KATHOLIEKE UNIVERSITEIT LEUVEN

Over Open Innovatie en Systeeminnovatie: FISCH als motor van vernieuwing

K. Debackere
K.U.Leuven

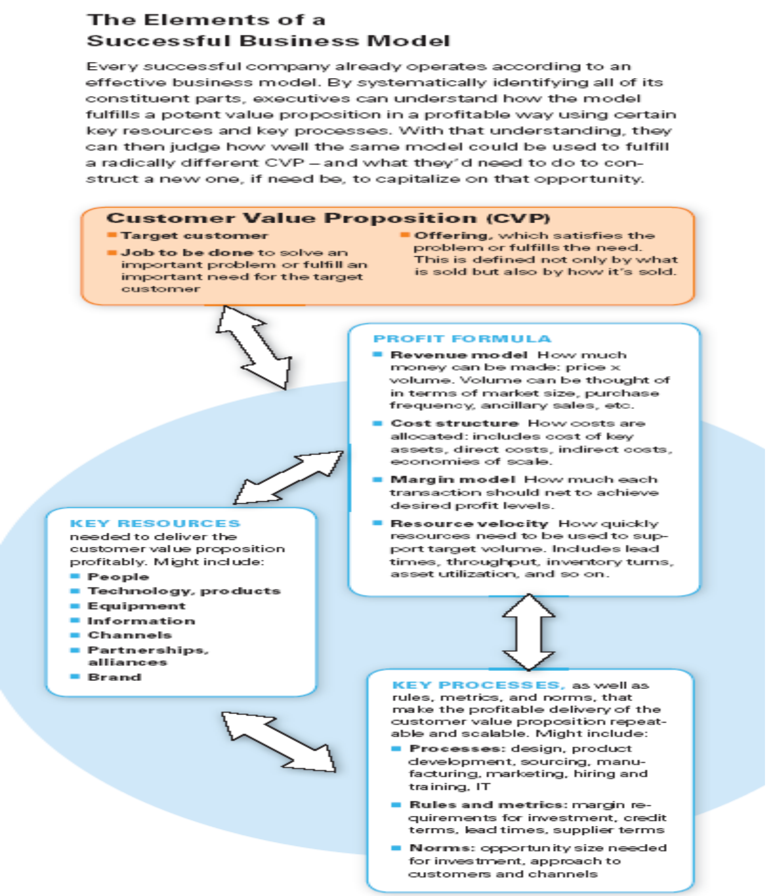
Vertrekkend van de VRWB studies (2004) …

