

# Strategic Innovation Management



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# Lecture 1. Introduction to Innovation management

- ▶ 1. What is an Innovation and why does it matter?
  - ▶ 2. Key notions of Innovation management
  - ▶ 3. The impact of technological innovation on society
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- ▶ The main **objective** of this lecture is to understand the basics of innovation and innovation management.

# Introduction

- ▶ Innovation is both a necessary means and a desirable end for businesses in a fast moving global economy. It is about managing a process that delivers either new products and services to the customers, efficiently, effectively and faster than the competition, or about enhancing the delivery of existing products and services by process improvement. Generally innovation involves managing a complex mix of procedures in a context that often conditions the way the end result will be achieved.



# Innovation in action. Cases:



- ▶ **“We always eat elephants...”** (Carlos Broens)
- ▶ Small/medium sized engineering firm in Australia (130 employees)
- ▶ Aerospace, medical and other advanced markets
- ▶ Confidence on taking on the challenges normally seen as impossible for firms of its size



- ▶ **Highly flexible, fast-turnaround clothing operation** with over 2000 outlets and 5000 stores in 52 countries (Amancio Ortega)
- ▶ Brands: Zara, Oysho, Massimo Dutti, Bershka, Pull and Bear, Zara Home, Stradivarius, Tempe, Lefties и Uterque.
- ▶ Central philosophy is close linkages between design, manufacture and retailing.



**KUMBA IRON ORE**

- ▶ **“We move mountains”**
- ▶ Kumba Resources - large South African mining company.
- ▶ Operation in mountains requires large-scale excavation and restitution of the landscape afterwards.
- ▶ Ability to run a complex large-scale machinery depends on a workforce able to contribute their innovative ideas on a continuing basis.



- ▶ **Surgeon Dr Pramad Karan and sculptor Ram Chandra**
- ▶ Artificial limb developed in Jaipur, India
- ▶ Designed to make use of low-tech materials and be simple to assemble
- ▶ Greatest achievement is a reduced cost - 17\$

# What is innovation?

- ▶ Innovation (Latin - innovare): to make something new. (Oxford English Dictionary)
- ▶ Innovation is a process that turns new ideas into opportunities and puts these into widely used practices. (Tidd et al, 1997)
- ▶ The technical design, manufacturing, management and commercial activities involved in the marketing of a new or improved product or the first commercial use of a new or improved process; (Freedman, 1982)
- ▶ Innovation does not only concern itself with major advances in technology or the commercialization of ideas but it also concerns itself with the utilization of small scale changes. (Rothwell and Gardiner, 1985)
- ▶ Innovation is the way that companies gain competitive advantage by approaching the way they do thing in the broadest sense and including new technology. (Porter, 1990)
- ▶ Innovation is the successful exploitation of new ideas. (UK DTI Innovation Unit, 1994)
- ▶ The European Commission Green Paper on Innovation (1995) indicates that the term innovation is commonly used in two different ways:
  - ▶ • To refer to *the innovation process* itself (i.e. the process of bringing any new, problemsolving idea into use)
  - ▶ • To refer to *the result of the innovation process* (i.e. a new product, process, service or work practice). An innovation in this sense may be a radical innovation/breakthrough or a product, process or service improvement or an adaptation.

# Innovation

The process of creating value from ideas.

Innovation is about making *changes*, and doing so not for the sake of change itself but in order to create *value*. Value can be either commercial or social.

Innovation is more than a new idea or an invention.

An innovation requires *implementation*, either by being put into active use or by being made available for use by other parties, firms, individuals or organizations (Oslo Manual, 2005).



