attributes, without having dividing lines. The types of innovation are classified in three groups.



In the **first group** the classification is based on the object innovation refers to:

- Product or Service Innovation and Process Innovation.

The **Product or Service Innovation** refers to the case when an enterprise introduces a new product in the market or provides a new service. **Process Innovation** is in place when an enterprise introduces new elements in its production process or its operation, being used for the production of a product or the provision of a process.

In some cases the dividing line between these two types is not clear. Separation depends on the organization involved. The emphasis placed by companies on every type of innovation differs depending on the company's stage of development. In the first stages, when the company is small, it adopts product innovations mainly. As the company grows and becomes more complex, it adopts process innovations too. The development of new products is a risky venture as it may inject big profits in an enterprise, if the venture succeeds, but it could also lead to failure.

On the contrary, process innovations, whereby higher production volume, low production cost and higher sales are sought after, are less radical, hence entailing lower risk for the enterprises adopting them.

In the **second group** the classification is based on the sector innovation refers to:

- Administrative or Organizational Innovation and Technological Innovation.

The **Administrative or Organizational Innovation** appears in the administration sector and affects the organizational system of an enterprise, consisting of business executives and the relations between them. In other words, the Administrative Innovation is the introduction of a new administrative system or a new administrative process; it does not introduce a new product or service but influences indirectly their introduction or the production process thereof.

The Technological Innovation pertains to the technological sectors of an enterprise, comprising the equipment and the procedures for raw materials and information transformation into products or services. Technological Innovation refers to the creation, improvement and expansion of the procedures sustained by the products. Technological innovation may refer to the adoption of a new idea relating to a new product or service, or the introduction of new elements in production processes or service provision of an enterprise.

Administrative Innovations are primarily adopted by large enterprises with more complex structures. These enterprises face bigger problems in auditing and coordinating various departments and try to solve such problems through administrative innovations. However, it seems that an increasing number of small enterprises implement Technological Innovations, striving in this way to gain a competitive advantage.

In the **third group** the classification is based on the intensity and scope of innovation:

- Incremental Innovation and Radical Innovation.

Incremental Innovation is the one leading to a relatively small deviation from current practices. It is introduced to improve old products or procedures, without intervening to the existing structure and strategy of the enterprise. **Radical Innovation** brings about fundamental changes in the activities of an enterprise and expresses a significant deviation from current practices. It gives momentum to new business activities, strategies and structures and introduces totally new products.

On average, Radical Innovations are adopted less frequently compared to gradual innovations. They constitute a bigger challenge for the existing structure, as regards determination of executives' duties and cause strong reactions upon the application thereof. They seem more complicated to the members of an enterprise because they are more original and they provoke a higher degree of uncertainty for their conditions of development and application. Usually large enterprises with higher success rates than smaller ones introduce Radical Innovations because the type of these innovations requires technical knowledge and stock of resources. Moreover, large enterprises possess the financial resources capable to absorb the largest part of the cost, in the event of failure and for this reason large enterprises act in a more decisive way.

2.3.2 *Characteristics of Innovation*

The characteristics of innovation are classified in three axes.

1. **Product Axis:** Product innovation is in place when a new or improved product is launched in the market.

The parameters examined under this axis are the following:

- **Market demand:** Demand and acceptance of the product in the market is one of the key criteria for product innovation. It is directly linked to the company's market share and to profit margin.
- **Level of resonance:** It is the level of target-customers locally, nationally or internationally; it is the product acceptance and market penetration yardstick.
- **Optimal use of existing condition:** It is examined whether the existing technology is used in an optimal way relevant to the product and its production. It relates to updating procedures and technology forecast.
- **Price/Value:** The price and value of a product is compared with the prices of corresponding competitive products in the market.
- **Compliance with the regulations:** Compliance with the safety, health, environmental regulations, etc. It is a characteristic of innovation because compliance with the regulations could often lead to qualitative innovative changes on the product.
- **Originality:** It is examined whether the product is a new solution or encompasses changes compared to competitive products. These changes may concern the product, its package, the way it is distributed or its use. It is also a way to evaluate an enterprise's approach to innovation.
- **Offer of improvements:** The product as an evolution of an existing technology, in the sense of using new materials, the existence of new functions, the use of the product in new applications. It defines whether the product brings about changes on the basic design or its architecture.
- **Coverage of operational needs:** Coverage rate of specific operational needs, customer needs, including over-coverage offering additional functions not fully determined by customer demands. It relates to customer requirements analysis.
- **Aesthetic:** The product's outward appeal is a criterion of innovation often underestimated; it constitutes though a key success factor.
- Adherence to intellectual property rules.