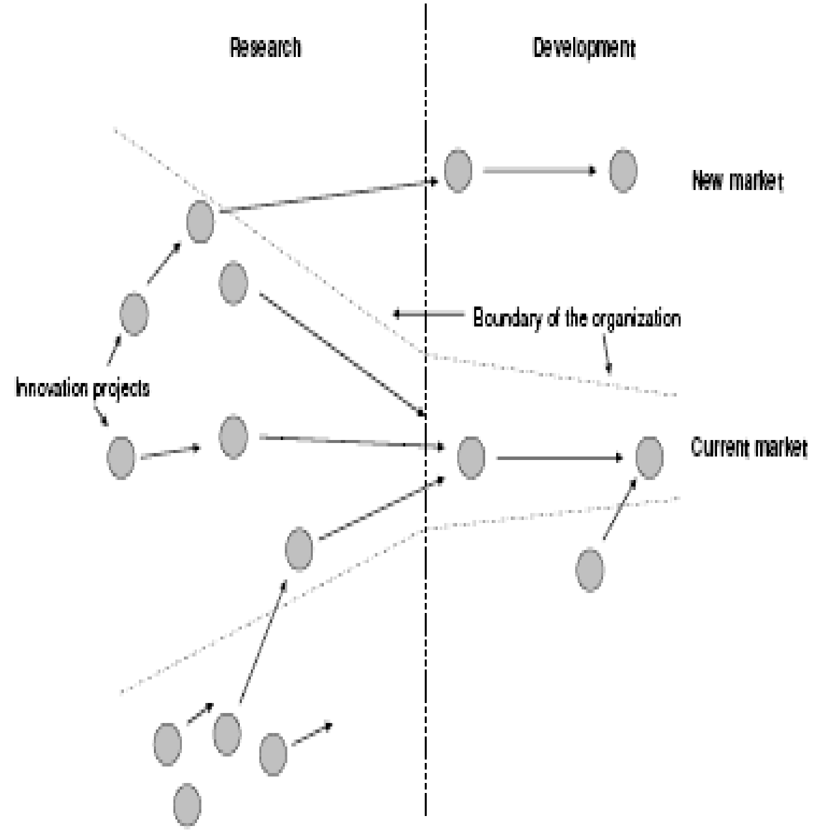
Domein	Evoluties op korte en lange termijn
Chemical Synthesis	Catalysts can be 'customized' and put together from single components. Combination of the high selectivity of homogeneous catalysis with the robustness of heterogeneous systems by supporting molecular species on the surface of solids such as zeolites and silica. New robust solids with hollow channels – mesoporous solids – the dimensions of which can be controlled in the molecular assembly process will have many uses including vehicle exhausting cleaning. Chemists will apply natural processes to industrial chemicals and materials achieving higher efficiency and improved safety. Some specific evolutions: Practical use of catalytic oxidation and hydrogenation with less salt by-product. Practical use of technology for direct synthesis of phenol from benzene though air-oxidation. Development of selective catalytic cracking technology for naphtha.
Bioprocesses & Biotechnology	Metabolic pathways will be fully understood. Very low cost raw materials for bioprocesses will be derived from agricultural and forestry wastes and, to an increasing extent, cultivated feedstock. Biotech-based processes will enable the manufacture of chemicals with greater energy efficiency and environmental care.
Materials Technology	Scientists will be able to design materials, and predict their properties from the molecular level through the macroscopic level relying on easy-to-use computational tools. They will also be able to precisely manipulate materials from nano-scale to macro-scale. Increased acceptance of methods for disassembly and reuse. Some specific evolutions: Biodegradable plastics will account for 30% of all plastics (organic mat.); Widespread use of polymer synthesizing processes that use renewable resources instead of conventional petrochemical processes. Widespread use of power generator turbines made primarily from reliable, high-strength, heat-resistant ceramics, ceramics as strong as and more wear-resistant than metal alloys. Surface coatings which change colour with temperature as well as providing protection. Special polymers are now being tested for fire-proof cushions and panels in aircrafts and cars. The accent lies on improving human safety.
Process Science & Engineering	Process design will be viewed more comprehensively and will focus on the principles of concurrent engineering, designing from first principle, improved energy efficiency, protection of human health, safety, and the environment. Some precise evolutions: Zero Net Life-Cycle Waste, Intelligent Control Systems, Model-based failure and mitigation. Many new commercial processes will use recycled raw materials as feedstock.
Chemical measurement & analysis	Non-specialists in the scientific community will be able to use research-grade analytical measurement instruments. Some improvements: All critical-process chemistry will be measured accurately on-line in a manufacturing environment. Interfaces, particulates, and aerosols will be accurately and precisely characterised. Large combinatorial chemicals will be routinely measured and characterized. Analysis cycle time will be reduced by a factor 10 of what it was in 1990. Crystallography and resonance spectroscopes will be used routinely to determine macromolecular structures. Sample preparation will no longer be needed for routine analytical measurements.
Computational technologies	Shortened product-process development cycles, optimisation of existing processes to improve energy efficiency, and efficient design of new products and processes. Atomistic modelling with high reliability will allow companies to rapidly design new materials the protect E&HS issues. Process modelling and optimisation will be an integral part of the development and implementation cycle. Coupling process science and engineering with the basic sciences will ensure rapid development, design, and scale up. Method of sampling thousands of variations of chemistries from a library to find candidates for development.
Supply Chain management	Global partnerships with customers, carriers, feedstock suppliers, co-producers, and third party service providers. Structure marketing and distribution operations from a global perspective. The safe and efficient distribution of chemical products will continuously improve thereby generating major benefits to the chemical industry in terms of economic gains, but also environmental gains; chemical companies responsiveness to the changing requirements of their customers will increase. They will be able to support their customer's needs several times faster then in the 1990s. Inventories could be reduced by 50% and handling costs by 20% of what they were in the 1990s.
Information Systems	Individuals will have instant access to information and decision support tools via intelligent, intuitive interfaces regardless their location. Data will be managed as a corporate asset. New data centralization and replication techniques; ERP programs like SAP will determine all processes of the companies' value chain. Security techniques, data compression, transfer and storage will have no limitations. All literature, regulatory information and scientific data will be available on-line. Analysis will be crucial. Tools like neural networks and artificial intelligence can be used in all functions. New tracking systems, computational approaches to design and development.
Manufacturing & operations	Continuous improvement is a way of life. Customers receive a consistent supply of reliable products that satisfy requirements. Cycle time of new products is reduced. Data flow seamlessly along the supply-chain. The three layers of automation-process, plant floor, and supply chain are connected. Capabilities are supported by all parties; plug and play features. Process control is highly automated, as are plant start-up, operation and shutdown. Dynamic simulation based control based on models that can handle more than 100 000 equations. Process clean-outs are automated with monitoring as a routine and frequent part of the process.

