COURSE NAME: Engineering Entrepreneurship

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INTRODUCTION TO ENGINEERING ENTREPRENEURSHIP

- **Defining entrepreneurship**
- Entrepreneurship is the process of identifying, creating, and pursuing new opportunities or ventures that bring value to customers and society.
- It involves the willingness and ability to take calculated risks, innovate, and create something new that can potentially lead to economic growth and job creation.
- Entrepreneurs often operate in uncertain and dynamic environments,
- Hence need to possess various skills such as creativity, resourcefulness, and resilience to succeed.
- Overall, entrepreneurship is a key driver of innovation, progress, and prosperity in the global economy.

- **Engineering entrepreneurship**
- Engineering entrepreneurship refers to the application of entrepreneurial principles and practices to the creation, development, and commercialization of innovative engineering products, services, or technologies.
- It involves using engineering knowledge and skills to identify and capitalize on market opportunities, develop new technologies or products, and build sustainable businesses around them.

- Engineering entrepreneurship combines the technical expertise of engineers with the entrepreneurial mindset of creating value, taking calculated risks, and solving problems.
- Engineers who embrace entrepreneurship are often driven by a desire to create solutions to real-world problems and to make a positive impact on society.
- They are able to leverage their technical knowledge and expertise to identify opportunities and develop innovative solutions that can be brought to market.
- Engineering entrepreneurship can involve a wide range of activities, such as developing new technologies, creating startups, leading research and development efforts, managing intellectual property, and partnering with investors and industry partners.

- Successful engineering entrepreneurs need to be skilled in communication, team building, finance, marketing, and project management, in addition to their technical expertise.
- **Why engineering entrepreneurship matters**
- Engineering entrepreneurship is becoming increasingly important in today's world because it plays a critical role in driving innovation, economic growth, and social progress.

1. Innovation: Engineering entrepreneurship is the key driver of innovation because it combines engineering knowledge with entrepreneurial skills to create new products, services, and technologies that solve real-world problems.
2. Economic growth: Engineering entrepreneurship is a catalyst for economic growth because it creates new jobs, attracts investment, and generates revenue for businesses, governments, and individuals.

3. Social impact: Engineering entrepreneurship has the potential to make a positive impact on society by creating solutions to pressing social and environmental problems, such as clean energy, healthcare, and sustainable transportation.

4. Technological advancement: Engineering entrepreneurship is essential for advancing technology and ensuring that society keeps up with the fast pace of technological change.

5. Career opportunities: Engineering entrepreneurship provides exciting career opportunities for engineers who are interested in pursuing their own ventures, leading research and development efforts, or working in innovative startups and companies.

The qualities of an Entrepreneur are especially needed in periods of high uncertainty in established companies or when new business units are created to enter new industries or new geographic markets, as well as start-up operations.

In all of these cases, the Entrepreneur is looking and identifying new business opportunities which need a special qualification.

Companies need this entrepreneurial mindset when directions are unclear or not recognizable in the current state.

New visions must be developed and employees must be motivated to move in the same direction.

There are several factors influencing the entrepreneurial mindset, which are also the fundamentals for strategic reorientation when necessary:

The internal factors such as corporate culture, commonalities in the organization and their need for a special focus when established companies want to develop their entrepreneurial spirit.

As well the same goes for start-up companies and their need to evolve from scratch.

The external factors must be recognized and the possible impact on their own business identified.

- Who is an entrepreneur?
- The term "Entrepreneur" is derived from the Middle Ages: "Entrepreneur" in Latin "prehendere" evolved into the French term "entreprendre" and can be translated as "to begin", "to try" or to "get a contract".

  Although the term was well known, it was the merit of:

- Schumpeter at the beginning of the 20th century to bring Entrepreneurs as the driving force of the society to the public (Schumpeter 1934).
- From his point of view the most important task of an Entrepreneur was the commercialization of innovations.

- Entrepreneurs have the gift of intuitive of doing the right thing to overcome the existing norms and societal obstacles (Schumpeter 1942).
- Entrepreneur is a person who perceives a business opportunity and creates an organization around it to pursue this opportunity without regard to resources currently controlled (Bygrave: 2, Stevenson: 10).
- The Entrepreneur takes risks, makes decisions and embeds them in an organization with a special corporate culture.

