Models of Innovation

Bujor Pavaloiu

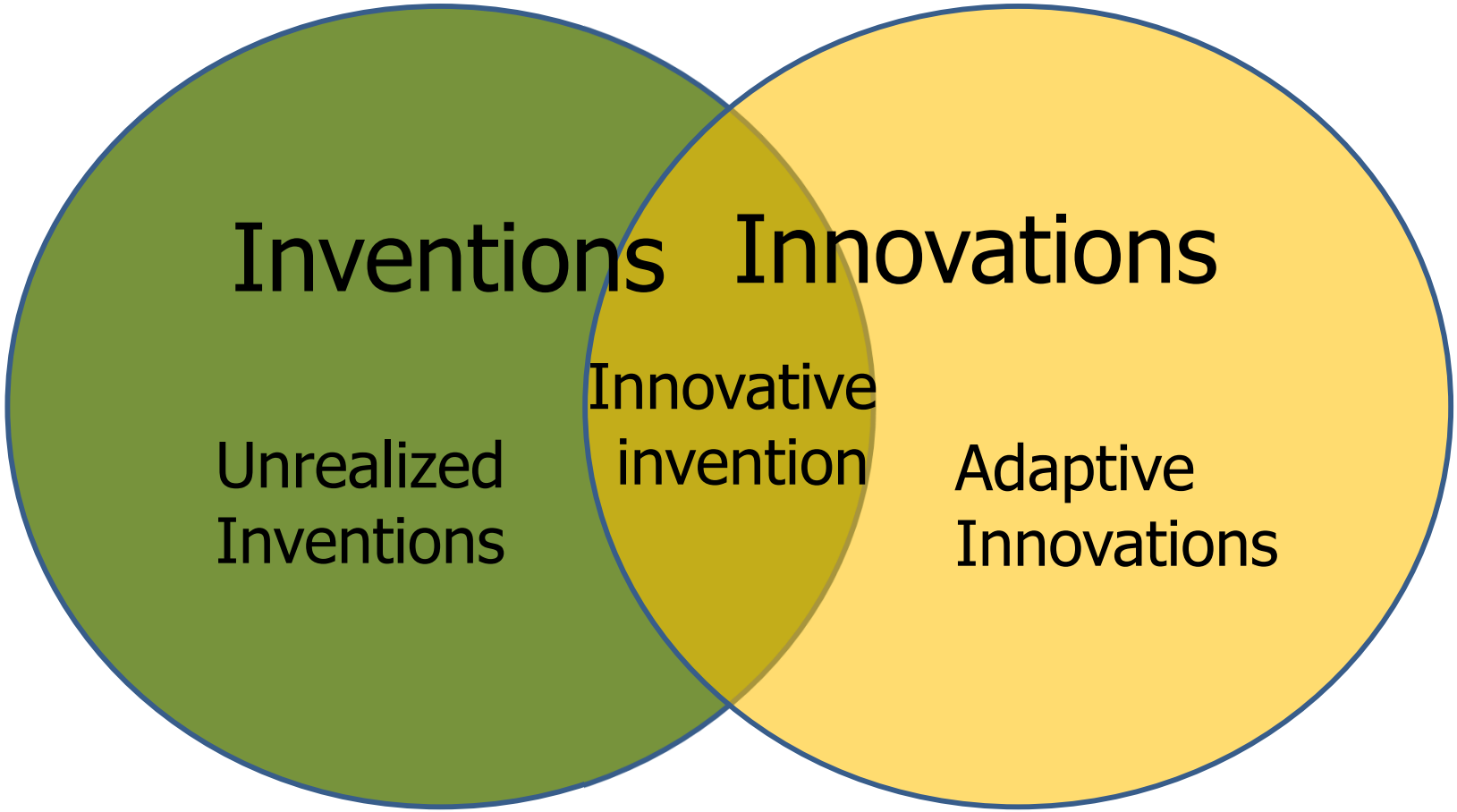
Outline

- **Introduction**
- Innovation Models
- Market-driven & Technology-driven Innovation
- Closed & Open Innovation

Innovation vs. Invention

- From the previous lecture, Innovation is regarded as the process of introducing something new (idea, method, process, device) or the subject/result of this action.
- Invention is the process of finding/discovering something new (product, device, process, or concept).
- Innovation is the next step, the materialization of the invention.
- If the initiative generated by an invention does not generate reasonable profit or competitive advantage for a company, it will remain at that stage.
- It needs a lot of components working together for an innovation to develop. Innovation is the introduction of newer and better solutions (usually given by inventions).

