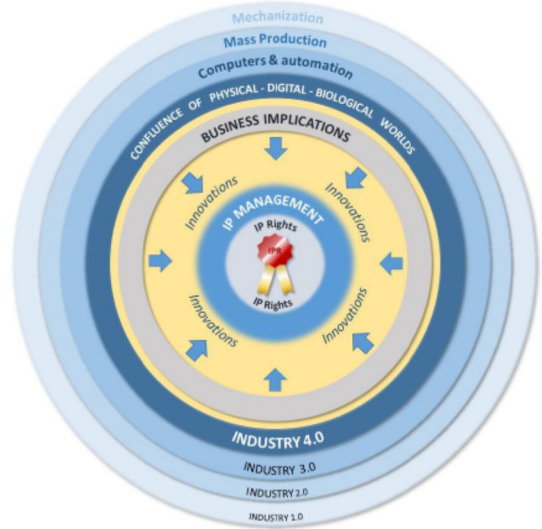


Era of Digitalization and Industry 4.0

The accelerated growth of exponential technologies, along with the optimization of the production system, are forcing traditional manufacturing companies to digitize their functions and processes. In order to describe this digital transformation, the ‘**Industry 4.0**’ term has been coined in order to describe this digital shift, and is synonymous with the “Fourth Industrial Revolution” in the history of manufacturing, which is altering the future of conventional manufacturing. It has been defined as a name for the current trend of automation and data exchange in manufacturing technologies, including Cyber-Physical Systems, Internet of Things, Cloud Computing, Cognitive Computing, Artificial Intelligence and creating the smart factory”. Although the terms "Industry 4.0" and "Fourth Industrial Revolution" are often used interchangeably, "Industry 4.0" factories have machines which are augmented with wireless connectivity and sensors, connected to a system that can visualize the entire production line and make decisions on its own. Major characteristics of Industry 4.0 are:



- Smart automation, robotics, internet-of-things, big data, wireless networks & connectivity, cloud computing
- Disruption in technology, business, human interactions, innovation
- Proliferation of innovation and intellectual property
- Proliferation of entrepreneurship opportunities
- Digital economy is unbundling profitable product and service offerings
- New IP Protection challenges

The new era of interconnectivity and digitalization provides manufacturing leaders with the opportunity to explore new means to achieve their business objectives hence encouraging innovation and entrepreneurship.

Who is an entrepreneur? An entrepreneur should be

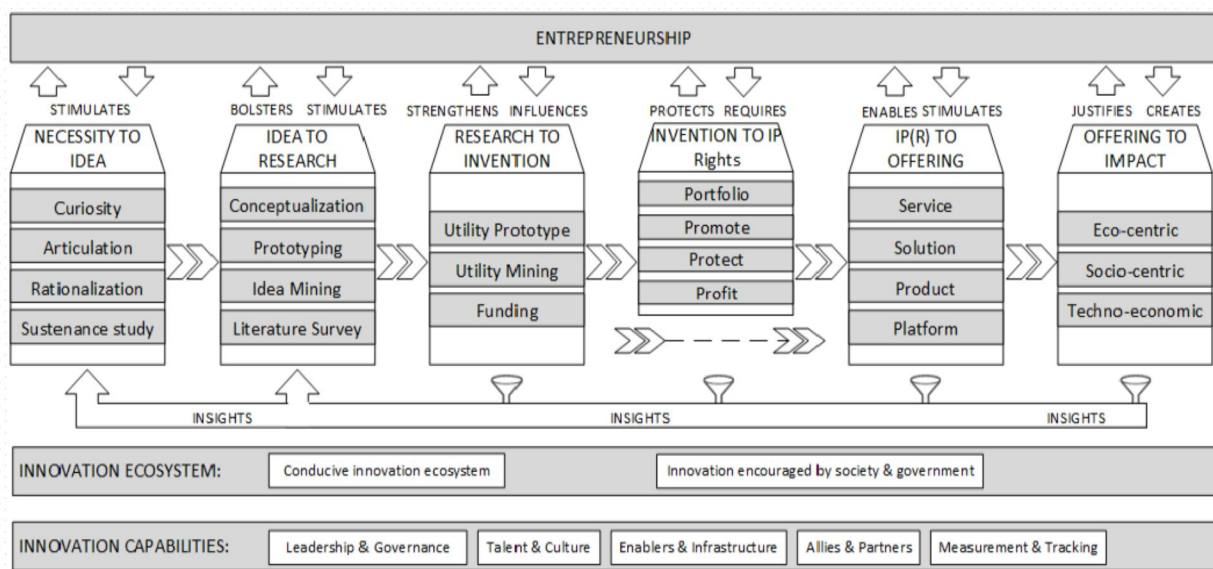
- a visionary
- an investor (monetary & human capital)
- a risk taker (& risk manager)
- an innovator
- an enterprise creator
- future-oriented

