Towards Good Practices for IPR & Technology Transfer in Nanotechnology Developments

n2no MARKET

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SEVENTH FRAMEWORK PROGRAMME THEME 4
Nanosciences, Nanotechnologies,
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SEVENTH FRAMEWORK PROGRAMME

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1 Overview

Introduction to Nano2Market

Over the past few years, the field of nanotechnology has evolved considerably, both at research and industry level. Ideas and exploitation abound in this field. Nanotechnology involves molecular manufacturing which in turn implies designing, modeling, fabricating and manipulating materials and devices at atomic scale. As such, the potential of Intellectual Property Rights (IPR) and Technology Transfer (TT) can be applicable to innovative improvement made at any one point of the manufacturing process.

Nanotechnology has potential to add significant value in performance and eventually lower cost to many products across many different sectors. Many different IPR and license agreements cultures can be applied on the nanotech area depending on the type of specific application and results. The project Nano2Market therefore evaluates IPR and TT issues in the field of nanotechnology in order to provide key recommendations on good practices.

The fact that some of the nanotech developments are now at a very early stage is an opportunity to set a framework of IPR culture optimised for the transfer of these technologies. Optimal IPR management can ensure successful exploitation of these technologies once they are ready for exploitation.

Nano2Market therefore takes an innovative approach to looking at IPR opportunity in Nanotechnology by examining value chains, starting from the basic research stage up to the commercialisation of the product. It examines how optimal IPR management can begin from various stages of the development of the technology or products.

Nano2Market Objectives

Nano2Market aims to provide:

- Support to European Research projects in the field of nanotechnologies
- Support to the transfer of knowledge from university to industrial production and the market
- Guidance for implementing or adapting IPR agreements and rules in European research projects
- Support to the exploitation of research results at the earliest possible stage
- Support to good governance in nanotechnology