Inventions vs. Innovations



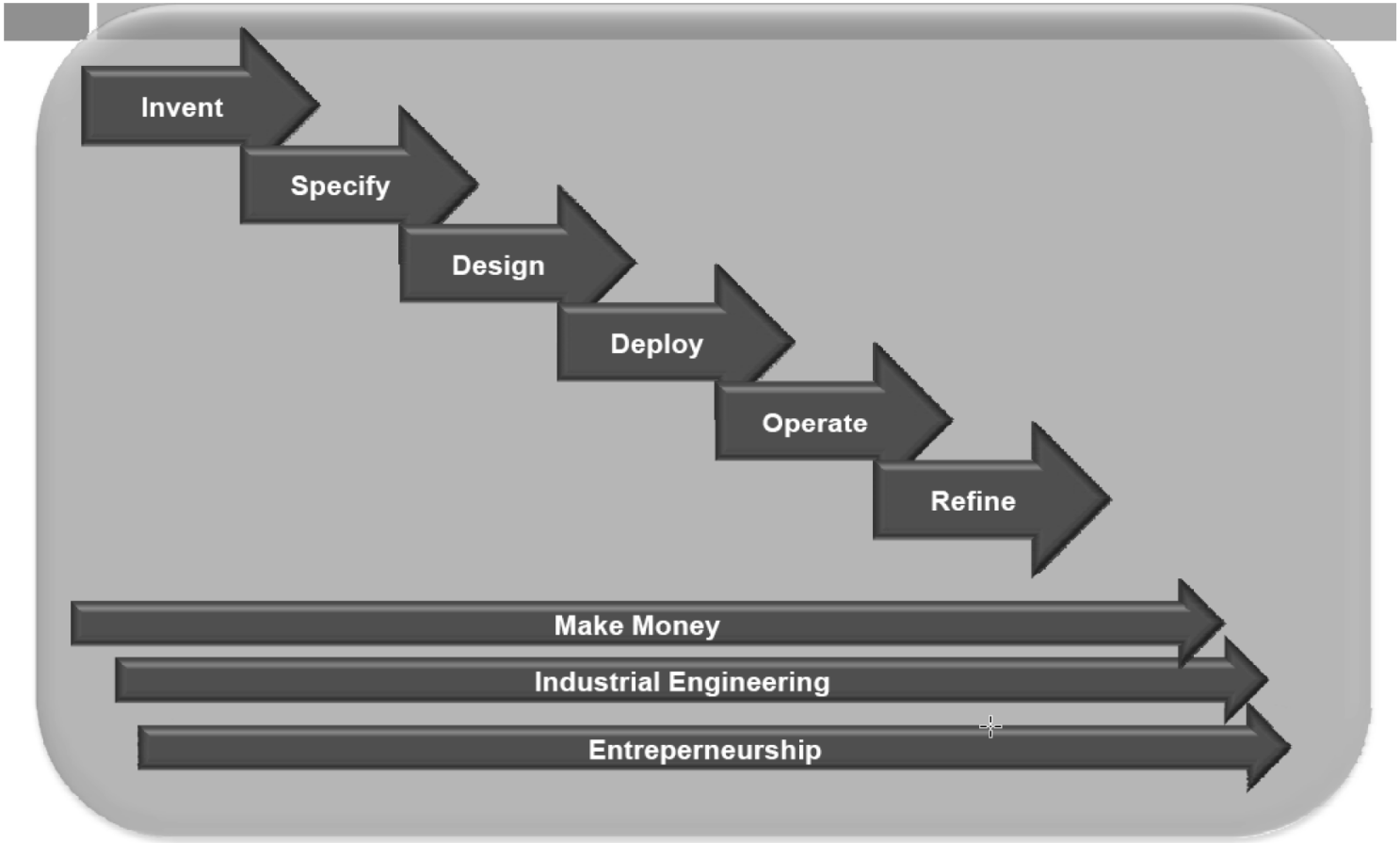
Invention vs. Innovation

Invention	Innovation
Novel product, device, process, or concept	Introduction of newer and better solutions to the market
Needs knowledge, scientific knowledge, competence, financial support. (maybe luck???)	Needs knowledge, technical knowledge, competence, market knowledge, social skills, financial support
Example: Initial light bulb	Example: Edison's light bulb.

Wooden wheel

Electric car - Aspark Owl

Components of the Innovation life cycle



Components of the Innovation life cycle [1]

Outline

- Introduction
- **Innovation Models**
- Market-driven & Technology-driven Innovation
- Closed & Open Innovation

Iceland Liechtenstein Norway grants

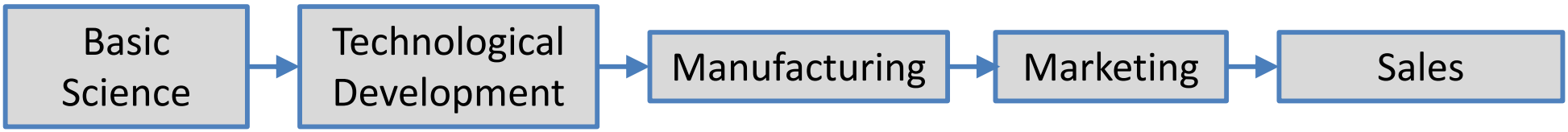
DEVELOPMENT OF INNOVATION MODELS

Genration	Model	Characteristic
First	Technology push	Simple linear sequential process, emphasis on R&D and science
Second	Market pull	Simple linear sequential process, emphasis on marketing, the market is the source of new ideas for R&D
Third	Coupling model	Recognizing interaction between different elements and feedback loops between them, emphasis on integrating R&D and marketing
Fourth	Integrated model	Combinations of push and pull models, integration within firm, emphasis on external linkages
Fifth	Network model	Emphasis on knowledge accumulation and external linkages, systems integration and extensive networking
Sixth	Open Innovation	Internal and external ideas as well as internal and external paths to market can be combined to advance the development of new technologies

[1] , adopted from Rothwell, R. (1992),
Successful industrial innovation: critical factors for the 1990s [2,3]