A successful entrepreneur should be an opportunity grabber and have motivation, conviction & passion. He/she should possess leadership abilities (people & organization management skills) and the ability to build connections & networking.

Innovation Cycle

Entrepreneurship influences and is influenced by all stages of innovation lifecycle:

- **Ideas** stimulate and are stimulated by entrepreneurship
- **Research** bolsters and is stimulated by entrepreneurship
- **Inventions** strengthen and are influenced by entrepreneurship
- **IPR (IP Rights)** protect and is required by entrepreneurship
- **Offerings** enable and are stimulated by entrepreneurship
- **Impacts** justify and are created by entrepreneurship



The diagram above shows the basic flow of innovation life cycle. An entrepreneur must stay curious in understanding and anticipating problem and solution and backed by extensive market and technological research. Law of the land recognizes and secures intellectual creation as own and prevents other from practicing it without explicit agreement. It allows entrepreneurs to reap the benefits of the intellectual creations. Entrepreneurship, Innovation and IP Rights (IPR) can create sustained impact in the ecosystem.

Innovation

Innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). It is transformation of an idea into reality. It happens when the need is felt for improvement in existing product/process/service (red ocean market) or need for a new product/process/service that adds up value to the customer

(blue ocean market). Organization for Economic Cooperation and Development (OECD) highlights two different types of innovation:

- Innovations that change the firm's products (product innovations)
- Innovations that change the firm's business processes (business process innovations).

Product Innovation is a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market. Additions of new functional features or improvements to existing functional features leading to improved quality, durability, reliability, economic efficiency during use, affordability, usability and user friendliness (for example, introduction of a new product line that uses less expensive materials and is consequently offered at lower cost automatic payment of a taxi ride after the ride has taken place)

Process Innovation is a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use by the firm. Core business function of producing goods and services and supporting functions such as distribution, logistics, marketing, sales, information and communication technology (ICT) services to the firm, administrative and management functions (for example, application of data mining analysis to large databases to identify potential market development opportunities).

The types of innovation (product and business process) are categorized by novelty or economic impacts. For example, introducing a new flat screen television is a major change to the older established television market. However, just enhancing the resolution of the screen is a minor change. The three categories are Incremental, Radical and Disruptive.

Incremental innovation is about continuous improvement making small changes to products, processes or services. It increases value to the customer (features, design changes, etc.) or creates possibility of making small changes to revenue or efficiency or both. The risk of introducing incremental innovation is low.

Radical innovation is about making major changes in using revolutionary technology and new business model. It has potential positive impact on enterprise's performance such as revenue or efficiency. It inherits high level of risk, high cost of failure and focuses on long-term impact. It may displace current products.

Disruptive innovation make product and services more accessible, affordable, and available to a larger users. Disruptive innovations originate in low-end footholds or new-market footholds. For example, with the advent streaming technology over internet, Netflix was able to offer on-demand movies and TV to a large customer base at cost-effective price and thus able to grow the business exponentially. It was the initial focusing on the low-end of the market that made Netflix disruptive.