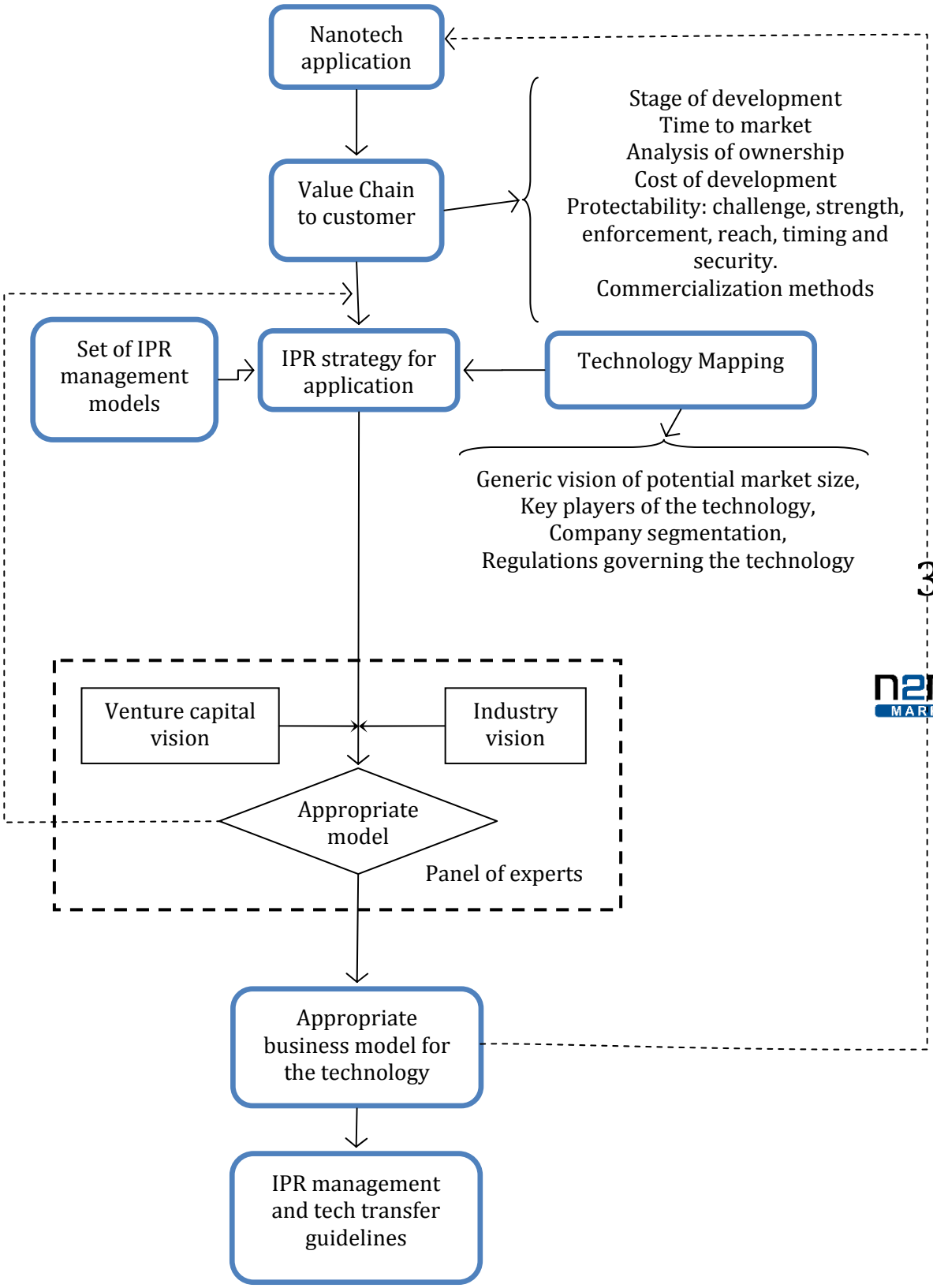

Figure 1.1: The Iterative Nano2Market-Approach.

2 Market

Market Overview & Technological Environment

Individual IPR and TT practices are often heavily influenced by the size of the market the respective technology is planned to be commercialised within, as well as the level to which the technology would disrupt that market.

Nano2Market conducted a thorough Technology Mapping exercise on the following nanotechnology-enabled innovations:

- Energy production and storage Fuel Cells
- Energy production and storage Ultracapacitors - Batteries
- Energy production and storage Organic photovoltaic
- CNT for actuators
- CNT for structural materials
- Nanoparticles for drug delivery
- Biosensors for diagnostics
- Biosample characterisation tools (SPM, NSOM)

The respective technology maps provide (a) a generic market vision of the technology, (b) a list of key-players of the technology, (c) a description of company segmentation, and (d) an introduction to the regulations governing the technology.

Technology Mapping

The Nano2Market Technology Map is based on a search strategy, composed of accurate combinations of key-words, enabling the collation of information related to a specific nanotechnology application. Innovative data-mining techniques were subsequently applied to combine the technology map with an analysis of sector-dependent IP cultures, with a view to identifying underlying clustering and other market conditions influencing IP and TT.

The analysis resulted in an illustration of the evolution in patents and scientific publications (see Figures2.1), as well as an overview and brief introduction to the top companies in the respective technology capability in patents and publications, on both (a) the global level and (b) the European level (see Figure 2.2).

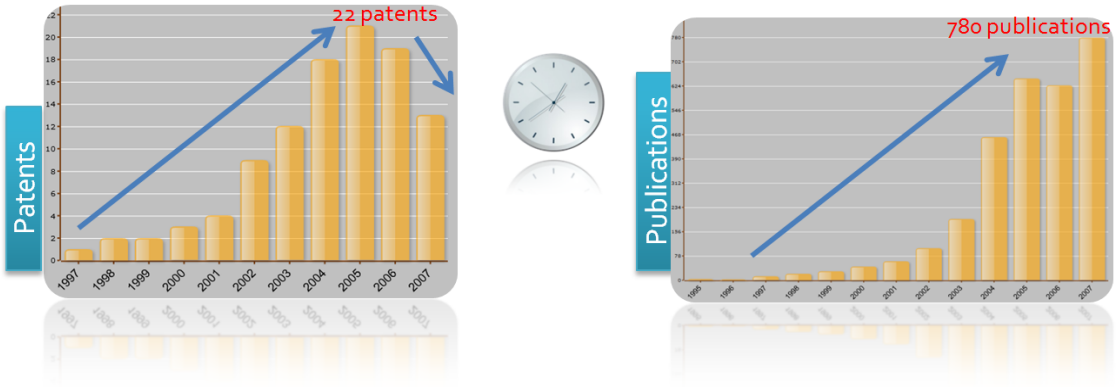

Figure 2.1: Timeline evolution of patent deposits and publication in the case of CNT actuators.