1. Technology push model

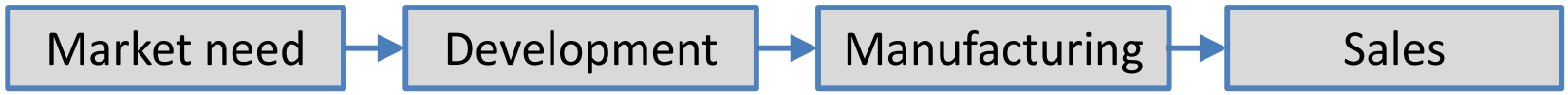
- The period 1950s – late of 1960s is characterized by technological and industrial expansion due to investments in research and technology.
- This suggests that innovation (and sales) comes from scientific breakthroughs.
- Usher, 1955, [4]



1st Generation Linear technology push model [4]

2. Market pull model

- The period of Mid 1960s – Mid 1970s is characterized by steady research and manufacturing employment.
- New products were introduced using existing technologies, based on the requirements of the market. It suggests that innovation (small, incremental) and sales come from the requirements of the market.
- Myers and Marquis, 1969, [5]



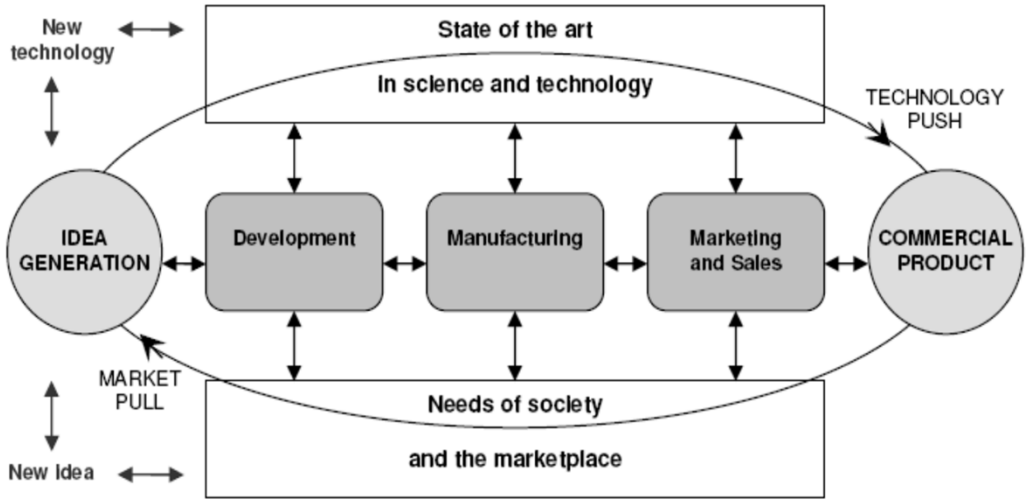
2nd Generation Linear market pull model [5]

3. Coupling model

- The period Mid of 1970s-Mid of 1980s is characterized by high rates of inflation and demand saturation.
- Successful innovation process on the basis of a portfolio of wide-ranging and systematic studies covering many sectors and countries - "coupling" model of innovation.
- Mowery and Rosenberg, 1979, [6] described the importance of corporate functions interacting in the innovation process.

Coupling model

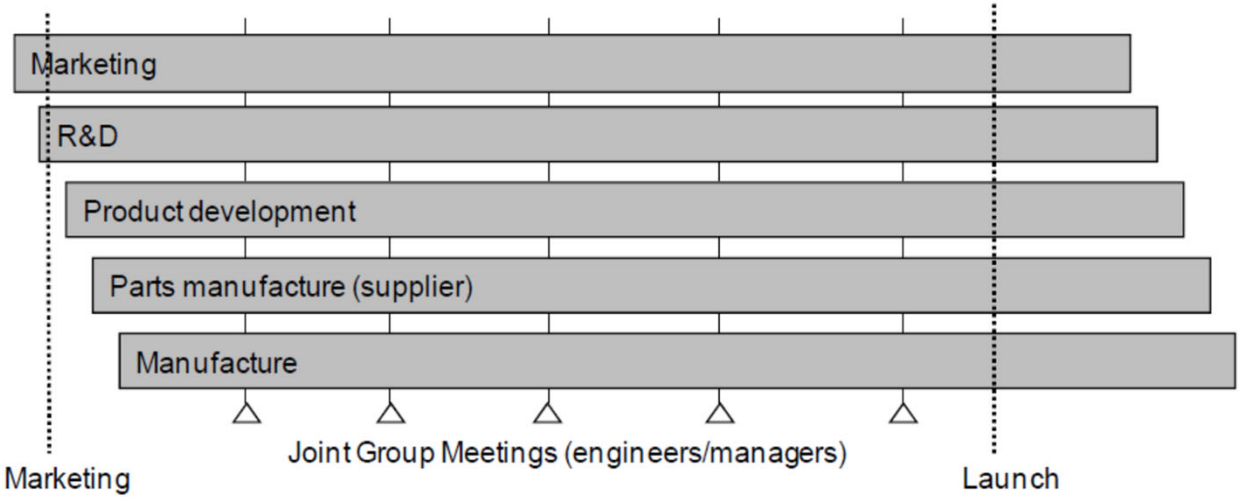
- Rothwell and Zegveld, 1985, [7] extended the traditional linear approach to connect businesses with external research institutions and the market in their 'coupling model'.