- The term Entrepreneur can be distinguished from other terms which are very close to each other: manager/ inventor:

	Entrepreneur	manager	inventor
personal characteristic	personal drive, highly dedicated to a business idea • persistent to succeed • takes calculated risks • builds something new • close to reality with his innovations	proven management skills and expertise • can set objectives and follow them in strategies, realize them in actions • ability to direct and motivate others • self-confident • decision-oriented • thinking about the next step in his personal career • takes risks cautiously	personal drive, highly dedicated to a business idea • self-confident • imaginative • persistent to succeed • analytical • lonesome wolf • high personal standards
job/role demands	spends much time in the early years to develop the business idea into a business concept • creativity and innovativeness • can attract other people to	oriented to values of the company • more routine work pattern • security attitude is built up • management skills crucial • thinks in "market offerings" as complete solutions to the customers' problems •	• always creative • limited or insufficient business understanding • limited, because no

- Entrepreneurship encompasses many different aspects, it is the expression of different extraordinary talents and capabilities.
- Entrepreneurs need the balance of know-how in methods and social competences as the basic strategic factor of success. According to Quinn et al. Entrepreneurs need the following knowledge (Quinn et al.: 72):
  - 1. The cognitive knowledge ("know-what") is the basis of every discipline, which is achieved through training and certifications.
  - 2. The capabilities ("know-how") transfer concepts into practical execution. The ability to transfer the acquired knowledge into a new environment and apply it there successfully.

- 3. The system understanding (“know-why“) contains the deep understanding about the web of cause-and-effect relations.
- This allows to solve larger and more complex problems.
- This is necessary to identify opportunities in the existing business models and help them into more effectiveness.
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- 4. The creative self-motivation (“care-why“) consists of will, motivation, and adaptability for success.
- Motivated teams often outperform teams with greater resources.
- The opposite is egomania, which may occur when managers have long periods of success and are getting used to it.
- It enables the Entrepreneur to adapt to rapid changes and to renew their knowledge, skills and system understanding in order to compete.

- Above all: Entrepreneurs are most successful when they have access to the human, the financial and the professional resources they need, and operate in an environment in which government policies encourage and safeguard Entrepreneurs.

- **Key attributes entrepreneurs**
- Successful engineering entrepreneurs possess a unique set of skills, qualities, and attributes that enable them to identify opportunities, create innovative products and services, and build successful businesses.

1. **Technical expertise**: Successful engineering entrepreneurs have a deep understanding of their technical field and possess the skills and knowledge necessary to develop innovative solutions to complex problems.

2. **Creativity:** Successful engineering entrepreneurs are creative and able to generate new ideas and solutions that have the potential to disrupt existing markets or create entirely new ones.

3. **Risk-taking:** Successful engineering entrepreneurs are willing to take calculated risks and pursue innovative ideas that may have a high potential for reward but also carry a significant risk of failure.

4. **Resilience:** Successful engineering entrepreneurs are resilient and able to bounce back from setbacks and failures, which are common in the entrepreneurial journey.

5. **Adaptability:** Successful engineering entrepreneurs are adaptable and able to pivot their business strategies in response to changing market conditions or unexpected challenges.

6. **Leadership:** Successful engineering entrepreneurs possess strong leadership skills and are able to inspire and motivate others to share their vision and work towards a common goal.

7. **Business acumen**: Successful engineering entrepreneurs understand the fundamentals of business, including finance, marketing, sales, and operations, and are able to manage resources effectively to build sustainable businesses.

PRINCIPLES OF ENGINEERING ENTREPRENEURSHIP

- Engineering entrepreneurship combines the principles of engineering and entrepreneurship to create innovative products and services that solve real-world problems. **Here are some key principles of engineering entrepreneurship:**

1. **Innovation:** Engineering entrepreneurship is built on innovation. Entrepreneurs in this field use their knowledge of engineering to develop new products and services that address unmet needs or solve existing problems.
2. **Customer focus**: Successful engineering entrepreneurs are customer-focused.

They understand the needs of their target market and use that knowledge to develop products and services that meet those needs.

3. **Technical expertise**: Engineering entrepreneurship requires a strong understanding of engineering principles and techniques.

Entrepreneurs in this field must have the technical knowledge and skills to develop and bring to market innovative products and services.

4. **Risk management:** Entrepreneurship always involves risk, and engineering entrepreneurship is no exception. Successful engineering entrepreneurs must be able to manage risk effectively, making calculated decisions based on their technical expertise and market research.

5. **Lean startup principles:** Many engineering entrepreneurs follow lean startup principles, which involve developing products quickly and efficiently and using customer feedback to refine them. This approach allows entrepreneurs to test their ideas in the market and make improvements based on customer feedback.

