ISSN:2321-1156
International Journal of Innovative Research in Technology & Science (IJIRTS)

NANOTECHNOLOGIES: MARKET DYNAMIC AND OPPORTUNITIES

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ABSTRACT: ***The rising demand for fast speed has generated the need for nanotech based systems and technologies, thus driving the growth of the nanotechnology markets. Nanotech finds application in different fields such as medical technology, production technology, lighting components and defense nanotechnics. Nanotechnology has been the greatest impetus to technological and industrial development in the 21st century and has been recognized as the resource for the next industrial revolution. Today, the global Nanotechnology market is estimated to be approximately $350 billion, and the leveraged impact of Nanotech in other enabled industries is substantially greater in terms of turnover and employment levels. This market is expected to grow significantly over the next few years, with the estimated market size approaching $580 billion by 2015. In Nanotechnology markets, companies are in search of early adopters for the developed and manufactured products. Nanotechnology is a fast-growing business sector, with a global market of around $ 380 billion, projected to reach over $ 950 billion by 2020. European Commission (2013a) also adds on that Europe has established a strong position with an overall total share of approximately 18 % ($ 183 billion in 2013).***

Keywords: Nanotechnology Markets*; Technology Transfer; Green Technologies; Competitive Advantage; Strategic Positioning and Market Dynamics.*

Introduction

Nanotechnology as a market has crept into several other major industry topics covered by many applications. The innovation and emerging nanotechnologies have significantly reshaped the manufacturing, biotechnology, environmental and pharmaceutical markets (Yun, 2007; Tseng, 2014). According to European Nano Business Association (2014), in-depth market analysis of these technologies as well as trends, forecasts and profiles of major players indicate how valuable, the growth of nanotechnology has become. Jung and Lee (2014) further argue that efficiency of nanotechnology has led to great discoveries in prescription drug products. Nanotechnology has contributed to a great environmental impact in the areas of water treatment and this has decreased the amount of pollutants that deplete the environment (Mirriarty, 2007; Clark, 2014; Munari and Toschi, 20014). Clark (2014) further asserts that nanotech technologies play an increasingly important role in various markets of the global economy. However, various technical, marketing and other hurdles need to be overcome before Nanotechnology can realize their full potential (Wullweber, 2014). Although Nanotech-enabled technologies are growing rapidly, the shortage of skilled manpower is inhibiting the growth of this field (Munari and Toschi, 2014). The Nanotechnology market has a huge potential as it supports a large number of jobs. In Europe more than 5000 small and medium enterprises and research institutes require skilled manpower for the Nanotech market (Arora et al., 2014). Germany is the leading market after France and UK and it accounts for about 20% of the European Nanotechnology market (Frewer et al., 2014). Satterfield et al., (2009) argue that due to the novelty of production methods, there are very few chemists and engineers in any given organization who have a depth of experience dealing with the particular technical challenges of commercializing nanotechnologies.

Objectives of the Article

(i) To study market trends of nanotechnologies in agribusiness sector
(ii) To study the growth rate in the nanotechnology industry
(iii) To assess the adoption strategies of Nanotechnology industry
(iv) To study the strategic positioning of different players in nanotechnology industry

TRENDS IN THE MARKET TRENDS IN NANOTECHNOLOGY INDUSTRY

The market of Nanotech is under the influence of a number of heavy trends (Frewer et al., 2014). Munari and Toschi (2014) argue that in all markets with technological vocation, these heavy sounded trends are important driving elements to explain the growth of the market of the Nanotech. Clark (2014) argues that nanotechnology is the engineering of functional systems at the molecular scale. It refers to the applied part of Nano science which includes the engineering to control, manipulate and structure the matter at an unimaginably

small scale (Arnaldi and Tyyshenko, 2014; Dai et al., 2014).