2. **Process Axis:** Process innovation is the introduction of new processes in product development or the improvement thereof.

The parameters examined under this axis are the following:

- **Market research:** Market research may disclose alternative solutions regarding design, price, distribution and product promotion and offers an estimate of product acceptance and image in the market.
- **Connection to target-customers:** Frequency of contact between the company and target-customers at local, national or international level. The main objective is to establish a long lasting relation mainly with large customers.

- **Access to new technology:** Frequency of the company's contact with the current technological evolutions regarding production of product. It relates directly with departments of R&D, design, cooperation with technological bodies, participation in exhibitions, etc.
 - **Costing Methodology:** Costing methodology in all stages of the product development process. Analysis and accurate costing methodology is required to cut the total product production cost.
 - **Compliance with the regulations:** Compliance of the product development process with the safety, health and environmental regulations, in parallel with the procedures to verify all the above. Compliance of the development process with the regulations often contributes to qualitative upgrading of the product.
 - **Technique of ideas development:** The existence of specific techniques and approaches for the elaboration of new ideas is examined; such ideas affect significantly the development of a successful innovative product.
 - **Improvement techniques:** The effort and the techniques to integrate new technologies and uses in the product are assessed.
 - **Emphasis on fulfilling operational needs:** Focus of product development process on the specific operational need the product addresses. It involves conversion of requirements to product specifications and relates to the way the trade mark participates in product development process.
 - **Focus on aesthetics in the design:** The success of products using a fixed technology and with fixed target-customers depends directly on their attractiveness and their visual diversification vis-à-vis competitive products. The aesthetic aspect of a product in combination with the analysis of its ergonomics is one of the main targets of industrial design. The use of systems and design engineers is assessed.
 - **Formal procedures to protect copyright:** It is examined whether the required actions are taken to protect copyright. It is assessed whether an enterprise is geared towards protecting patents and designs and whether the above methodology constitutes its policy.
3. Management (organization) Axis: The introduction of changes in administration and organization constitutes the administrative innovation that completes the first axis.

The parameters examined under this axis are the following:

- **Feasibility study:** It is the base (technical, economic, commercial) to decide upon an investment.
- **Formal procedures to ensure communication with target-customers:** Such procedures may include participation in exhibitions, sample distribution, meetings with groups of customers, etc.
- **Formal procedures to apply the best technology:** One of the key indications of innovation is systematic follow up of current technological evolution, the assessment of the technological level of competitors, the identification of new technologies and the correct selection of the best technology.
- **Cost control:** Control is a systematic review process applied during the design phase, in order to cut production cost, preserving at the same time the value and

the required operation specifications (value/price) and ensuring the product's sustainability and competitive price.

- **Quality control:** Formal control procedures during the design phase that include use of methods to analyze and improve innovation process quality and processes to safeguard rules applying to date.
- **Organizational culture:** Emphasis of organizational culture on innovation. It has been evidenced that organizational culture relates directly to a company's innovativeness. Some elements of organizational culture placing emphasis on innovation is the encouragement to create new ideas, the clarification of the enterprise's innovation policy to all employees, the determination of performance measurement systems, personnel training etc.
- **Quantitative controls with criteria to assess improvement of technology, new materials, functions and uses:** Introduction of controls with quantitative data and minimum acceptance values to assess improvement of technology, new materials, functions and uses. Processes for the integration and evaluation of new technologies and methods by the company.
- **Quantitative controls with criteria on the satisfaction rate of functional needs:** Introduction of controls with quantitative data and minimum acceptance values to fulfill specific functional needs.
- **Marketing and quality control processes for the aesthetic aspect of the product:** Introduction of marketing and quality control processes to assess and ensure good product aesthetic appeal. It relates directly to production and testing of originalities.
- **Formal control to protect copyright:** Formal control procedures to protect copyright are examined.

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