3rd Generation Coupling model [9] apud [1]

4. Integrated model

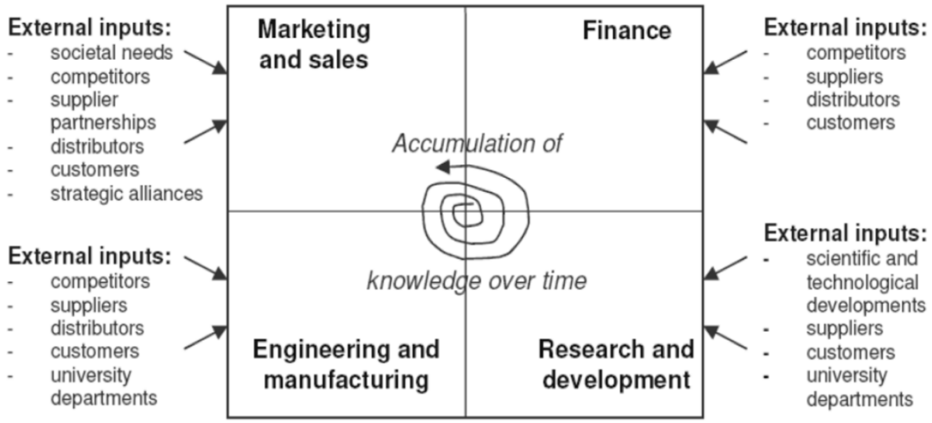
- The period Early 1980s - Early 1990s is characterized by the rapid growth of strategic alliances. Shortened products life cycle lead to time-based strategies, integration and parallel development.
- Kline and Rosenberg, 1986, [8]



4th Generation Interactive Model [9] apud [1]

5. Network model

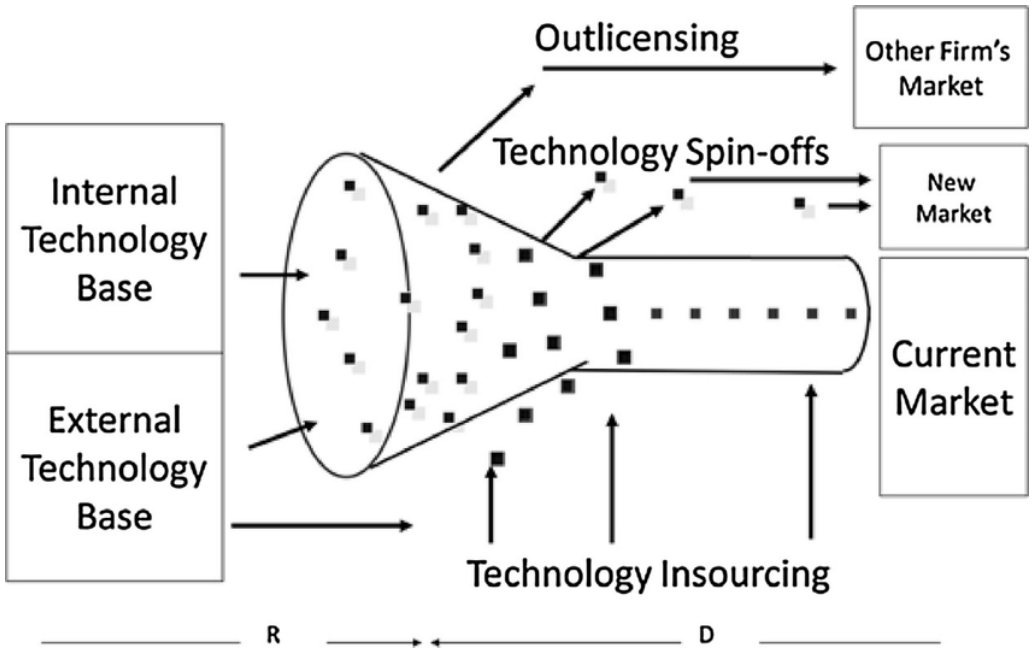
- The period from Mid 1990s is characterized by major changes and interactions. The 'chain-linked' model and adds a strategic component—the integration of cooperating companies, the growing importance of information and communication technologies and the use of expert systems and networks.
- Rothwell, 1992, [10]



5th Generation Networking Model [11] apud [1]