## Frascati Manual, 2015, 7<sup>th</sup> edition

### *Guidelines for Collecting and Reporting Data on Research and Experimental Development*

#### The Measurement of Scientific, Technological and Innovation Activities

- ▶ This manual owes its name to the Italian town where, in **1962**, the OECD Working Party of National Experts on Science and Technology Indicators (NESTI) first agreed on a common approach to measure and report statistics on R&D. The manual has been revised on six occasions to address new challenges and take into account emerging user interests. The 6th edition of 2002 has been formally translated into 15 languages.
- ▶ As the internationally recognised methodology for collecting and using R&D statistics, the **OECD's Frascati Manual** is an essential tool for statisticians and science and innovation policy makers worldwide. Now in its 7th edition, it includes definitions of basic concepts, data collection guidelines, and classifications for compiling R&D statistics. This updated edition contains improved guidelines reflecting recent changes in the way R&D takes place and is funded and the wider use of R&D statistics and definitions. It includes new chapters dedicated to the practical aspects of collecting R&D data in different sectors, and provides new guidance on capturing various types of public support for R&D such as tax incentives.



# How is R&D defined?

- ▶ **Research and experimental development (R&D)** comprise creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge.
- ▶ For an activity to be an R&D activity, it must satisfy **five core criteria**. The activity must be: novel, creative, uncertain, systematic, transferable and/or reproducible.
- ▶ The term R&D covers three activities: basic research, applied research and experimental development:
- ▶ **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- ▶ **Applied research** is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.
- ▶ **Experimental development** is systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

# Oslo Manual (3<sup>rd</sup> edition, 2005)

## *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*

### The Measurement of Scientific and Technological Activities

- ▶ An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.
- ▶ Innovation is a **continuous process**. Firms constantly make changes to products and processes and collect new knowledge, and it is more difficult to measure a dynamic process than a static activity.
- ▶ The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be **new (or significantly improved) to the firm**.
- ▶ **Innovation activities** are all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation.
- ▶ An **innovative firm** is one that has implemented an innovation during the period under review.

# Main types of innovation according to Oslo Manual

- ▶ 1) A **product innovation** is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Product innovations can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies.
- ▶ 2) A **process innovation** is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products.
- ▶ 3) A **marketing innovation** is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales.
- ▶ 4) An **organizational innovation** is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies.

# Oslo Manual: excerpts

**71.** “The knowledge-based economy” is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors.

**76.** The work of Joseph Schumpeter has greatly influenced theories of innovation. He argued that economic development is driven by innovation through a dynamic process in which new technologies replace the old, a process he labelled “creative destruction”. In Schumpeter’s view, “radical” innovations create major disruptive changes, whereas “incremental” innovations continuously advance the process of change. Schumpeter (1934) proposed a list of five types of innovations:

- i)* Introduction of new products.
- ii)* Introduction of new methods of production.
- iii)* Opening of new markets.
- iv)* Development of new sources of supply for raw materials or other inputs.
- v)* Creation of new market structures in an industry.