Sechi et al., (2014) note that more commercialization is becoming a popular trend in nanotechnology. Over the next several years, significant advances are expected in carbon nanotube manufacturing technology, specifically in controlling the purity and structure, and in reducing costs due to economies of scale (Hull et al., 2013). Nanotechnology is very diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale (Arnaldi and Tyyshenko, 2014; Dai et al., 2014). A more realistic view by Chen et al., (2013) is that Nanotechnology will leave virtually no aspect of life untouched and is expected to be in widespread use by 2020. Mass applications are likely to have great impact particularly in industry, medicine, new computing systems, and sustainability. Stronger materials/higher strength composites are the first trend that is being witnessed in Nanotechnology (Harik, 2014). Nanotechnology is applied in the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, micro fabrication, etc (Arora et al., 2013). In fact, the move toward nanotechnology is a continuation of ongoing miniaturization efforts in many industrial sectors (Arnaldi and Tyyshenko, 2014; Dai et al., 2014).

THE GROWTH RATE OF NANOTECHNOLOGY MARKETS

According to European Commission (2013a), the rise of Nanotechnology industry in the world from a niche activity to a key enabling technology (KET), and to becoming one of the most important industries for the future, shows how Nanotech is on its path to making the 21st century that of Nanotechnology. Today, the global Nanotechnology market is estimated to be approximately $350 billion, and the leveraged impact of Nanotech in other enabled industries is substantially greater in terms of turnover and employment levels (Clark, 2014; Arora et al., 2014). This market is expected to grow significantly over the next few years, with the estimated market size approaching $580 billion by 2015 (European Commission, 2013a; Frewer et al., 2014). In Nanotechnology markets, companies are in search of early adopters for the developed and manufactured products (Fisher and Maricle, 2014). According to SPIE (2014), Nanotechnology is a fast-growing business sector, with a global market of around $ 380 billion, projected to reach over $ 650 billion by 2020. European Commission (2013a) also adds on that Europe has established a strong position with an overall total share of approximately 18 % ($ 183 billion in 2013). For instance, the European Nanotechnology industry employs more than 300 000 people directly, many of these in the over 5,000 Nanotechnology SMEs often structured in national and regional innovation clusters which represent a highly educated workforce (Jung and Lee, 2014; Tseng, 2014). Cheng and Pang (2014) argues that Nanotechnology is a very dynamic and vibrant industrial sector that holds the potential for huge market growth. The expected compound annual growth rate for Nanotechnology over the coming years is 8 %, clearly demonstrating the rapid growth of this key technology sector (Makkonen and Inkinen, 2014; Clark, 2014; Munari and Toschi, 2014).

STRATEGIES FOR ADOPTION OF NANOTECHNOLOGY PRODUCTS

Different players are in the process of establishing internal business units to focus on these specific end markets, who can be new buyers of these products (Arora et al., 2014; Coppola and Verneau, 2014). Their markets teams are focused on their respective markets to ensure that they remain aligned with their customers' changing needs, and anticipate market trends different from the traditional customers (Randhwawa et al., 2014; Fadel et al., 2014). The market for Nanotechnology is highly competitive, with product innovation creating significant swings in market share between the leading handset manufacturers (Munari and Toschi, 2014). This innovation also creates new types of wirelessly enabled devices including tablets, phablets, and wearable technology such as watches and glasses (Cefic, 2009; Wu, 2004; Bonaccorsi and Thoma, 2005). Arora et al., (2014) argue that creation of open innovation centers can help to foster this collaboration. A research by the Canadian Institute for Telecommunications Research (2013) help highlight that Europe and other regional players need to invest in education and science for developing people and their ideas, and this will create a consistent demand from buyers. Education and advanced training of engineers and scientists is required at a high level to increase the level of innovation in optical communication components, sub-systems, systems and networks (Protegerou et al., 2014; Coppola and Verneau, 2014). Current approaches could be beneficially extended to include direct interaction between the stakeholders, such as concertation, consultation and roadmapping for new research and innovation activities, establishing adhoc collaborations between members, and exchanges of people and resources (Protegerou et al., 2014; Arora et al., 2104).

