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Table of Contents

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Analysing E-Services and Mobile Applications with Companied Conjoint Analysis and fMRI Technique

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ABSTRACT

Previous research has shown that neuromarketing and conjoint analysis have been used in many areas of consumer research, and to provide for further understanding of consumer behaviour. Together these two methods may reveal more information about hidden desires, expectations and restrains of consumers' brain. This paper attempts to examine these two research methods together as a companied analysis. More specifically this study utilizes fMRI and conjoint analysis as a tool for analysing consumer's preferences and decision making in e-health and ITC products. This paper provides theoretical background with short history of conjoint analysis and contributions for the audience of consumer research: 1. how conjoint evaluation models works; 2. different conjoint models; 3. counting attribute interactions in conjoint analysis; and 4. brain activation triggers in fMRI and connection to conjoint analysis. Researchers of consumer behaviour may learn a new method for understanding user´s preferences and decision making from e-services and mobile applications. E-services and mobile applications need to be successfully analysed for various marketing segments of new products. An application might appeal well to consumer, but what is known about the attributes that makes consumer act? The customer might orally request other than her brain will inform. Needs could be derived from product parts or attribute bundles of mobile applications. The knowledge will help the producer to target new applications to relevant marketing segments.

Keywords: *Blood Oxygen Level Dependent (BOLD), Buying Behaviour, Conjoint Analysis, fMRI, Neuromarketing*

INTRODUCTION

Neuromarketing aids in discovering desires, expectations and hidden restrains regarding consumers' choices, by applying the technology of medical imaginery. Neuromarketing originates from neurosciences, with an objective to understand the functioning of the human mind. On the contrary neuroeconomy and neurofinances focus on the decision making processes of the

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economic agents and particularly in the study of the role and the emotions and the knowledge. These branches are connected to economy and behavioural finances (Boricean, 2009). In this article we are going to link neuromarketing with one of its method, namely functional magnetic resonance imaging (fMRI) with conjoint analysis.

Using Finn's (1985) terminology, benefit refers to an individuals' estimation of the amount of utility which will be supplied by a particular product. The amount of attribute depends on the individuals' prior product experience, the ability to estimate the desirability of different aspects of the new product, and on declining marginal utility. In addition, imagery which depends on society's association with the product and is a function of price, place and promotions, also influences the amount of benefit. By obtaining, preparing, using, and disposing products, consumers have developed a frame of reference for evaluating the benefits of new products, like new e-health applications. According to Reynolds and Gutmann (1984), consumers are capable of inferring both the functional and psychophysical consequences of particular product-attributes (Bont, 1992), such as mobile applications' software or the physical product.

CONSUMER PERSPECTIVE

The Attractiveness of a Product

The attractiveness of a product for a consumer, or how much utility it supplies, depends on its constituent attributes. To supply the maximum amount of utility to the consumers, one is advised to construct a product which is as possible to the optimal combination of attributes (De Bont, 1992). Gestalt principles aim to formulate the regularities according to which the perceptual input is organized into unitary forms, also referred to as sub-wholes, groups, groupings, or Gestalten (the plural form of Gestalt). These principles mainly apply to vision, but there are also analogous aspects in auditory and somatosensory perception. In visual perception, such forms are the regions of the visual field whose portions are perceived as grouped or joined together, and are thus segregated from the rest of the visual field (Todorovic, 2008). Gestalt principles are well known in neuromarketing and in fMRI studies.

The gestaltists tended to favour the notion that these principles are among the fundamental properties of the perceptual system, providing the basis of our ability to make sense of the sensory signals. An opposed view is that the Gestalt principles are heuristics derived from some general features of the external world, based on our experience with things and their properties (Blake & Rock, 1975). There is a connection between gestaltists principles from neuromarketers and fMRi studies but also Lancaster's (1966) bundle of attributes from conjoint analysis. With combining conjoint analysis and fMRI it is possible to study products as a whole and with its sub-wholes in same time. With e-health applications sub-wholes could be consuming time, colours, figures, voices, pictures etc. which will closely show principles of these scenes seen on mobile applications.

According to Finn (1985, p.37): "For the prediction to have value, the stimulus presented at the time of the concept test must convey to the subjects the same meaning that they would extract from a marketplace exposure to the product at a later time of launch." Product concepts should be presented as realistically as possible. When consumers are confronted with concepts containing only limited product information, they may face major difficulties in evaluating the specific product concepts (De Bont, 1992, 20). Triesscheijn (1982) states that sometimes consumers lack abilities to imagine how the new product will appear. The detection of specific poorly fulfilled needs can be the basis for a program of requirements for the new product (Roozenburg & Eekels, 1991) or for the new application. Crawford and Benedetto (2010) asserts as a major weakness of concept testing that, because of the fact that product information is ambiguous, there are numerous opportunities for misunderstanding.

Evaluation of the Benefits to Customers

Although prospective buyers are the most appropriate respondents in a product test (De Jonge & Oppejdijk van Veen, 1982) by definition, prospective buyers are already anticipating the purchase of a given product. This is not always true for potential buyers (Bont, 1992). The segmentation of respondents can provide greater predictive validity. However, Green and Krieger (1991) report poor results for prespecified segments.