# Oslo Manual: excerpts

## Why firms innovate?

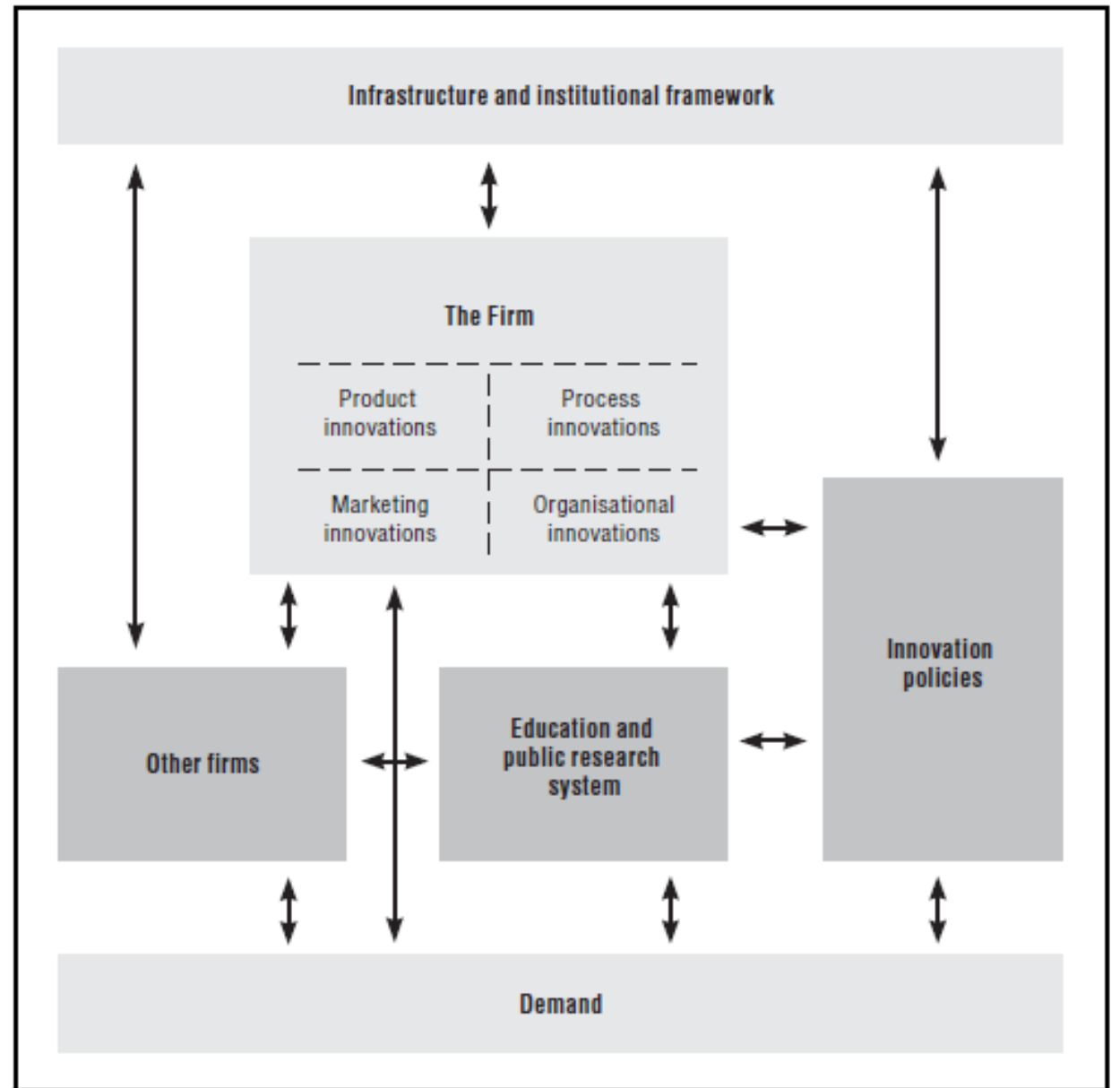
**77.** It is crucial to know why firms innovate. The ultimate reason is to improve firm performance, for example by increasing demand or reducing costs. A new product or process can be a source of market advantage for the innovator. In the case of productivity-enhancing process innovations, the firm gains a cost advantage over its competitors, allowing a higher mark-up at the prevailing market price or, depending on the elasticity of demand, the use of a combination of lower price and higher mark-up than its competitors to gain market share and increase profits. In the case of product innovation, the firm can gain a competitive advantage by introducing a new product, which allows it to increase demand and mark-ups.

**78.** Firms can also increase demand through product differentiation, by targeting new markets and by influencing demand for existing products. Changes in organisational methods can improve the efficiency and quality of their operations, thereby increasing demand or reducing costs.

**79.** Innovation can also improve performance by increasing the firm's ability to innovate. For example, improving the capabilities of production processes can make it possible to develop a new range of products, and new organisational practices can improve the firm's ability to gain and create new knowledge that can be used to develop other innovations.

# Oslo Manual: excerpts

**99.** The link between innovation and economic change is of central interest. Through innovation, new knowledge is created and diffused, expanding the economy's potential to develop new products and more productive methods of operation. Such improvements depend not only on technological knowledge, but also on other forms of knowledge that are used to develop product, process, marketing and organisational innovations. Specific types of innovation can differ greatly in their impact on firm performance and on economic change. For this reason, it is important to be able to identify the implementation and impacts of different types of innovation.