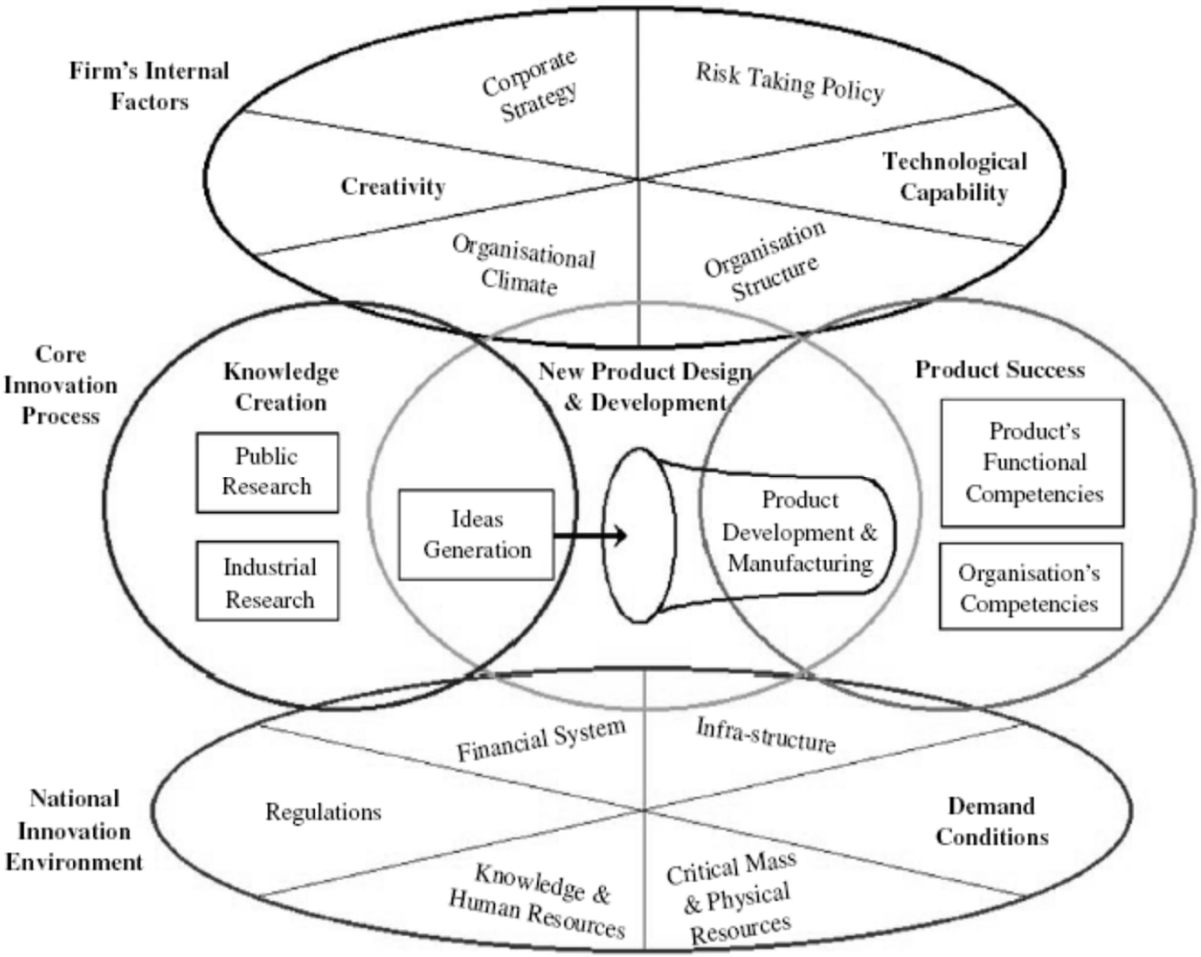
6. Open Innovation model

- Open innovation is a business management model for innovation that promotes collaboration with people and organizations outside the company
- Chesbrough, 2003, [12]



6th Generation Open Innovation Model [12]

Open Innovation model



The Creative Factory Systems Innovation Model [13] apud [1]

Outline

- Introduction
- Innovation Models
- **Market-driven & Technology-driven Innovation**
- Closed & Open Innovation

Market-driven & Technology-driven Innovation

Even if they are considered the initial generation models for innovation/research, these are easily noticeable and are identified as components for the others models.

Innovation can be:

- **Market/Demand pull**, which tries to provide solutions and products for the market demands;
- **Technology push**, which tries to introduce to the market new solutions for existing products or even new products.

The demand-pull strategy is a reaction process and it is inherently limited and shortsighted.

Market driven or Market/Demand pull

- For Market pull, the market demands a product or a service and the producers respond by producing and delivering that product or service.
- The market defines the problem and the producers solve it.
- The market inspection is extremely important. The innovation/ technology transfer/ product development is based on the perception of the customer needs and desires. The customer defines the solution and educates the producer.
- Many times, the product development fills a market-defined niche.
- Many times, it is recognized as the **industrial pull**.

Market pull examples

The Evolution of the Camera

https://www.precisioncamerarepairs.com/blog/the-evolution-of-the-camera

Technology driven/ Technology push

- In technology push, the producer, seeing an advantage to the consumer that the consumer does not see, creates a product type and also the demand for that product type.
- The producer is in the business of fulfilling functions for the consumer, and uses unique methods, technology or approaches to better fulfill the function in ways even the consumer may not initially recognize.
- In short, technology push product development is based on the belief that the supplier recognizes a market need even before the market does.

Technology push examples

- "If I had asked people what they wanted, they would have said faster horses" Henry Ford.
- "It was easy to explain what the iPod was - a thousand songs in your pocket - which allowed us to move quickly to the iconic silhouette ads. But it was hard to explain what an iPad was" Steve Jobs
- There is a large army of innovations that needs to be done such that some others to be feasible "We will make electricity so cheap that only the rich will burn candles" Thomas Edison
- Yet, electric bulbs are not pure technology push – long market driven evolution - Electric bulbs invention
- Some of the examples from the evolution of the photo-cameras are technology-push. Which ones?