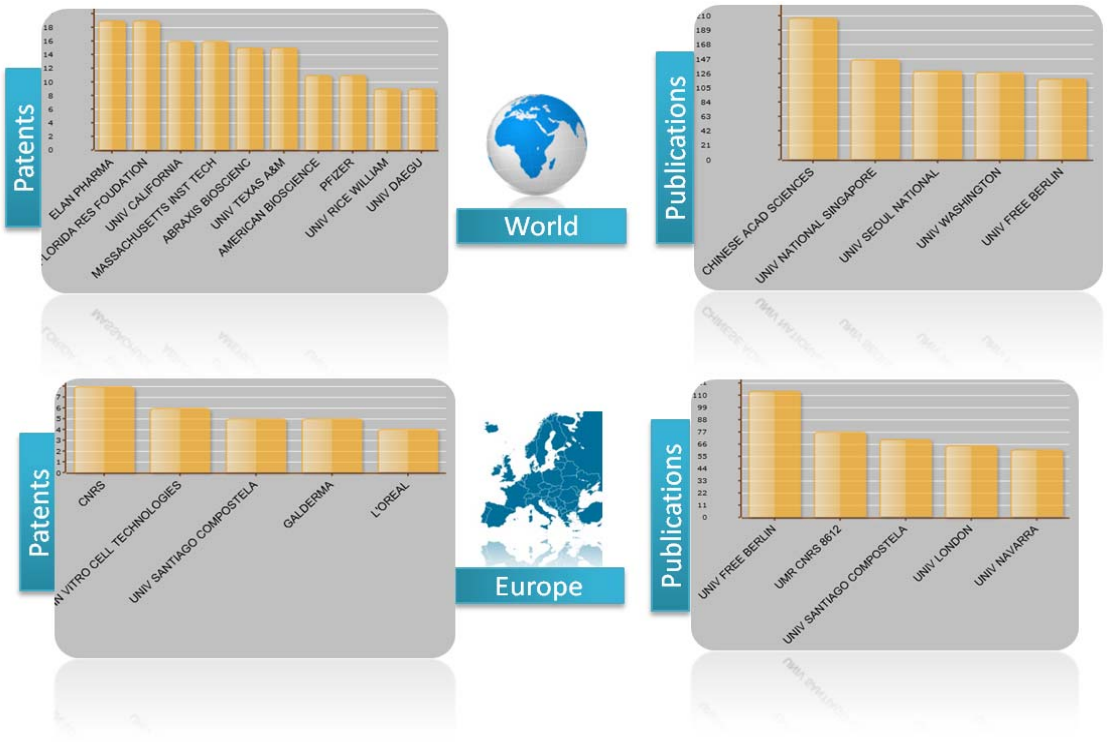

Figure 2.2: Top 10 and 5 of the major actors in patents and publications in the case of nanoparticles for drug delivery.

3 Intellectual Property & Technology Transfer

Good IP and TT Strategies

Even for a specific sector, it is difficult to assert that only one optimal strategy for technology transfer is appropriate. Aspects such as the regulatory framework, standardization, cost vs benefit, converging with bio/IT technologies and its feasibility, etc., can vary greatly from one application to the next, and have to be carefully reviewed and covered. One single breakthrough scientific advance can lead to a manifold of products, each of them to be sold to different markets and consumers, with different barriers to overcome.

Starting from the information compiled in the previous work during the Nano2Market Project (construction of value chains, exploration and analysis of the global patent landscape, IP cultures for the diverse sectors) for the diverse internal case studies, Nano2Market reviewed and captured the high complexity of the technology transfer procedure is to carry out open discussions of the models observed and proposed for each application (see Figure 3.1).

These discussions are framed within an event called the Nano2Market Seminar, in which relevant stakeholders debate these procedures. Here, technology transfer models and IP strategies are validated by a panel of experts, comprising members of the consortium as well as guests specifically identified whose expertise complements that of the consortium. The Nano2Market seminar gathers technology providers (academic research centres and companies generating IP), IPR experts, market analysts, and IP customers, such as companies interested in licensing and venture capital firms. The seminar provides a meeting point and area of convergence and free debate, in which all these points of view are taking into account to agree upon an appropriate IP model for the technology transfer for every case study.