# Oslo Manual: excerpts

**105.** The general institutional environment determines the broad parameters within which firms operate. The component elements include:

- The *basic educational system for the general population*, which determines minimum educational standards in the workforce and the domestic consumer market.
- The *university system*.
- The *specialised technical training system*.
- The *science and research base*.
- *Common pools of codified knowledge*, such as publications, technical, environmental and management standards.
- *Innovation policies* and other government policies that influence innovation by firms.
- *Legislative and macroeconomic settings* such as patent law, taxation, corporate governance rules and policies relating to interest and exchange rates, tariffs, and competition.
- The *communications infrastructure*, including roads and telecommunication networks.
- *Financial institutions* which determine, for example, the ease of access to venture capital.
- *Market accessibility*, including possibilities for the establishment of close relations with customers as well as matters such as size and ease of access.
- *Industry structure and the competitive environment*, including the existence of supplier firms in complementary sectors.



# Why do need to manage innovation?

- ▶ Managing innovation is not easy or automatic. It requires skills and knowledge which are **significantly different from the standard management** toolkit and experience, because most management training and advice is aimed to maintain stability. As e result, most organizations either simply do not formally manage the innovation process or manage it in an ad hoc way. Successful innovation management is much more than managing a single aspect, such as creativity, research and development or product development. It should promote the interactions between changes in markets, technology and organization.
- ▶ Innovative firms grow twice as fast, both in employment and sales, as firms that fail to innovate. Organizations that are consistently successful at managing innovation **outperform their peers** in terms of growth, financial performance, employment, and that the broader social benefits of innovation are even greater.