6. **Collaboration:** Engineering entrepreneurship often involves collaboration between engineers, businesspeople, and other professionals. Successful engineering entrepreneurs must be able to work effectively with others to bring their ideas to life.

7. **Business acumen:** While engineering entrepreneurship is rooted in engineering principles, it also requires strong business skills. Entrepreneurs in this field must be able to develop business plans, secure funding, and manage finances effectively.

EVOLUTION OF ENTREPRENEURSHIP

- Entrepreneurship has evolved significantly over time, driven by changes in **technology, society**, and the ec**onomy**. Here are some key stages of entrepreneurship's evolution:

1. **Pre-industrial revolution**: Before the industrial revolution, entrepreneurship was mostly focused on small-scale activities like crafts and trading. People would typically work for themselves, often from their homes, and sell their goods and services in local markets.

- 2. **Industrial revolution:** The industrial revolution brought significant changes to entrepreneurship. Mass production and technological innovations like **steam engines** allowed for the creation of large-scale manufacturing enterprises. This led to the rise of the factory system and a shift towards wage labor.
- 3. **Post-World War II era**: After World War II, entrepreneurship began to shift again. The rise of consumerism and suburbanization led to the growth of small businesses and the emergence of franchises. Governments also played a role in promoting entrepreneurship by providing funding and support for small businesses.

- 4. **Information age:** The rise of the internet and other digital technologies has transformed entrepreneurship once again. The barriers to entry have been lowered, allowing more people to start their own businesses. E-commerce and online marketplaces have made it easier to reach a global audience, and social media has made it easier to market and promote products and services.
- 5. **Collaborative economy**: More recently, we have seen the rise of the sharing economy and collaborative entrepreneurship. Platforms like **Uber** have enabled individuals to share their resources and create new business models based on collaborative consumption.

CHARACTERISTICS OF ENTREPRENEURSHIP

- Entrepreneurship can be defined as the process of creating, developing, and managing a business venture in order to make a profit. Some key characteristics of successful entrepreneurship include:
- 1. **Vision and creativity:** Entrepreneurs are able to see opportunities where others may not.
- They have a vision for their business and are creative in finding innovative ways to bring that vision to life.
- 2. **Risk-taking**: Entrepreneurship involves taking calculated risks. Successful entrepreneurs are able to manage risk and are willing to take chances in order to achieve their goals.

- 3. **Self-motivation and perseverance**: Entrepreneurs must be self-motivated and persistent. Starting and growing a business can be challenging, and it requires a lot of hard work and determination.
- 4. **Flexibility and adaptability:** Entrepreneurs must be able to adapt to changing market conditions and adjust their strategies accordingly. They must be flexible and willing to pivot when necessary.
- 5. **Customer focus:** Successful entrepreneurs are customer-focused and understand the needs and desires of their target market. They are able to create products and services that meet those needs and provide value to their customers.
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6. Leadership skills: Entrepreneurs must be able to inspire and motivate their team. They must be able to communicate their vision and goals effectively and provide direction to their team.

7. Financial management skills: Entrepreneurs must have strong financial management skills. They must be able to create and manage a budget, understand cash flow, and make informed financial decisions.

TYPES OF ENTREPRENEURSHIPS

- different types of entrepreneurships vary in their goals, strategies, and approaches. Here are some of the most common types:
- 1. **Small business entrepreneurship:** This type of entrepreneurship focuses on starting and running a small business. Small business entrepreneurs typically aim to provide a product or service to their local
- community and may operate on a small scale.

2. **Social entrepreneurship**: Social entrepreneurs aim to create businesses that have a positive impact on society or the environment. They may focus on issues like poverty, education, health, or the environment and may use innovative approaches to solve social problems.

- 3. **Corporate entrepreneurship:** Corporate entrepreneurs work within an existing organization to create new products or services or to find new markets. They may work in large corporations or start-ups and may focus on innovation, growth, or diversification.
- 4. **Digital entrepreneurship**: This type of entrepreneurship is focused on using digital technologies to create and grow businesses. Digital entrepreneurs may use e-commerce, social media, or other digital platforms to reach customers and build their brands.

- 5. **Lifestyle entrepreneurship:** Lifestyle entrepreneurs aim to create businesses that align with their personal interests and values. They may prioritize work-life balance and may focus on creating a business that allows them to live the lifestyle they want.
- 6. **High-growth entrepreneurship:** High-growth entrepreneurs aim to create businesses that can scale quickly and generate significant revenue. They may focus on developing new technologies or disrupting existing markets.

