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Neuromarketing Technology Assessment (NTA) - A Postmodern Paradigm

Alireza Mamaghani and Gang Zong

School of Economics and Management, Beijing University of Technology (BJUT), Beijing, China

ARTICLE INFO

Article history:

Received 11 October 2013

Received in revised form 20

November 2013

Accepted 23 December 2013

Available online 25 February 2014

Keywords:

Technology Assessment,

Postmodern Philosophies of

Technology Assessment,

Neuromarketing, Neuromarketing

Technology Assessment.

ABSTRACT

Background: The issue of Technology Assessment (TA) has been transcended by larger questions concerning governance in the 21st century. **Objective:** The main aims of this paper is representing of Postmodern Philosophies of TA and give new methods for evaluation of technologies by neuromarketing Paradigm. Analytical of axiology of Technology assessment by Neuromarketing researches is a modern and meta-technological assessment. Meanwhile, it can identify key affective factors on customer preference. **Results:** So strategic managers in companies can revise TA roadmap by marketing information and target customers brain reacts. **Conclusion:** The conceptual model of Neuromarketing Technology Assessment (NTA) for the first time is represented in this paper, this model not only will be able to develop capacities and valuable resources to create focal strategies, but it can synchronize with modern technologies regarding to customer needs.

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To Cite This Article: Alireza Mamaghani and Gang Zong., Neuromarketing Technology Assessment (NTA) - A Postmodern Paradigm. *J. Appl. Sci. & Agric.*, 8(7): 1241-1247, 2013

INTRODUCTION

According to NASA technology plan, Technology is defined as the practical application of knowledge to create the capability to do something entirely new or in an entirely new way. This can be contrasted to scientific research, which encompasses the discovery of new knowledge from which new technology is derived, and engineering which uses technology derived from this knowledge to solve specific technical problems."

The impact of technology as a source of competitive advantage for manufacturing industries is widely accepted by practitioners, governments and academics. Much of the effort since about 1980 in the area of technology management has been directed towards strategic issues (Drejer, 1997). how to integrate technology strategies with marketing and other corporate strategies.

In order to realize this competitive advantage, it is vital to understand both the specific technologies, and the ways in which organizations can best manage technology.

Technical components consist of resources, materials, tools, machines, energy, power, and information. Social components consist of human elements including work skills, intellectual processes, occupations, environmental relationships, and organization and management of technical systems. Social components include social systems, ideological systems, and ecological systems. In the below Figure, the evolution and relationship of technological systems and social purpose (Devore, 1980):

Technology transfer can be defined as the "(international) transfer of systematic knowledge for the manufacture of product, for the application of a process, or for the rendering of a service" (UNCTAD, 1979). Technology transfer can be effected in many ways, ranging from turnkey operations to direct technology-licensing agreements, joint ventures, and direct foreign investment; (1) improved product and service quality and reduced prices, resulting in greater domestic and international competitiveness; (2) diversification into new products or markets, resulting in expanded business activity; and (3) "learning by doing", resulting from cooperation with technologically advanced foreign firms (Calantone, lee, & Gross, 1988), (Phillips, Calatone, & Lee, 1994).

Technology Assessment (TA):

The technology life-cycle (TLC) describes the commercial gain of a product through the expense of research and development phase, and the financial return during its "vital life". Some technologies, such as steel, paper or cement manufacturing, have a long lifespan (with minor variations in technology incorporated with time) whilst in other cases, such as electronic or pharmaceutical products, the lifespan may be quite short (Achilladelis, 1993).

Corresponding Author: Alireza Mamaghani, School of Economics and Management, Beijing University of Technology (BJUT), Beijing, China.
E-mail: ar.mamaghani@gmail.com