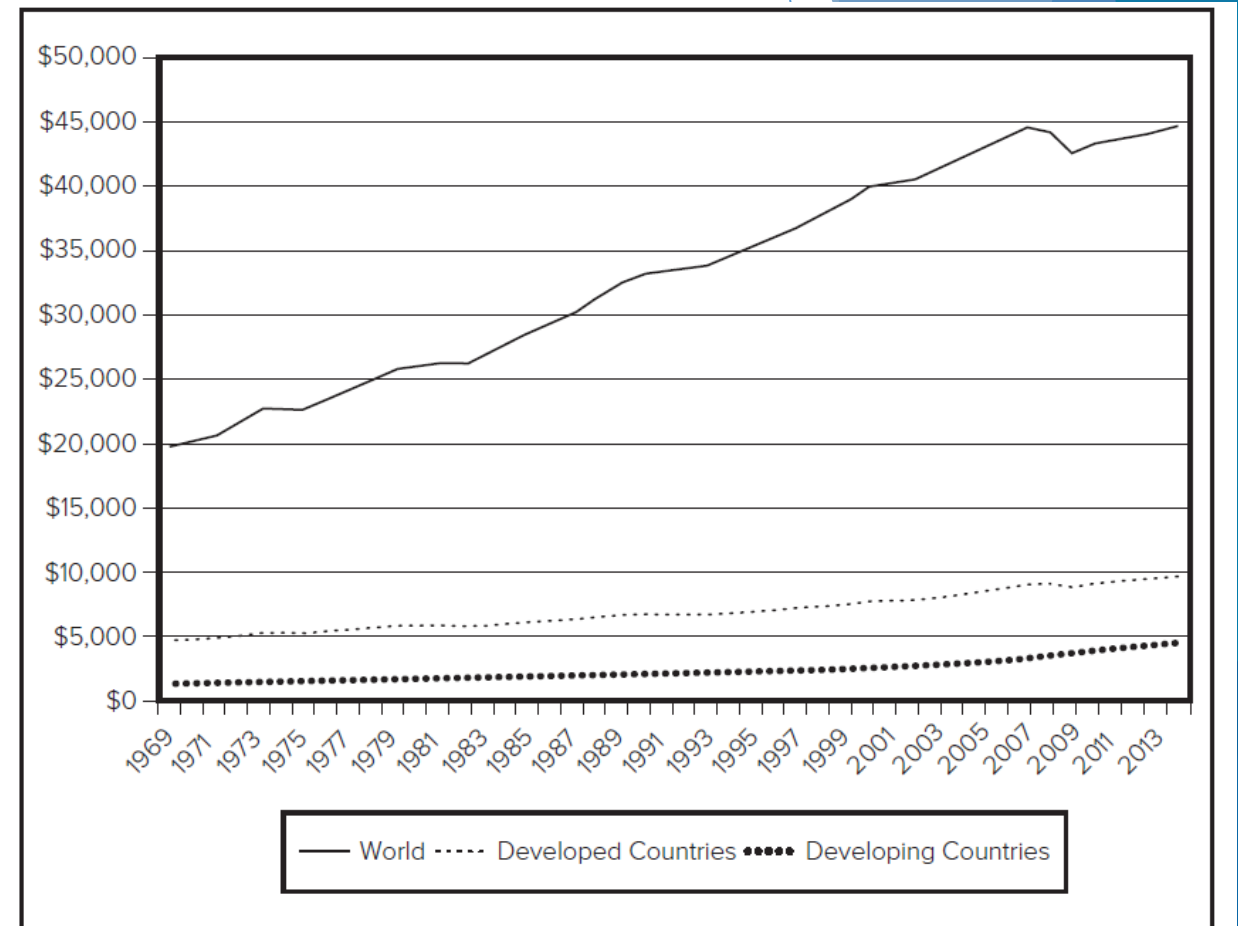
# Importance of innovation

- ▶ Innovation is important to organizations because of:
  - ▶ • Competitive pressures and the need to survive
  - ▶ • The management of a firm or enterprise. Managers have to implement change, new processes and improvement in systems.
  - ▶ • The impact of innovation on organizational life.
- ▶ **Competitive pressure and the need to survive**
- ▶ Gary Hamel (1998), writing in the Sloan Management Review, suggests that *only those companies that are capable of recreating themselves and their industries in a profound way will be around a decade hence*. The warning is simple, innovate or perish!
- ▶ Research in the fields of organisational management and marketing suggests that companies and organizations that use the innovation process to differentiate their own products and services from their competitors are twice as likely to be successful both strategically and financially.
- ▶ Competitors often observe that innovative organisations represent a threat to them out of all proportion to the size or financial performance of the innovative organization concerned.

# The impact of technological innovation on society

## Gross Domestic Product per Capita, 1969-2014 (in Real 2010 \$US Billions)

- ▶ The aggregate impact of technological innovation can be observed by looking at **gross domestic product (GDP)**. The gross domestic product of an economy is its total annual output, measured by final purchase price.
- ▶ Economists showed that the historic rate of economic growth in GDP could not be accounted for entirely by growth in labor and capital inputs. Economist Robert Merton Solow argued that this unaccounted-for **residual growth represented technological change**: Technological innovation increased the amount of output achievable from a given quantity of labor and capital.
- ▶ Solow received a Nobel Prize for his work in 1981, and the residual became known as the **Solow Residual**.