IMPORTANCE OF ENTREPRENEURSHIP

1. Job Creation: Entrepreneurs are the backbone of job creation. By starting their own businesses, they create job opportunities not only for themselves but also for others. This can help reduce unemployment rates and contribute to economic growth.

2. Innovation and Creativity: Entrepreneurs are known for their innovative and creative ideas. They bring new products, services, and business models to the market that can revolutionize industries, improve existing products and services, and create new markets.

3. Economic Growth: Entrepreneurship is a key driver of economic growth. By starting new businesses, entrepreneurs increase competition in the market, attract investment, and stimulate economic activity.

4. Wealth Creation: Entrepreneurship can create wealth not only for the entrepreneurs themselves but also for their employees and investors. Successful businesses can generate significant profits and contribute to the growth of the economy.

5. Social Impact: Many entrepreneurs are motivated by a desire to create positive social impact. They may start businesses that address social and environmental issues or provide solutions to problems facing their communities.

- challenges that individuals and societies may face when trying to arrive at the entrepreneurship agenda
- Lack of Resources: One of the biggest challenges to starting a business is the lack of financial resources. Many potential entrepreneurs may not have access to the funding they need to start their businesses, such as loans or investment capital.

- Limited Education and Training: Without proper education and training, it can be difficult for aspiring entrepreneurs to acquire the skills and knowledge they need to start and run a successful business. This includes everything from basic business skills to specialized industry-specific knowledge.
- Risk Aversion: Starting a business involves a degree of risk, and some individuals may be hesitant to take on that risk. Fear of failure or uncertainty about the future can be a major barrier to entrepreneurship.

- Regulatory and Legal Barriers: In some countries, there may be significant regulatory and legal barriers that make it difficult for individuals to start and run businesses. These barriers can include complex bureaucratic processes, high taxes, and strict regulations.
- Limited Access to Markets: Entrepreneurs may face challenges in accessing markets, particularly if they are entering a crowded or competitive industry. Without a strong market presence, it can be difficult for businesses to succeed.

- Cultural and Social Norms: Cultural and social norms can also pose challenges to entrepreneurship. In some societies, there may be a stigma attached to failure or a lack of support for those who pursue non-traditional career paths.



THEORIES OF ENTREPRENEURSHIP

- Entrepreneurship is a complex and dynamic process that involves identifying and pursuing new business opportunities. There are several theories of entrepreneurship that attempt to explain the motivations, behaviors, and outcomes of entrepreneurial activity.

- **Opportunity-based Theory:** According to this theory, entrepreneurs are motivated by the pursuit of opportunities that arise from changes in the market or technological advancements. They identify gaps in the market and develop innovative solutions to fill them.



- The Opportunity-based Theory of entrepreneurship was first introduced by Professor Howard Stevenson of Harvard Business School in the 1980s. Stevenson argued that entrepreneurs are individuals who identify and pursue opportunities to create new products, services, or business models, rather than simply starting businesses to make money or achieve personal goals.
- According to Stevenson, entrepreneurial opportunities arise from changes in the market, technology, or society, and successful entrepreneurs are those who are able to identify and exploit these opportunities. The Opportunity-based Theory has since become one of the most widely recognized and influential theories of entrepreneurship, shaping research and practice in the field.

- Resource-based Theory: **The Resource-based Theory of entrepreneurship was first introduced by Jay B. Barney,**
- This theory suggests that entrepreneurship is driven by the entrepreneur's access to and ability to leverage resources. Entrepreneurs who have access to a diverse range of resources, including financial, human, and social capital, are more likely to succeed in their ventures.

- Social Capital Theory: **has its roots in the work of sociologists Pierre Bourdieu and James Coleman 1900 n 2000**
- Social capital theory emphasizes the importance of networks and relationships in entrepreneurship. According to this theory, entrepreneurs who have strong social networks and relationships are more likely to be successful in their ventures.

- **Behavioral Theory:** This theory focuses on the psychological characteristics of entrepreneurs, such as risk tolerance, creativity, and persistence. It suggests that individuals who possess these traits are more likely to engage in entrepreneurial activities.
- **Institutional Theory**: Institutional theory emphasizes the role of social and cultural norms in shaping entrepreneurial behavior. It suggests that entrepreneurs are influenced by the norms and values of their social and cultural environment, and that these factors can either facilitate or constrain entrepreneurial activity.

- **Evolutionary Theory:** This theory views entrepreneurship as a process of economic evolution. It suggests that entrepreneurs are constantly adapting to changes in the economic environment, and that successful entrepreneurship is a result of this evolutionary process.