The idea here is to start with examining the key leaders (i.e. those patenting and/or selling nano-based products more successfully) strategies identified in the diverse case studies, and go beyond the most conventional IPR models and discuss the IP management paradigms: patenting vs. trade secret vs. know-how triggered agreements vs. scientific publications, as well as how to manage collaboration and co-filing in order to ensure a smooth transition to the market, and what it is the best schedule for certain

decisions (such as patent extensions, to which regions, etc.). The knowledge of the market and the relationship between developer and end-user was regarded as well as a valuable input to define certain decisions in the innovation cycle.

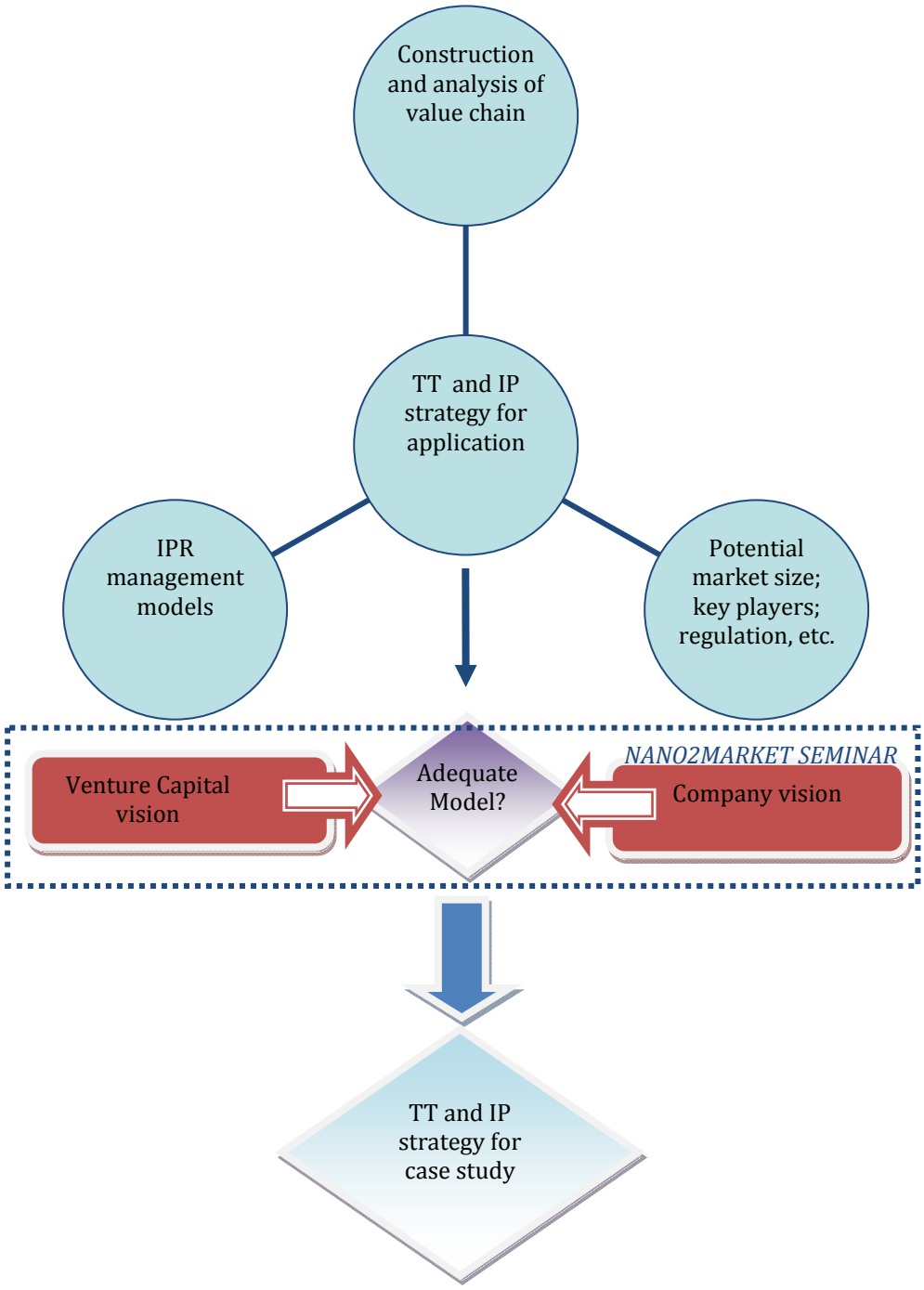

Figure 3.1: Illustration of the Nano2Market approach to identifying IP- and TT-strategies in selected case studies.