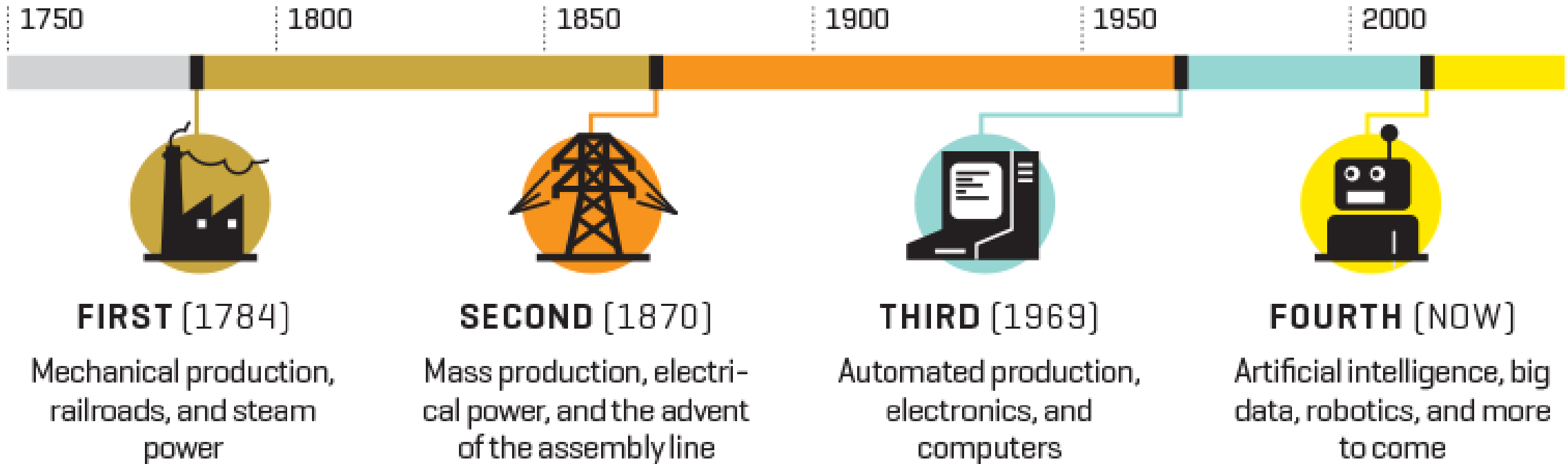
# Timeline of Some of The Most Important Technological Innovations In The Last 200 Years

- 1800 - 1800—Electric battery
- 1804—Steam locomotive
- 1807—Internal combustion engine
- 1809—Telegraph
- 1817—Bicycle
- 1820 - 1821—Dynamo
- 1824—Braille writing system
- 1828—Hot blast furnace
- 1831—Electric generator
- 1836—Five-shot revolver
- 1840 - 1841—Bunsen battery (voltaic cell)
- 1842—Sulfuric ether-based anesthesia
- 1846—Hydraulic crane
- 1850—Petroleum refining
- 1856—Aniline dyes
- 1860 - 1862—Gatling gun
- 1867—Typewriter
- 1876—Telephone
- 1877—Phonograph
- 1878—Incandescent lightbulb

- 1880 - 1885—Light steel skyscrapers
- 1886—Internal combustion automobile
- 1887—Pneumatic tire
- 1892—Electric stove
- 1895—X-ray machine
- 1900 - 1902—Air conditioner (electric)
- 1903—Wright biplane
- 1906—Electric vacuum cleaner
- 1910—Electric washing machine
- 1914—Rocket
- 1920 - 1921—Insulin (extracted)
- 1927—Television
- 1928—Penicillin
- 1936—First programmable computer
- 1939—Atom fission
- 1940 - 1942—Aqua lung
- 1943—Nuclear reactor
- 1947—Transistor
- 1957—Satellite
- 1958—Integrated circuit

- 1960 - 1967—Portable handheld calculator
- 1969—ARPANET (precursor to Internet)
- 1971—Microprocessor
- 1973—Mobile (portable cellular) phone
- 1976—Supercomputer
- 1980 - 1981—Space shuttle (reusable)
- 1987—Disposable contact lenses
- 1989—High-definition television
- 1990—World Wide Web protocol
- 1996—Wireless Internet
- 2000 - 2003—Map of human genome