Open innovatie business modellen

Business model innovatie:
een totaalperspectief

Open innovatie:
een grensverleggend perspectief





Source: Chesbrough (2003, p. xxv).

“Triple Helix” als draaischijf voor innovatie

- **De “Triple Helix” benadering:**

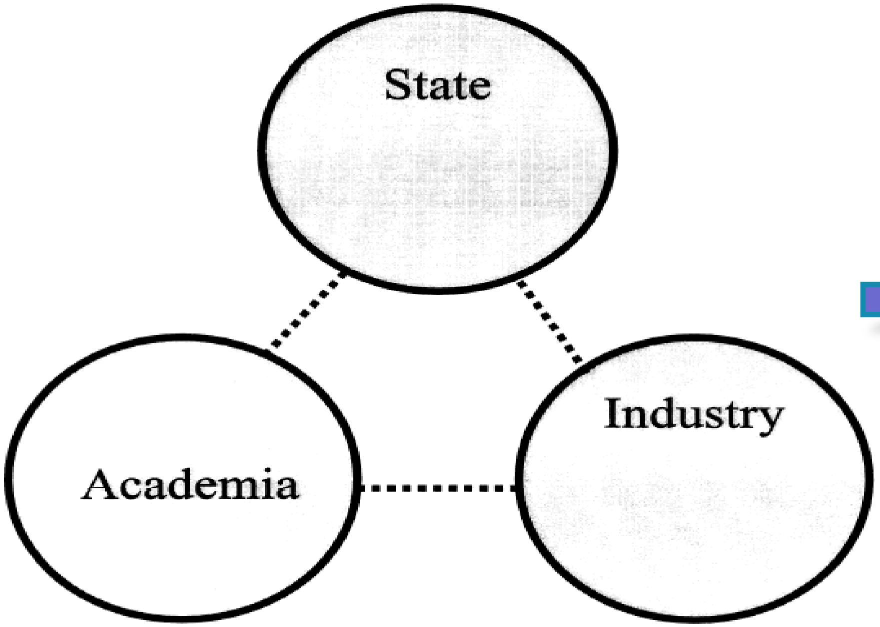


Fig. 2. A “laissez-faire” model of university–industry–government relations.

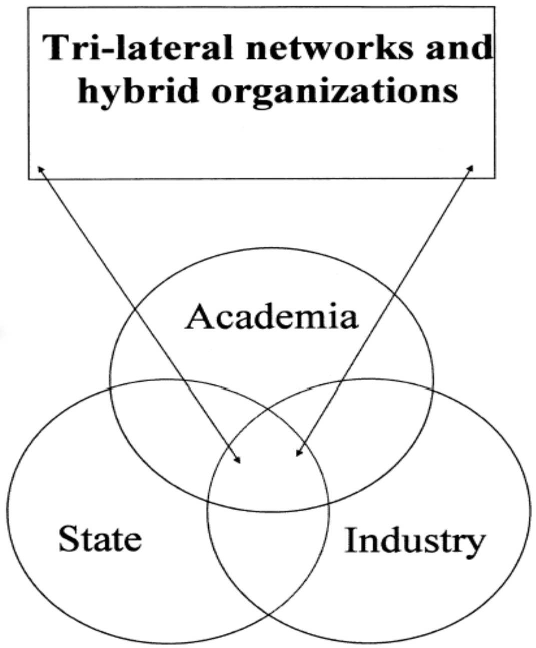


Fig. 3. The Triple Helix Model of University–Industry–Government Relations.

FISCH als motor voor open – & systeeminnovatie

KATHOLIEKE UNIVERSITEIT LEUVEN

- Multipele actoren: markt en maatschappelijke componenten, kennisinstellingen, overheidsagentschappen, bedrijven (groot, klein; al dan niet technologie-intensief)
- Behoeften: economisch & maatschappelijk
- Dwarsverbanden en complementariteit tussen actoren
- Innovatie en complementaire activa, infrastructuur
- Alignment, netwerkdenken en ketendenken
- Aandachtspunten:
  - Technologisch (energie, ecologie, recycling, materialen, duurzame chemie, …), met oog voor convergenties
  - Methodologisch (product/dienstconcepten, procesontwerp & bewaking, roadmap, "groot project")
  - Organisatorisch (organisatie van dwarsverbanden en uitbouw van competentiedomeinen, platformdenken & handelen (FISCH))