4 Value Chains

Nano2Market Case Studies

The cases selected for the Nano2Market value chain analysis are based on the 8 European nanotechnology strategic application areas shown in Figure 4.1.
The relevant cases 1-12 were chosen in order to cover at least one of the 8 relevant strategic areas. This is shown in Figure 4.2 by various background colours, indicating the link of the cases selected to one of the 8 application areas.

The cases are characterized by their development status (from time to market > 10 years up to market entry). Also shown on the y-axis is the assumed complexity of patenting and licensing of various application areas. The complexity covers the more conventional cases (area down right) with classical licensing schemes for material enabled applications up to the top left area where different licensing schemes meet e.g. materials + bio-/pharma + software.

In most of the cases studied a value chain is clearly visible, indicating f.e. that material enabled applications are very similar in the case of classical materials and nanomaterials. It becomes a little bit more fuzzy when bio-nano applications come into play (biosensors, smart scaffolds) and the value chain for software enabled nano-bio-applications is not visible yet.

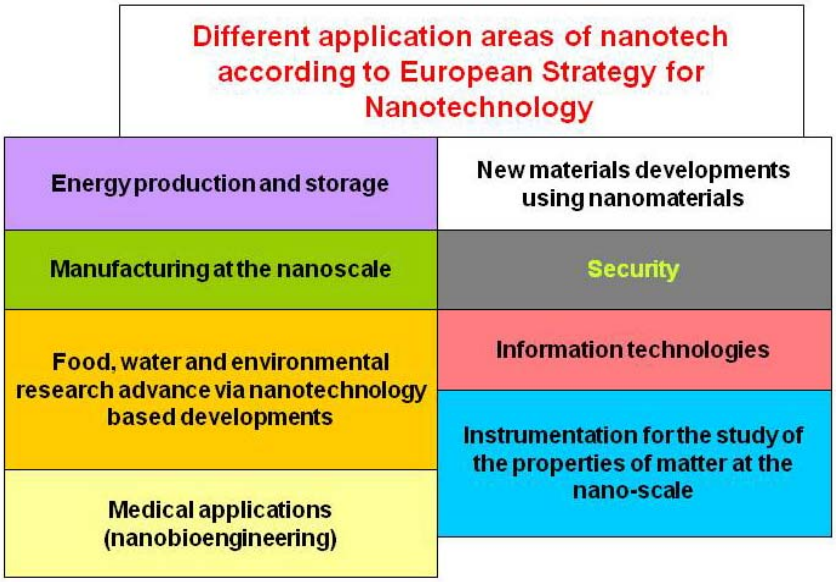

Figure 4.1: Overview nano applications – EU-strategy (2007).