Market pull vs. Technology push

Attribute	Market pull	Technology push
Technology uncertainty	Low	High
R&D expense	Low	High
R&D duration	Short	Long
Time to market	Known	Unknown
Innovation process	'Stage-gate' type	'Probe and learn' type
Market-related uncertainty	Low	High
R&D customer integration	Easy	Difficult
Customer experience	Present	None present
Customer education	Not necessary	Usually necessary
Market research type	Quantitative conventional market research	Qualitative 'exploratory' research
Need for changing customer behaviour	Minimal	Extensive

Gerpott (2005) and Herstatt and Lettl (2004)

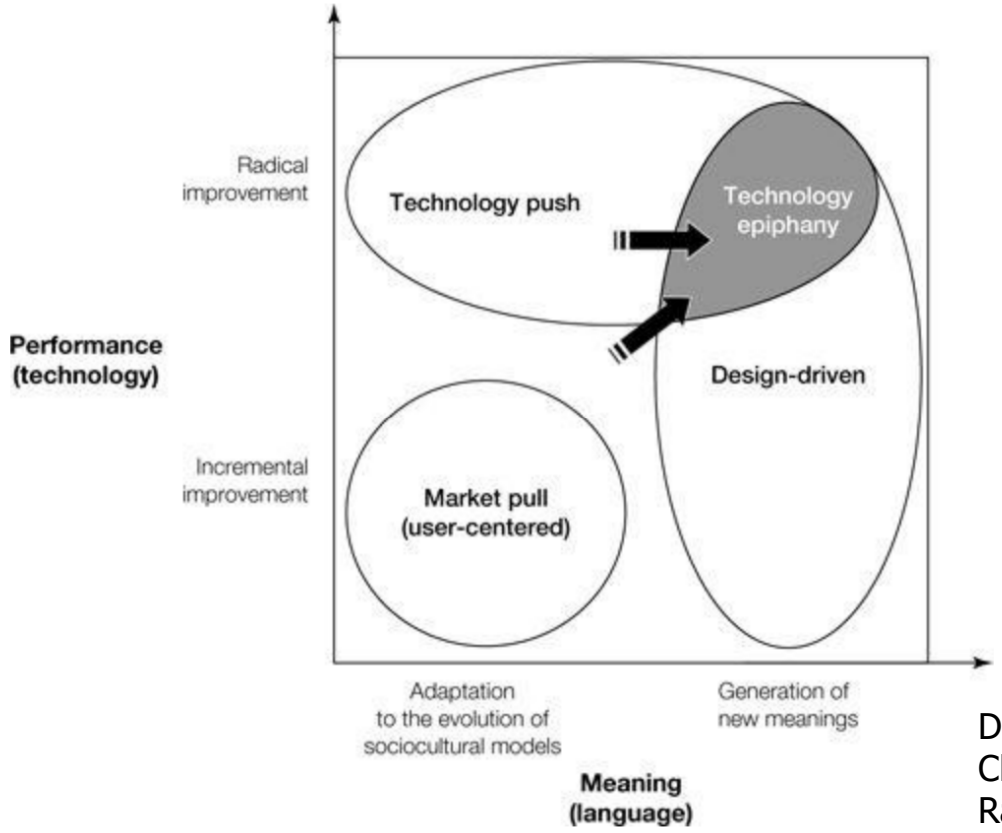
Technology Driven Organizations

A technology-driven organization has technology based business model and innovation strategy.

- Technology-driven organizations are innovative, using the technology innovations to better serve customers, gain a competitive advantage, and evolve with the marketplace.
- These companies are less afraid of technological advancement, which gives them more mobility, freedom, and creativity to innovate.
- They also embrace a digital culture, workplace, and mindset. They will assimilate faster the digital technology, being ready to innovate in the domain or in related ones.

Design Driven Innovation

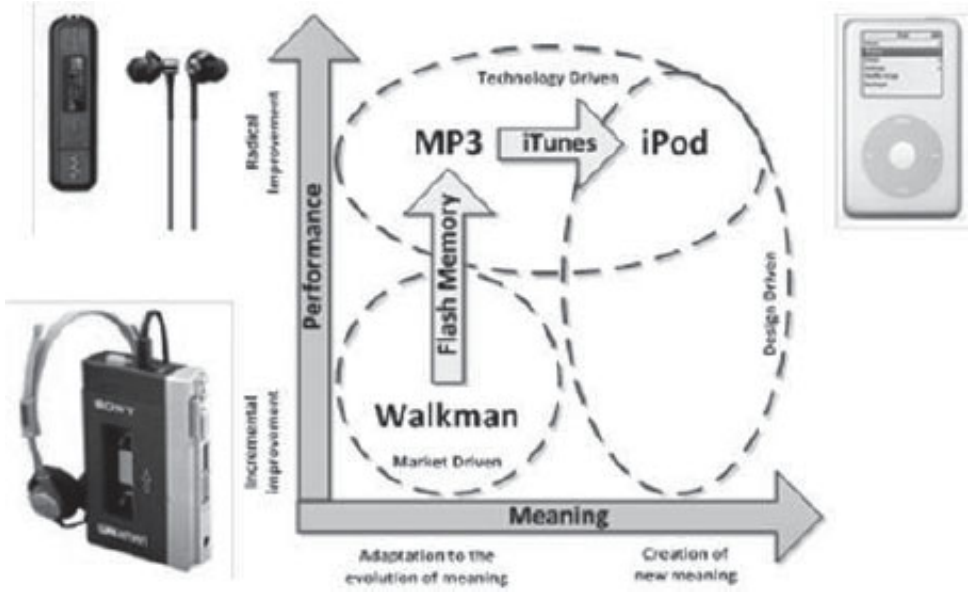
- There is a third recognized path to innovation – Design Driven. It is a push approach, but instead of pushing just the technology, it pushes the whole market along with the socio-cultural model.