# THE FOUR INDUSTRIAL REVOLUTIONS



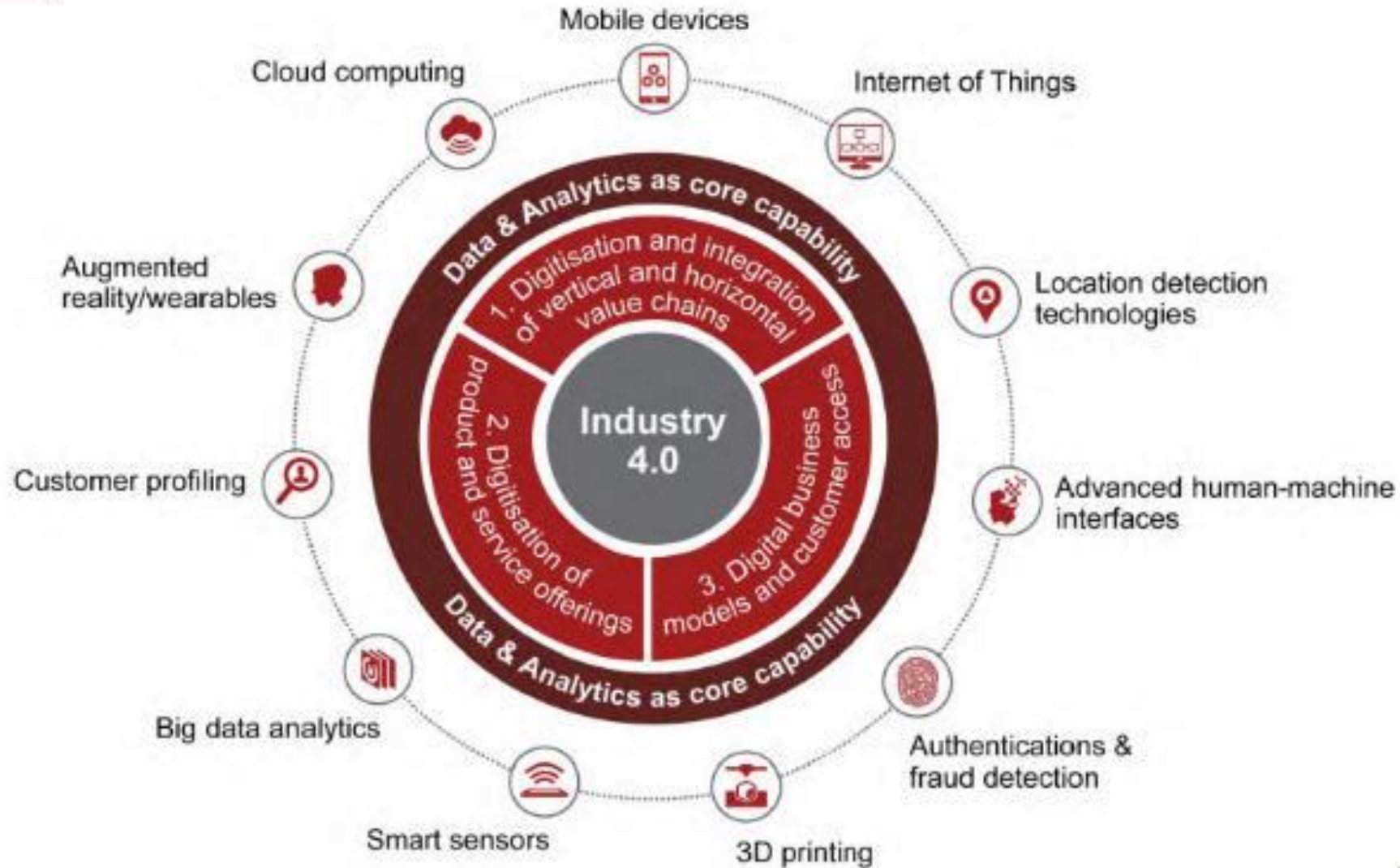
- ▶ First industrial revolution: 1750-1850
- ▶ Second industrial revolution: 1850-1920
- ▶ Third industrial revolution: 1920-1990
- ▶ Fourth industrial revolution: from 1990 till now