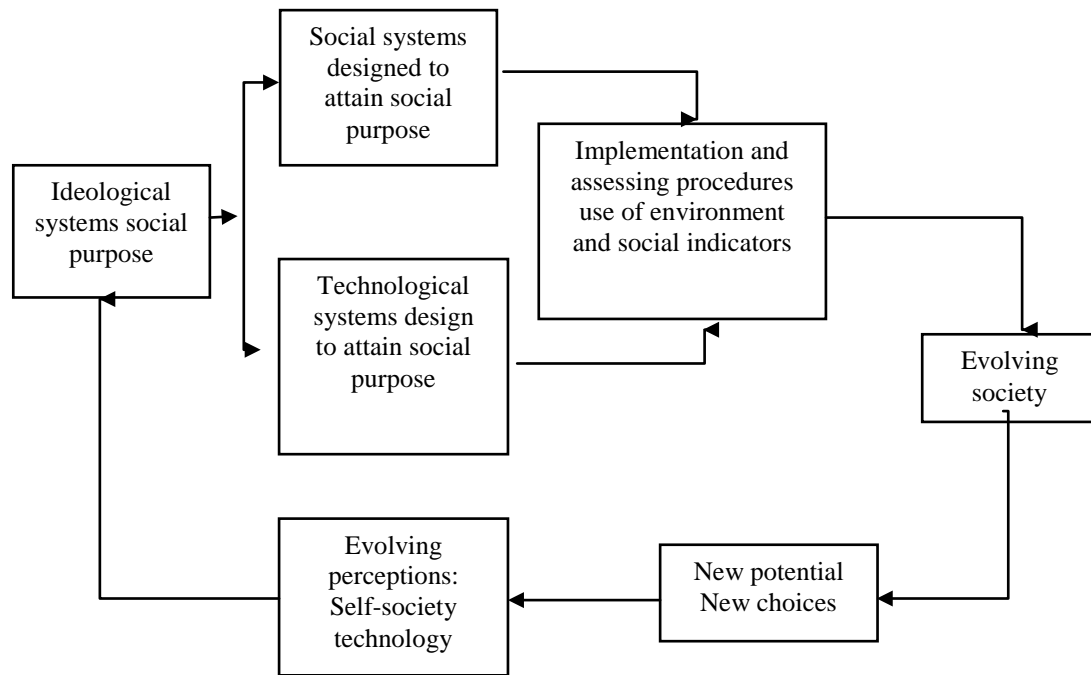


Fig. 1: Evolution and relationship of technological systems and social purpose.

The TLC associated with a product or technological service is different from product life-cycle (PLC) deal with in product life-cycle management. The latter is concerned with the life of a product in the marketplace with respect to timing of introduction, marketing measures, and business costs. The *technology* underlying the product (for example, that of a uniquely flavored tea) may be quite marginal but the process of creating and managing its life as a branded product will be very different. The technology life cycle is concerned with the time and cost of developing the technology, the timeline of recovering cost, and modes of making the technology yield a profit proportionate to the costs and risks involved. The four stages of technology life cycle are as follows (Ansari & Mamaghani, 2011, pp. 180-191):

A) Innovation stage:

This stage represents the birth of a new product, material or process resulting from R&D activities. In R&D laboratories, new ideas are generated depending on gaining needs and knowledge factors. Depending on the resource allocation and also the change element, the time taken in the innovation stage as well as in the subsequent stages varies widely.

B) Syndication stage:

This stage represents the demonstration and commercialization of a new technology, such as, product, material or process with potential for immediate utilization. Many innovations are put on hold in R&D laboratories. Only a very small percentage of these are commercialized. Commercialization of research outcomes depends on technical as well non-technical, mostly economic factors.

C) Diffusion stage:

This represents the market penetration of a new technology through acceptance of the innovation, by potential users of the technology. But supply and demand side factors jointly influence the rate of diffusion.

D) Substitution stage:

This last stage represents the decline in the use and eventual extension of a technology, due to replacement by another technology. Many technical and non-technical factors influence the rate of substitution. The time taken in the substitution stage depends on the market dynamics.

The aim of Technology Assessment is to inform decision makers, to provide an early warning signal for unintended consequences, to prepare stakeholders for possible technological changes, or to facilitate the participation of stakeholders in decision making (Smits & Leyten, 1988). More recently, stakeholder participation and feedback loops have been emphasized as important for the technological construction process. Technology Assessment, giving an integrated picture of the consequences of the introduction of a new technology is crucial for development. TA is done to assure technical validity, economic viability, political

feasibility and environmental and social acceptability of the technology transfer process (Chen & Sun, 2000). The technology should be controlled and maintained by properly trained operators. Meanwhile, there should be experts and manage to adapt the technology for new demands, or the availability of new and improved components. This is an important element of TA. If this is done properly, long term costs of technology transfer might be prevented by developing the ability to improve, adapt, replicate or even re-sell the technology.