Digital Disruption: Case Studies

Kodak led the photography industry for years with focusing on improvements to traditional film. With the advent of digital imaging (disruptive innovation) which revolutionized the way people captured, stored and used images –made Kodak obsolete. Kodak held on to analog cameras instead of moving quickly to digital to remain as industry leader

Nokia kept focusing on hardware innovation and underestimated the importance of software apps that run on smartphones, which was equally important aspect of user experience

Yahoo undervalued the importance of search and focused more on online advertising market

How does Innovation happen in an Organization?

In an ideal scenario, an employee (or a team) has an idea –and that is a very good idea. The idea or its concept gets taken up in an appropriate organizational forum and gets accepted. The organization decides that it is an investment worth betting on (through market studies, surveys). Organization helps manage the necessary funding, IP protection, infrastructure and logistics to take the concept to a solution level. Organization sets up and empowers the team to develop the offering and invests into marketing & sales efforts. It reaps the benefit of the innovation –through market revenue (sales, royalties), goodwill, brand image. Organization rewards the stakeholders behind the innovation's success to encourage more innovations.

Challenges in Innovation: [During Idea and Research stage]

- Don't feel empowered to innovate: Lack of support of the leadership
- Not motivated to innovate: No incentives for employees and stakeholders
- No innovation strategy: Lack of shared vision or purpose, no organizational commitment to innovation.
- Centralized groups: Feeling that innovation is restricted to the R&D or Technology teams
- No diversity: Teams with similar thoughts, cultures may have limited outlook and ideas
- Fear of failure: People are afraid of looking foolish or being laughed at
- Work Stress: No time to think creatively, difficult to think collectively, reduced quality of mental processes
- Following Rules and Assumptions: Confirming to accepted patterns of beliefs, culture, thoughts, rules and processes. Restricted thinking due to flawed assumptions
- Too much logical thinking: Neglecting intuition, suppressing imagination
- Lack of attentive listening: Not listening to external stakeholders such as markets, analysts, technologists, customers...

Challenges in Innovation: [During Offering and Commercialization]

- No collaboration culture in the organization:
 - Internal Collaboration: within various departments Management, Finance, Engineering, Marketing, Sales
 - External Collaboration: Industry partners, Customers, Competition
- Complacency: Organization tend to rely on their existing successful products. Would not want reduce investments on them for fear of losing resources of customer attention
- Procrastination or Delayed decisions: Investment decisions need to be made fast or else the relevance of the idea to the market needs is lost. Finding a sponsor and funding needs to be done at priority

- Management expectations & support: Lack of Senior Exec ownership. Early Pay-Off expectations. Constantly shifting priorities. No risk-taking appetite. Resistance to change. Organizational politics and hierarchy. Micromanagement
- No focus on protection: All inventions and IP developed during the exercise needs adequate protection to maintain the novelty of the offering

Challenges in Innovation: [During Growth and Requirement]

- Loss of Market connection: Understanding of changing customer needs and innovating to keep abreast of futuristic trends
- Wrong measurement of success of offering: Continuous reliance on sales and profits as a measure of success without focusing on number of ideas being generated, investments (funding, time) on innovation-related initiatives, customer satisfaction, market share
- Not ensuring graceful retirement: Ensuring brand image of the organization is not impacted by abrupt closure of the offering. Important to ensure customers interests are properly managed

Questions:

1. Elaborate Innovation Life Cycle.
2. Explain how Innovation, IP and Entrepreneurship are connected.
3. What is an innovation? Explain.
4. Are invention and innovation mean the same? Explain.
5. What is incremental innovation? Explain.
6. Why innovation is required for any organization to succeed?
7. Explain incremental, radical, and disruptive innovation with example.
8. Explain the risk of not being innovative in a business and cite two examples.
9. State and briefly explain the various stages of innovation from an offering perspective.
10. Why would an organization invest in an idea?
11. When is an idea appropriate for being considered as an innovation?
12. How can you ensure the longevity of a product?
13. What stop employees from innovating in an organization?
14. What happens if an organization does not take early decisions regarding innovative ideas?
15. Explain how an organization can build innovation as part of its culture.