STRATEGIC POSITIONING OF PLAYERS WITH ECONOMIES OF SCALE EFFECT

Positioning with economies of scale effect is an important tool that players in every industry use to gain core competence and competitive advantage (Youtie and Kay, 2014). Different players in nanotechnology markets have developed unique competitive positions that contribute to their overall control within the industry (Arora et al., 2014; Munari and Toschi, 2014). Singh (2014) reports that players in Nanotechnology are trying to position themselves, by betting on the effects of learning the effects of scale as well as large-scale effects. This configuration of economic advantages allows them to obtain a better average cost for the manufacturing and the distribution of their innovation (US Government, 2006; European Commission, 2013a; Dai et al., 2014). Looking at the growth and positioning of Nanotechnology across the regions and nations, a strong shift in market share towards China is apparent, which caught up with Japan, the market leader, achieving a total share of 21 % of the world market (Chen et al., 2013; Chen and Pang, 2014; Tseng, 2014). At the same time, a strong tendency towards regional specialization of the various Nanotechnology markets could be seen (Zhang, 2014; Jordan et al., 2014). Whilst the medical technology & life sciences and the more production oriented markets tend to have their focus in more mature industrial regions, such as Germany, North America and Japan, the markets more related to information and communications have their focus in those Asian countries with developing industries, primarily China and South Korea, but also Taiwan and Malaysia (Butter, Leis, Sandtke, McLean, Linclin, and Wilson, 2011; Chen et al., 2013; Sechi et al., 2014).

DISCUSSION

Based on, the findings of industry trends and dynamics and literature review arguments, it remains relative that Nanotechnology technologies and practitioners should adopt different strategic practices in their market strategies so as to become strategically positioned (Harik, 2014; Ross et al., 2014). This will also create a sustained competitiveness within the industry. Reports from European Commission (2013a) indicate that Nanotechnology industry and market will be influenced by many different kinds of societal and economic factors, for instance, the ongoing globalization and population ageing, or changing the workforce and consumer demand. Both factors lie outside Nanotechnology industry, but have a crucial impact (Protegerou et al., 2014). The dynamic of the market of the optics and Nanotechnology indicate that the industry is under the influence of a number of heavy trends (Fadel et al., 2014). The growth of the market of the Nanotechnology being is largely understandable by the rate of adoption of the buyers in search of technology solutions (Arlnaldi, 2014). Nanotechnology is believed by many to be one of the most promising areas of technological development and among the most likely to deliver substantial economic and societal benefits to the world in the 21st century (Tseng, 2014; Fisher and Maricle, 2014). With so much potentially at stake, a global competition has emerged among nations and companies to develop and capture the value of nanotechnology products (Wullweber, 2014). As Clark (2014) asserts, an assessments of competitive strength generally rely on indicators such as revenues, market share, and trade.

The competitive and positioning advantages can be attained through proper study of market trends, market dynamics and the eventual formulation of effective market strategies, as highlighted by the research model in the appendix section. With regards to market trends, technology and market trends significantly affect network architectures, economies of scale and direct systems cost, ultimately influencing the overall future performance and price of nanotechnological products (Shapira and Wang, 2009; Sech et al., 2014; Arlnaldi, 2014).

Conclusion

The growth of the global Nanotechnology industry is expected to accelerate. The recent dramatic expansion of the optical telecommunications markets is only one aspect of this.

The inherent pervasiveness of Nanotechnology and its interdisciplinary nature require the broad involvement of many value chain partners, both as directly cooperating partners for R, D&I; and as potential end-users (Obraztosv, 2004).