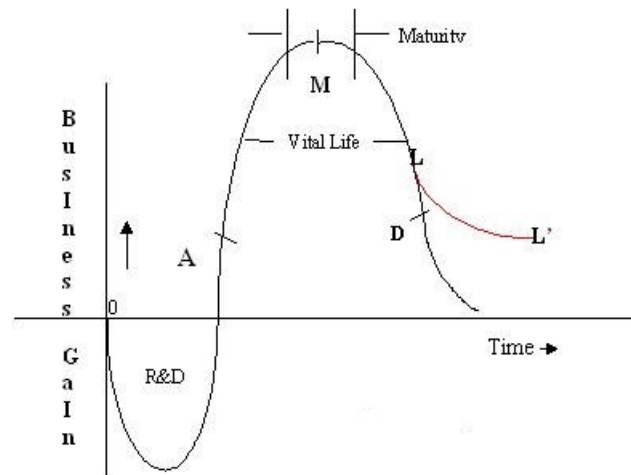


Fig. 2: Technology life cycle path.

Postmodern Philosophies of Technology Assessment:

The aim of philosophy remains what it was in Ancient Greece, namely somehow to describe how all knowledge fits into a system, into a permanently open system because knowledge from the different sciences and technologies continues to increase and changes with time (Ansari & Mamaghani, 2011, p. 120). Since some philosophers have blame technology for (all) the problems our society has to face, we need to take a look at the evaluation of technology, and, in particular, at the so-called 'technology assessment (TA) philosophy.

The intrinsic cultural value of technology is often neglected by those who esteem it for its practical exploits. This is mistaken, because technology, though oriented to practical efficiency and usefulness, cannot be confused with its misuses and abuses. (In fact, the clarifying and stressing of this distinction is one of the goals of this work). at least as it is practiced by most academic philosophers — in as much as they are concerned with pseudo problems or repeating old texts in the search for the total and unchangeable truth—, it has nothing of real importance to say to our atomic age (Schilpp, 1961, p. 254).

If there was a time when “philosophy not merely did have something to say, but said it so emphatically that it cost Socrates his life, Spinoza his religious affiliation, and Kant his right to write and publish” (Schilpp, 1961, p. 239). present-day philosophy, the “love of wisdom”, has become a (well paid) job in the so-called First World, and an ideological tool in the Second, while problems grow bigger and bigger (not only in the so-called Third World) and the international relations between the two superpowers are even worse than after World War II.

Present-day, Technology assessment is more of an academic concern than a practical and effective tool for decision making. TA's philosophy is developed in three main terms of Epistemology, Ontology and Axiology. It is important to develop a body of knowledge on TA including methodology, procedure and applications. Because TA may be too costly, controversial, vague, and academic, it is also important to develop realistic indicators for the different impacts of technology and their evaluation. In this sense, Carpenter (Carpenter, 1977, pp. 44, 574-593) sees some unresolved philosophical issues in TA along the following lines:

Epistemology of TA:

Epistemology, and epistemological inquiries, have a long history, arching from superstition toward what Gurvitch called the “social frameworks of knowledge. Technology has always been present as an essential component of how we think, and what we teach. When the technology changes, as it is now, its role becomes all the more evident. Colleges continue to push writing as the skill students must have to be articulate thinkers. Yet they risk stagnation in an epistemological eddy if they do not also appreciate digital video production, database programming, or even the underlying functionality of MediaWiki, (Mediawiki, 2013) as necessary for developing the cognitive abilities to create and share knowledge (Trans & Margaret, 1971, p. 75).