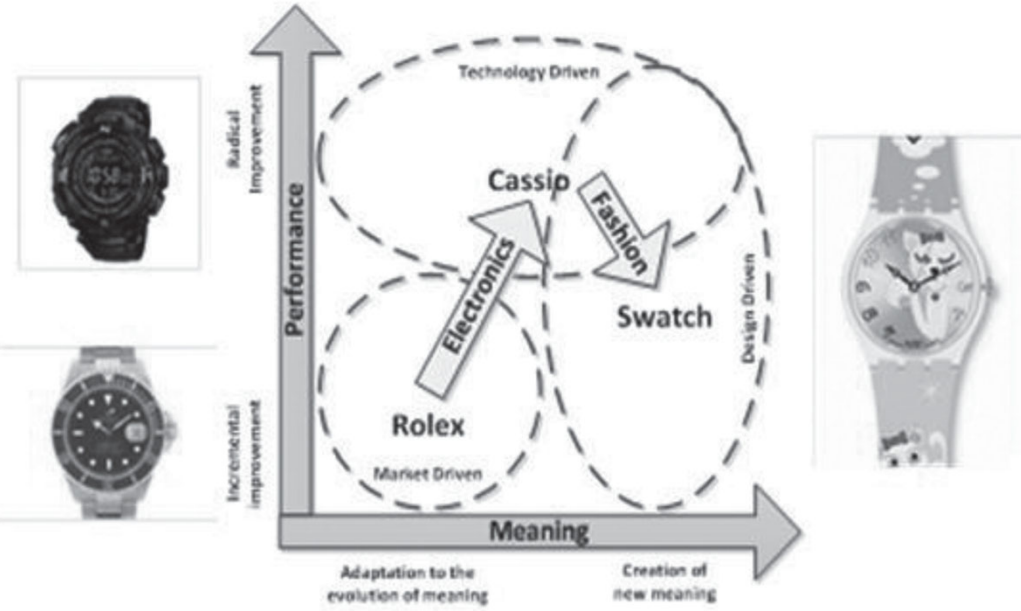
Design Driven Innovation:
Changing the Rules of Competition by Radically Innovating What Things Mean, Roberto Verganti, 2009

Design Driven Innovation Examples

Audio players



Watches



Ronald Jean Degen, Teaching Entrepreneurship Students the Practice of Innovation: A Brain-based Guided Experience Approach, Revista de Ciências da Administração, vol. 15, n. 37, p. 92-104, dez. 2013

Design Driven Innovation Examples

- **Innovation of meaning**

Mini skirt, Mary Quant, 1960
Women's liberation from conservative fashion

https://fashion-era.com/60s-mini-skirt/

Power suit, Armani, 1980,
Women economic boom and independence

Ted Blackbrow/
Associated Newspapers/REX USA

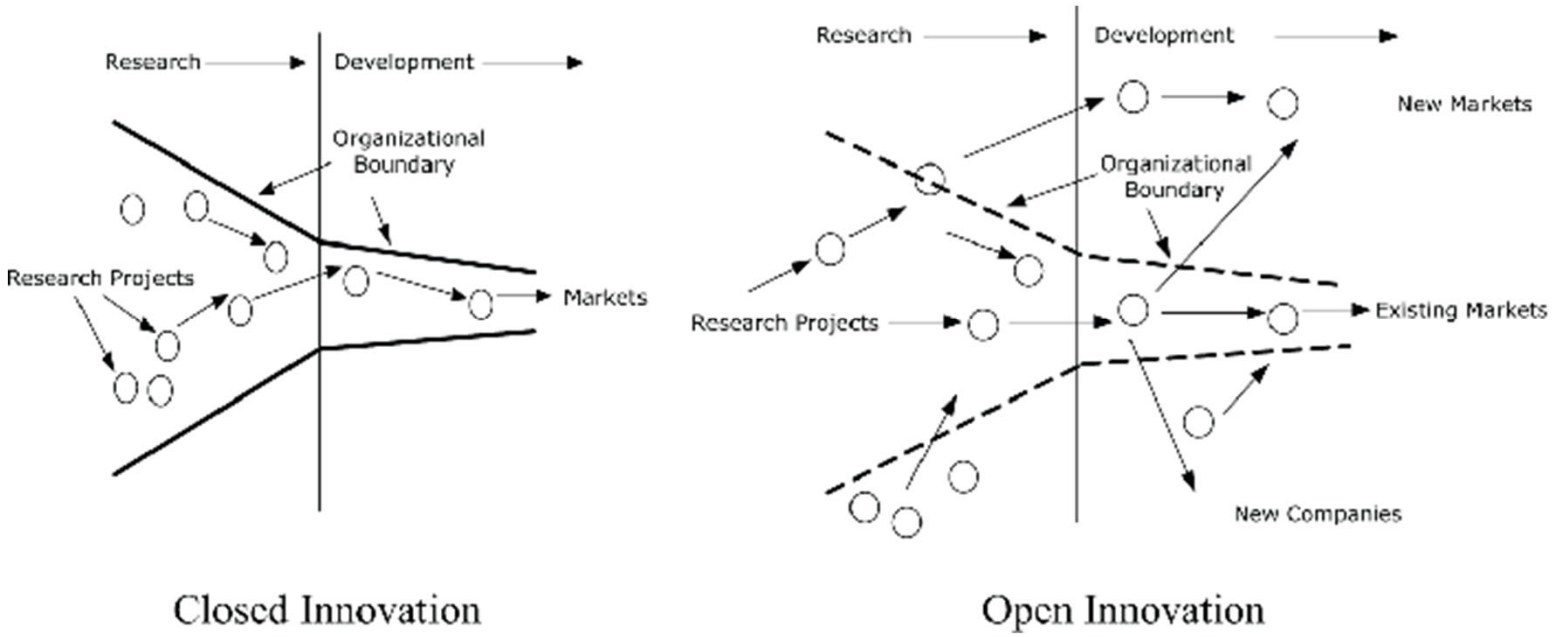
Outline

- Introduction
- Innovation Models
- Market-driven & Technology-driven Innovation
- **Closed & Open Innovation**