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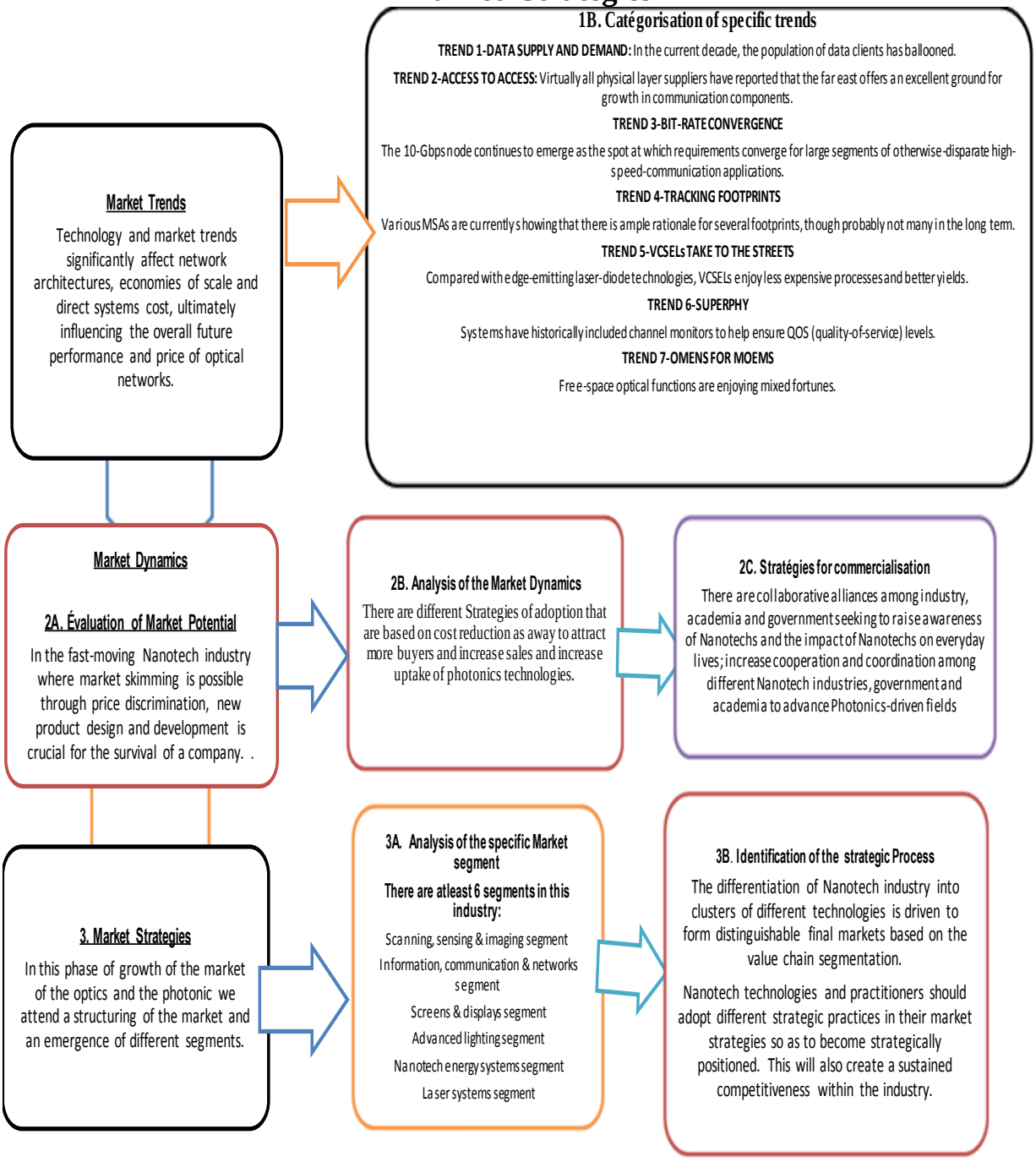
Figure on the model summary of the research

The Nanotech Industry: The Structuring of the Market and Competitive market Strategies



A model for the Plan of action in Nanotechnology industry

Biography

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Vincent Sabourin is a full professor of strategy and international business at the School of sciences of management of University of Quebec in Montreal for 23 years where he teaches at various level of executive MBA. He was the founding director of the department of strategy and social and member responsibility representing directors of departments to the committee of university studies. He was also one of 25 Canadian experts selected within the framework of a doctoral thesis concerning the strategic planning to HEC Montréal. Correspondence: UQAM, ESG School of Management, 315 east St-Catherine Montreal Qc. Canada H3C 4P2. Suggestions are welcome: sabourin.vincent@uqam.ca

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Acknowledgement

The authors wish to thank Festus Memba, for his support with this research. The article received the financial support from the Institute for strategic skills, a nonprofit organization dedicated to research and transfer