Ontology of TA:

Work on ontology content evaluation started in 1994. In the last two years, the ontological engineering community's interest in this issue has grown and extended to the evaluation of technology used to build ontologies. Ontology technology is an evaluation's main underlying idea. Because ontology technology is maturing and should soon be ready for industry, we must evaluate and benchmark it to ensure a smooth transference. The evaluation should consider several factors including interoperability, scalability, navigability, and usability. Ontologies have task-dependent and static natures, and most are created by people with a limited perspective on possible alternative conceptualizations. Ontology researchers should focus on semiautomatic text-analysis-based updating, enriching, filtering, and evaluation of ontologies (Gómez-Pérez.A, 2004)

Axiology of TA:

One of the important issue in technology's philosophy is axiology, the axiology or value theory is the branch of philosophy concerned with the nature of values, their origin (biological, social) and their impact on human action, technoaxiology can be conceived as the study of the valuations performed by technologists in the course of their profession (Félix & Arbulu, 2011). Axiology and the Hierarchy of Value also reveal the structure or blueprint for designing and creating maximum organizational performance. Actually, axiology is the study of Value, values and value judgments. Formal (scientific) axiology provide key insights and tools on two levels: (1) the *objective* structure of value in nature (how "it" works) and (2) the *subjective* value team of TA practitioners and judgments people make that lead to their choices, actions, and reactions (Demarest & Harvey, 2013). We can try to expand axiology of technology for assessing technology instead of customer wants. Neuromarketing can be represent a conceptual paradigm to technology assessing for identifying key factors include in management of technology which is managers should be implement in their judgments and assessments.

Methodology of Conceptual Research Model:

Knowledge about markets comes from a wide variety of sources: legislation, patents, copyrights, reports, proceedings and trade journals, competitor products, statistical data, and through surveys and interviews with customers and users (Pugh, 1991: 29-43). An Appropriate Technology (AT) is one which is designed to optimally satisfy demands by taking into account the economic and social situation of its users, and the natural environment of its operation. In comparison with conventional technologies, AT is affordable by a large number of users, decreases social inequalities, and creates environmental sustainability.

The following quote from Wikipedia explains well what Neuro-Marketing is: "Neuromarketing is a new field of marketing which uses medical technologies such as functional Magnetic Resonance Imaging (fMRI), and Electroencephalography (EEG) to study the brain's responses to marketing stimuli (wikipedia, 2013). For the first time word of "neuromarketing" was coined by Ale Smidts in 2002 (Lewis & Darren , 2005). Researchers use the fMRI to measure changes in activity in parts of the brain, or EEG to measure activity in specific regional spectra of the brain response, to learn why consumers make the decisions they do, and what part of the brain is telling them to do it. Marketing researchers use neuromarketing to better measure a consumer's preference, as the verbal response given to the question "do you like this product? "May not always be the true answer. This knowledge will help marketers create products and services designed more effectively and marketing campaigns focused more on the brain's response. Technical or industrial innovation is used to describe a new breakthrough in a process or production technique or a novel product and it is used widely by economists (Roebuck, 2012) .

Lunching products to market is the process of transforming customers' needs into saleable products. The customers can be people, institutions or other companies. The needs of customers are often multiple and complex. The aim of this process is to produce products which are suited to the needs of their users and to avoid the costly mistake of designing a product for which there is no demand. Establishing the needs of customers is the most difficult aspect of market led design, since customers do not always know what they want (Vecchiato, Maglione, & Wei, 2012).

Axiogenics is the technology of *applied* neuro-axiology: the neuro-axiological principles and practices that allow us to generate greater value in our daily lives. Axiogenics is not some rehashed mystical, moral, or religious philosophy, nor is it a newfangled twist on the rhetoric of so-called "success gurus." It is a fresh, new paradigm for personal, leadership and organizational development. It is a science-driven, strengths-focused technology for deliberately unleashing human potential and creating positive changes in how we think, how we perceive, the kinds of choices we make, and the actions we take. Many human sciences, including neuroscience and axiology, have come to the realization that the mind-brain is, in fact, value-perception/judgment driven. That is, value, values, and value judgments drive many, if not most or even all, of the processes of both the brain and the mind, including our sub-conscious habits of mind.

The research integrates elements from psychology, sociology, anthropology, economics, and marketing, and more recently also from neurosciences. The goal is to understand consumer decision-making processes, both from individuals and from groups (e.g., families). Understanding consumer behavior is relevant for management, because it enables decision makers from different institutions (i.e., managers in companies, public policy makers, etc.) to effect informed decisions and develop strategies that maximize both consumer welfare and well-being, and the institution's profitability (Demarest & Harvey, 2011).