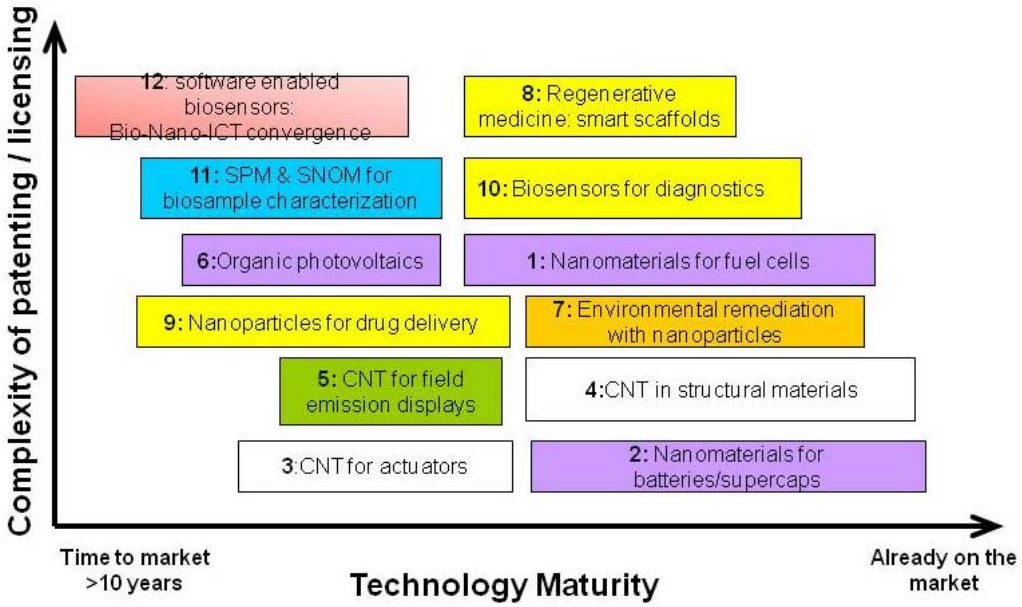

Figure Complexity vs. maturity in 12 selected cases.

The Nanotech Value Chain

Nano2Market industries & case studies

Markets

Electronics — Electronics

- Planar Actuators
- Field Emission Displays
- Electron and Scanning Probe Microscopes

Energy — Energy production & storage

- Nanomaterials for Energy Production & Storage
  - Fuel cells
  - Batteries
  - Organic photovoltaic

Life Sciences — Laboratory Technology, healthcare, diagnostics

- Healthcare
  - Regenerative Medicines
  - Nanoparticles for Drug delivery
  - Magnetoresistive Biosensors for Diagnostics
  - Portable/ Implantable Biosensors
  - CNT Actuator as Artificial Muscle and Bone Replacement
- Biosample Characterization Tools

Materials — Sports, electronics, boats, etc.

- Carbon Nanotubes in Structural Materials

Water & Environment — Water, Environmental, remediation

- Environmental Remediation with Nanoparticles

The five different industries studied by the Nano2Market consortium (electronics, energy, life sciences, materials, and water & environment) cover a broad spectrum of opportunities for nanotechnology developments.

Case studies were performed for each of these industries. These case studies describe both the technology base and also the value chains of these nanotechnology developments.

The place of these nanotechnology developments within the value chain (nanotools, nanomaterials, nanointermediates, or nano-enabled products) (see Figure 4.3), together with the market assessment of the industries, provides entrepreneurs with the necessary information to subtract the added value of their nanotech development. This added value helps entrepreneurs placing themselves in the most profitable place of the value chain, the place with the most opportunities.

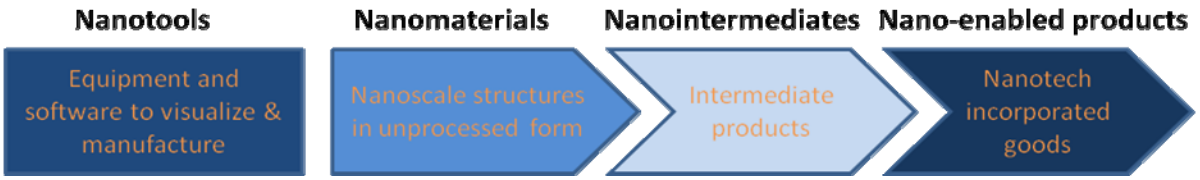

Figure 4.3: Generic nanotechnology value-chain.

5 Business Models

Linking Business Models to Value Chains

The business model spells out how a company is making money based on its value chain position. A business model consists out of several components. These can be brought back to four elements, being the product or offer (value proposition), the customer (market segment, value chain structure), the management & infrastructure or eco system (position in value chain, competitive strategy), and the finances (revenue generation and margins) holding the other 3 elements together. All individual elements should be completely understood by the entrepreneur in order to develop a solid business model and execute this business model in a good way.

Figure 5.1: Generic illustration of a business plan.

Entrepreneurs face several barriers from initial basic research all the way till a commercial application generating revenue. The business model plays a crucial role in overcoming some of these barriers. For instance, the business model holds all necessary information for the regulatory environment of the nanotechnology development. Therefore is also excludes all regulation barriers that might be expected by investors. So the business model makes it possible to circumvent some regulation barriers, very important for high-entry markets and relatively new technologies like nanotechnology. The business model also very clearly shows the market potential of the application, which is also a crucial factor for investors.