# Industry 4.0

- ▶ The days of simple product innovation are shortening. It is through the **fourth industrial revolution** (also known as Industry 4.0), currently being undertaken, that technology, talent, and new innovation ecosystems are emerging - building greater complexity into our final innovation offerings. Intelligent automation and technology are fuelling this new industrial revolution. And this unprecedented, exponential pace of change is increasingly reliant on collaborative platforms to realize the result: more radical innovations.
- ▶ Organizations everywhere are facing mounting pressure to transform - to shift from product-centric business models to new models focused on creating and capturing different sources of new value. As a result, **innovation is becoming more complex**.
- ▶ Manufacturing is fast becoming the **digital manufacturing enterprise** (DME). The DME is designed to increase response rate and manage in more efficient, connected, and effective ways. There is this growing recognition that everything needs to be connected to bring a different perspective to any global value chain - one of being far more responsive and bringing manufacturing closer to the customer need.



# Industry 4.0 is a journey towards a complete value chain transformation driven by new technologies and new collaborative business models





# Externalities

- ▶ Production technologies may create pollution that is harmful to the surrounding communities; agricultural and fishing technologies can result in erosion, elimination of natural habitats, and depletion of ocean stocks; medical technologies can result in unanticipated consequences such as antibiotic-resistant strains of bacteria or moral dilemmas regarding the use of genetic modification. However, technology is, in its purest essence, knowledge – knowledge to solve our problems and pursue our goals. **Technological innovation is thus the creation of new knowledge that is applied to practical problems.** Sometimes this knowledge is applied to problems hastily, without full consideration of the consequences and alternatives, but overall it will probably serve us better to have more knowledge than less.
- ▶ **Externalities** - Costs (or benefits) that are borne (or reaped) by individuals other than those responsible for creating them. Thus, if a business emits pollutants in a community, it imposes a negative externality on the community members; if a business builds a park in a community, it creates a positive externality for community members.

# Challenges in the Innovation Context

Acceleration of  
knowledge  
production

Global  
distribution of  
knowledge  
production

Market  
expansion

Market  
fragmentation

Market  
virtualization

Rise of active  
users

Growing concern  
with  
sustainability  
issues

Development of  
technological  
and social  
infrastructure

# Summary

Is about **growth** - about recognizing opportunities for doing something new and implementing those ideas to create some kind of value.

Innovation is also a survival imperative. It contributes to competitive success in many different ways. It is a **strategic** resource to achieving goals.

## Innovation

Innovation doesn't just happen. It is driven by **entrepreneurship**. The powerful mixture of energy, vision, passion, commitment, judgment and risk-taking provides the power behind the innovation process.

Innovation doesn't happen simply because we hope it will. It is a complex process which carries a risks and needs careful and systematic **management**.

# Questions:

- ▶ 1. What is an innovation? Why is innovation so important for firms to compete in many industries?
  - ▶ 2. What are some advantages of technological innovation? Disadvantages?
  - ▶ 3. Why do you think so many innovation projects fail to generate an economic return?
  - ▶ 4. Explain the impact of technological innovation on the development of society. Industrial revolution: evolution, technologies, consequences.
  - ▶ 5. What are the modern challenges in the Innovation context?
  - ▶ 6. Oslo Manual / Frascati Manual - overview, chapter 2, glossary
- 
- ▶ **Literature:**
    1. Melissa Schilling: Strategic Management of Technological Innovation, McGrawHill, International Edition 2011.
    2. Tidd, J., Bessant, J.R. 2014. Strategic innovation management. Wiley, Hoboken.
    3. Innovation management / authors Borut Likar ... [et al.] ; editor Borut Likar, co-editors Peter Fatur, Urška Mrgole ; translation Arslingue K. Žontar, TEFL, TBE. - 1st. ed. - El. knjiga. - Ljubljana: Korona plus - Institute for Innovation and Technology, 2013
    4. Kupeshova S. Innovation Management. Almaty, "Kazakh universiteti". 2011. - 160 c.

**Thank you for your attention!**