The general assumption is that human brain activity can provide marketers with information not obtainable via conventional marketing research methods (e.g., interviews, questionnaires, focus groups) (Ariely & Berns, 2012). This is mainly driven by the fact that people cannot (or do not want to) fully explain their preferences when explicitly asked; as human behavior can be (and is) driven by processes operating below the level of conscious awareness (Calvert & Brammer, 2012). In such cases, the effectiveness of the different marketing strategies may be evaluated by monitoring brain activity resulting from consumers observing different advertisements and products. For example, the effectiveness of the different marketing strategies may be evaluated by monitoring brain activity resulting from consumers observing different advertisements and products. The change in the human brain signal, denoted as Electroencephalogram (EEG), and its main spectral bands of Delta (0–4 Hz), Theta (3–7 Hz), Alpha (8–12 Hz), Beta (13–30 Hz), and Gamma (30–40 Hz) is observed to examine consumers' cognitive or affective processes in response to prefabricated marketing (Khushaba & *et al.*, 2013). The effective method of evaluation a customer wants is marketing mix (or Ps) of products. Marketing mix is not a scientific theory, but merely a conceptual framework that identifies the principal decision making managers make in configuring their offerings to suit consumers' needs which was represented by McCarthy in 1964 (Chong, 2003). The tools can be used to develop both long-term strategies and short-term tactical programs (Palmer, 2004). The early marketing concept in a similar way to the notion of the marketing mix, based on the idea of action parameters presented in 1930s by Stackelberg (1939). Rasmussen (1955) then developed what became known as parameter theory. He proposes that the four determinants of competition and sales are price, quality, service and advertising (Chai, 2009). Mickwitz (1959) applies this theory to the Product Life Cycle Concept. Borden's original marketing mix had a set of 12 elements namely: product planning; pricing; branding; channels of distribution; personal selling; advertising; promotions; packaging; display; servicing; physical handling; and fact finding and analysis (Mickwitz, 1995). Frey 1961 suggests that marketing variables should be divided into two parts: the offering (product, packaging, brand, price and service) and the methods and tools (distribution channels, personal selling, advertising, sales promotion and publicity) (Frey, 1961). Möller (2006) presents an up-to-date picture of the current standing in the debate around the Mix as marketing paradigm and predominant marketing management tool by reviewing academic views from five marketing management sub-disciplines (consumer marketing, relationship marketing, services marketing, retail marketing and industrial marketing) and an emerging marketing (E-Commerce) (Möller, 2006). Regarding to marketing researches all items is shown in figure no. 3, are affected on customer brain reaction are important in neuromarketing framework.

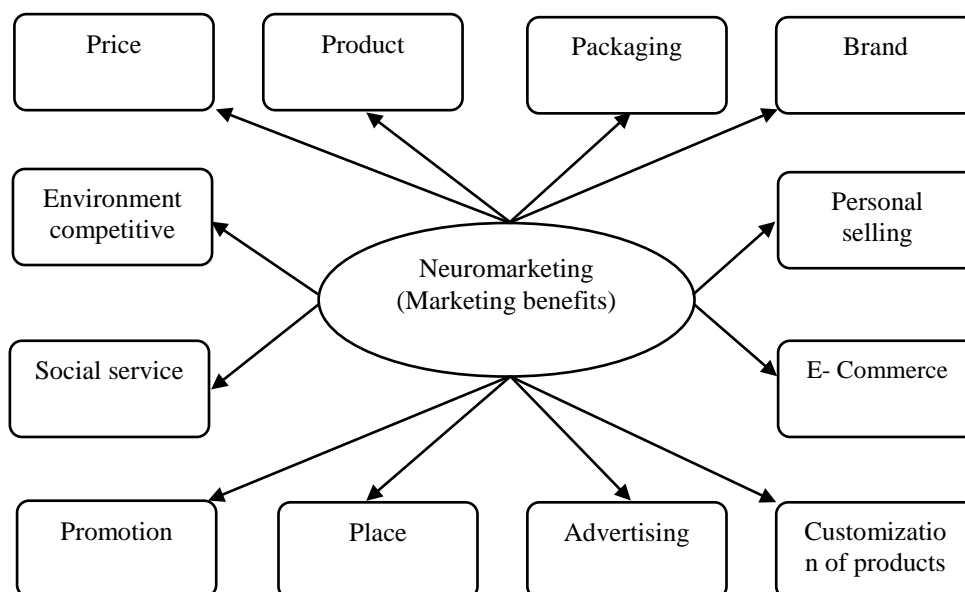


Fig. 3: Key importance factor on neuromarketing.