Open Innovation

- Open innovation is a business management model for innovation that promotes collaboration with people and organizations outside the company.
- Open innovation is a subject at the intersection of research, business and politics.
- In the context of open innovation, there is increased awareness of the importance of considering nonprofit purposes, while public and nonprofit organizations need to be linked to other stakeholders to get a more complete picture of how innovation can be done more efficiently and effectively [14].

Open Innovation vs Closed Innovation



Closed vs Open Innovation [15]

Open Innovation vs Closed Innovation

- Throughout the years, important factors emerged and they paved the way for open innovation paradigms:
  - The increasing availability and mobility of skilled workers
  - The growth of the venture capital market
  - External options for ideas sitting on the shelf
  - The increasing capability of external suppliers
  - These four factors have resulted in a new market of knowledge

Open Innovation Advantages

Open innovation offers benefits to companies operating on a program of global partnership [16]:

- Reduced cost of conducting research and development
- Potential for improvement in development productivity
- Incorporation of customers early in the development process
- Increase in accuracy for market research and customer targeting
- Improve the performance in planning and delivering projects
- Potential for synergism between internal and external innovations
- Potential for viral marketing
- Enhanced digital transformation
- Potential for completely new business models
- Leveraging of innovation ecosystems

Open Innovation Disadvantages

Potential drawbacks [16]:

- Possibility of revealing information not intended for sharing
- Potential for the hosting organization to lose their competitive advantage as a consequence of revealing intellectual property
- Increased complexity of controlling innovation and regulating how contributors affect a project
- Devising a means to properly identify and incorporate external innovation
- Realigning innovation strategies to extend beyond the firm in order to maximize the return from external innovation

References

- [1] Niek D du Preez , Louis Louw, (2008) A Framework for Managing the Innovation Process, Management of Engineering & Technology, 2008.
- [2] Rothwell, R. (1992). Successful industrial innovation: critical factors for the 1990s. R&D Management. Vol 22:3. pp. 221 – 239.
- [3] Rothwell, R., (1994), Towards the Fifth-generation Innovation Process. International Marketing Review, 11, 7–31. doi:10.1108/02651339410057491
- [4] Usher, A. P. (1955). Technical change and capital formation, in national bureau of economic research, capital formation and economic growth, Princeton University Press , pp. 523–550
- [5] Myers, S., & Marquis, D. G. (1969a). Successful industrial innovations: a study of factors underlying innovation in selected firms. In NSF 69–17. Washington: National Science Foundation
- [6] Mowery, D., & Rosenberg, N. (1979). Influence of market demand upon innovation—critical-review of some recent empirical studies. Research Policy, 8(2), 102–153.
- [7] Rothwell, R., & Zegveld, W. (1985). Reindustrialization and technology. Harlow: Longman
- [8] Kline, S. J., & Rosenberg, N. (1986). An overview of innovation. In R. Landau & N. Rosenberg (Eds.), The Positive Sum Strategy (pp. 275–305). Washington, D.C.: National Academy Press.

References

- [9] Rothwell, R. (1995) Industrial innovation: success, strategy, trends, In M. Dodgson and R. Rothwell, (Eds). The Handbook of Industrial Innovation (pp.33–53), 1995
- [10] Rothwell, R. (1992). Industrial innovation and environmental regulation: some lessons from the past. Technovation, 12(7), 447–458.
- [11] Trott, P., (2016), Innovation Management and New Product Development. 3rd edition. Harlow, England: Pearson Education Limited.
- [12] Chesbrough, H. W. (2003b). The era of open innovation. MIT Sloan Management Review, 44(3), 35–41.
- [13] Galanakis, K., (2006) Innovation process: Make sense using systems thinking, Technovation, 26(11), pp 1222-1232
- [14] Marcel Bogers, Henry Chesbrough and Carlos Moedas, (2018). Open Innovation: Research, Practices, and Policies, California Management Review, Vol. 60(2) 5–16
- [15] W. Krause, C. Schutte and N. du Preez, (2012), Open Innovation In South African Small And Medium-sized Enterprises
- [16] Ramanathan, V., Driving Open Innovation, available at https://www.linkedin.com/pulse/driving-open-innovation-venugopal-ramanathan/

Bibliography

- Creating Technology-Driven Entrepreneurship, Foundations, Processes and Environments, Edts. Giuseppina Passiante, Aldo Romano, 2016, Palgrave Macmillan
- Open Innovation in Firms and Public Administrations: Technologies for Value Creation, Carmen de Pablos Heredero, Edts. David López Berzosa, 2012, IGI Global
- Design Driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean, Roberto Verganti, 2009, Harvard Business Press
- Technological Entrepreneurship: Technology-Driven vs Market-Driven Innovation, Ian Chaston, 2017, Palgrave Macmillan