6 Best Practices

The Nano2Market Toolbox – Tools for Companies

The Nano2Market toolbox represents all information to design your own business model by explaining all the ingredients of a proper business model. On top, the toolbox explains the importance of business model innovation.

As an illustration of how certain nanotechnology companies and organizations have overcame all barriers on the way from fundamental research till a successful commercially available nanotech application, the toolbox also holds a best practices report. This report illustrates how some nanotech developments have been properly placed onto the market taking in account all aspects studies by the Nano2Market consortium.

7 Investors

Investors' Views on Nanotechnology Developments

During the different developmental stages of a start-up company, several financial funding steps are required. After the dot.com bust and biotech, nanotechnology is seen by many as the 'next big thing'. Nanotechnology clear has the potential to significantly add value to several industries, but because nanotechnology is a relatively new technology platform, investors are cautious when it comes to investing in nanotech. Therefore it is important to also address investor views to all aspects of business development regarded to in Nano2Market.

The Nano2Market Toolbox – Tools for Investors

The Nano2Market toolbox describes the equity life-cycle, and the requirements of gaining capital from business angels, venture capitalists, and corporate venture capitalists. These 3 equity investors have very strict requirements for investing, and not every investor is aware enough of the impact nanotechnology could have on the market they are interested in.

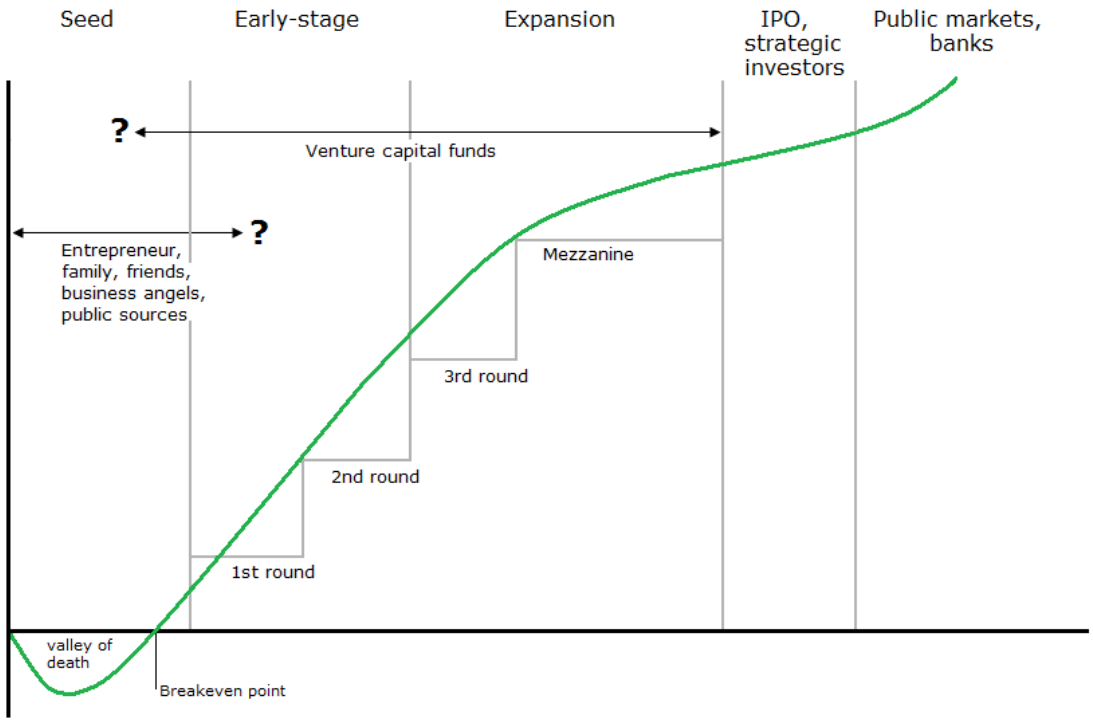

Figure 6.1: Equity life-cycle.

In order to get such capital funding, several financial barriers have to be overcome. Proper intellectual property and technology transfer

management play important roles in overcoming these barriers. These and many more requirements for access to finance are described in the Nano2Market toolbox.

An important requirement for an entrepreneur approaching investors is a solid business plan. The Gate2Growth business plan assessment tool gives feedback on the investor readiness of your business plan. It gives an in-depth analysis for all aspects of your business plan and is much more than just a checklist.

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