Due to the special technologies, needed and high costs involved only a few companies and universities, are able to run such complex researches. Additionally, to interpret data requires high skilled professionals and researchers from in different fields such as; neurologists, psychologists, economist and software engineering. Therefore, conceptual model for TA Regarding to postmodern neuromarketing concepts with identifying product Ps and Analytical of axiology's Technology assessment. Neuromarketing Technology Assessment mixes (NTA) with products and service mixes can represent a cognitive conceptual model for TA. In NTA model, we have to represent synchronic items effected in production and technology area. Some items are importance in marketing field and some of them are shown in the figure4.

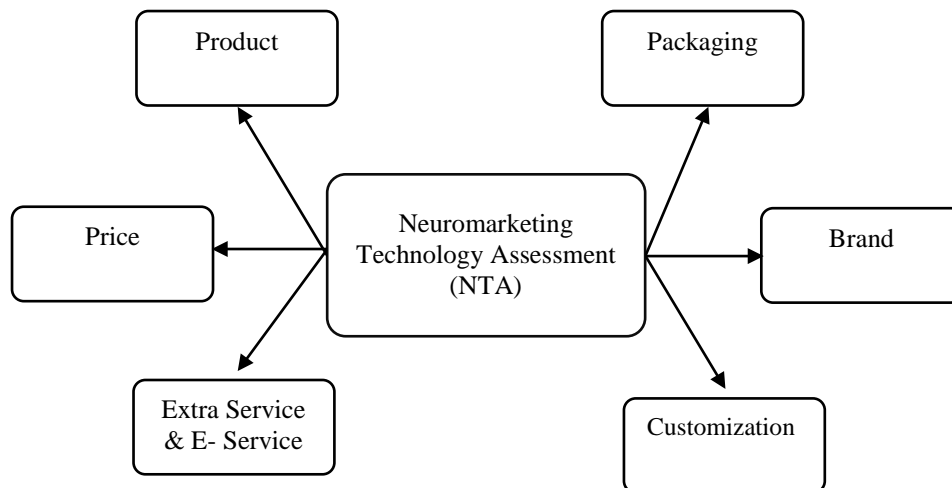


Fig. 4: Neuromarketing Technology Assessment mixes (NTA) model.

Regarding to customer behavior, NTA model and axiology of TA literature, managers or experts should research about six terms in revising of technology assessment process. This model gives classification scheme on the production TA. Strategic mans can synchronize number of products in production lines for managing fix costs and matched them by customer reaction price in target markets.

The quality and quantity of products are important in brand equity and brand extension too. Moreover, color, style of label, packing shape are the main items that should revise in technology road map. Technology of production in modern products or industrial goods has any capability to answer different customers' needs. So we should have a strategic prospective for technology feedbacks in companies. Therefore, implementation technology roadmaps by customer wants and providing good service can enhance acceptable satisfaction among customers in rival markets.

Discussion and Conclusion:

Studies using neuromarketing methodologies provide insight into real-time consumer response to a specific stimulus. Neuromarketing researchers need to do much more work into theory development and testing in order to move forward. From the methodology perspective the qualitative method is used more often than the quantitative one because of the complexity and high costs of this type of research. Sometimes only qualitative methods are not enough to bring with it accurate results and strong arguments. Future interested researchers should pay attention to both the qualitative and qualitative studies and explore data from a higher number of subjects. Marketing researches show that, lack of local research results in a small body of information to be compared with studies done in other countries and cultural aspects that could differentiate consumer behavior. In this paper we prefer represent a postmodern Analytical model for Technology assessment in base of axiology. So adaptation of technology instead of neuromarketing researches can develop real competitive advantage of products regarding to customer preference and increase product life cycle and technology life cycle with the optimum risks. Neuromarketing Technology Assessment mixes (NTA) can try to join product and service mixes together and represent a conceptual model for axiology of technology assessing.

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