In consumers' evaluating of attribute-profiles it is best to restrict the attribute-level information to a maximum of 5 to 6 attributes (De Bont, 1992; Green & Srinivasan, 1978). Studies by Scott and Wright (1976) and by Cattin and Weinberger (1980) showed that the number of attributes (6 versus 9) was negatively related to the validity of the results. Green and Srinivasan (1978) suggest that the full-profile method should be preferred as long as the number of attributes included in a conjoint study is small (up to six). For a larger number of attributes they recommend trade off matrices or bridging designs. Only for more than ten attributes do they suggest that Adaptive Conjoint Analysis (ACA) or other approaches may be preferred over full profiles.

Meyer (1987) stated that the process of concept evaluation is inseparable from more general principles of information processing. Consumers with large amounts of product knowledge are better to evaluate early product-concepts than consumers with little knowledge (Bont, 1992, pp. 18–35; Maheswaran & Sternthal, 1990).

Ramsey (1926) examined subjective probability in the context of decision making under uncertainty: probability is then defined in circumstances where an individual has to make a decision and future states of the world, and hence the rewards, are uncertain (Darnell & Evans, 1990, p. 13). In line with Finn (1985), it is necessary to include consumer characteristics, since consumers will evaluate the same stimulus differently (Bont, 1992, p. 27). In psychological approaches the perception of the attributes, not the attributes themselves, is seen to be of prime importance (Holbrook & Corfman, 1985) and according to Lancaster (1966; 1971) product can be considered as a bundle of attributes, such as e-health application attributes.

CONJOINT ANALYSIS

The History of Conjoint Analysis

Conjoint tasks may be viewed as multiattribute decision problems (Krantz & Tversky, 1971) and the purpose of the analysis is to identify the relative contribution of attributes and their levels to respondents' preference orderings for objects representing various attribute combinations (Hair, 1987; Priem, 1992). Conjoint analysis is a general term representing several analytical techniques that involve a posteriori decomposition of the decision process. *Nonmetric* conjoint analysis (Green & Wind, 1973) uses rank order preference data to generate 'part worth utilities' that represent respondents use additive, main effects only, decision models (Priem, 1992). The term *conjoint analysis* means decomposition into part-worth utilities or values of a set of individual evaluations of, or discrete choices from, a designed set of multiattribute alternatives (Louviere, 1988, p. 93).

The axiomatic theory of rank-order conjoint analysis is called *Conjoint Measurement* (Krantz & Tversky, 1971). This theory requires real ranking data to satisfy a large number of ordinal conditions before one can conclude that a particular utility specification is appropriate for scaling (estimating) part-worth utilities from an individual's judgment data. (Louviere, 1988, p. 95).

Part-worth utilities are estimated by least-squares procedures that optimise the fit between observed and predicted rankings assuming that an additive utility specification is correct. *Badness-of-fit* statistics known as *stress* measures are used as an index of how well additive or other specifications fit the observed rankings (Louviere, 1988, p. 95). Weiner (1985) and Anderson (1986) have demonstrated that a) conjoint experiments ensure high goodness-of-fit or low badness-of-fit, b) many possible specifications can produce approximately equivalent fit measures, and c) wrong specifications can produce better fit measures than *right* specifications in real, fallible data. In particular, factorial-type experiments guarantee that main effects or other simple specifications will account for most of the variance in judgment data, even when wrong. This happens because "true" utility functions are conditionally monotone in each attribute, and the joint combination rule can be well approximated by functions that predict "higher overall utility corresponds to more high part-worths" and "lower overall utility corresponds to more low part-worths". Conjoint models mimic these conditions very well (Louviere, 1988).

Applications of Conjoint Analysis in Marketing Research

De Bont (1992, p. 81) pointed out that conjoint analysis is a method in analysing marketing, product evaluation, customer research, and market segmentation. Conjoint analysis has also been used extensively in marketing research to estimate the impact of selected product characteristics on customer preferences for products (Cattin & Wittink, 1982). Mobile e-health applications can be easily evaluated before marketing. According to Green and Krieger (1991) market segmentation presupposes heterogeneity in buyers' preferences and ultimately choices for products/services. Preference heterogeneity for products/services can be related to either *person* variables (e.g. demographic characteristics, psychographic characteristics, product usage, etc.) or *situational* variables (e.g. diagnosis of disease in which medicine is consumed, etc.) and their interactions.

Conjoint analysis is well suited for the implementation of selected types of e-health applications market segmentation. First, the focus of conjoint analysis is squarely on the measurement of buyer preferences for product attribute levels, including price, and the buyer benefits that may flow from the product attributes. Secondly, conjoint analysis is a micro-based measurement technique. Part-worth functions i.e. preferences for attribute levels, are measured at the individual level. Thirdly, conjoint studies typically entail the collection of respondent background information e.g. demographic data, psychographic data. Increasingly, background data include information collected on respondents' perceived importance of purchase/use occasions. Fourthly, even rudimentary conjoint studies usually include a buyer choice simulation stage in which the researcher can enter new or modified product profiles and find out who chooses them versus those of competitors. Market segmentation and product positioning are inextricably related, as buyers and sellers seek mutual accommodation in product/service offerings that best satisfy preference and profit objectives. This process takes place in a competitive milieu of other brands/suppliers in the same product category or even other categories of goods competing for the buyer's budget (Green & Krieger, 1991). Mobile and e-health applications or by-products market segments should be checked beforehand from their users and conjoint is very good for that with fMRI. Different applications have own segments and usually they need differentiation for positioning. Different marketing segments have to follow customer needs on e-health applications.

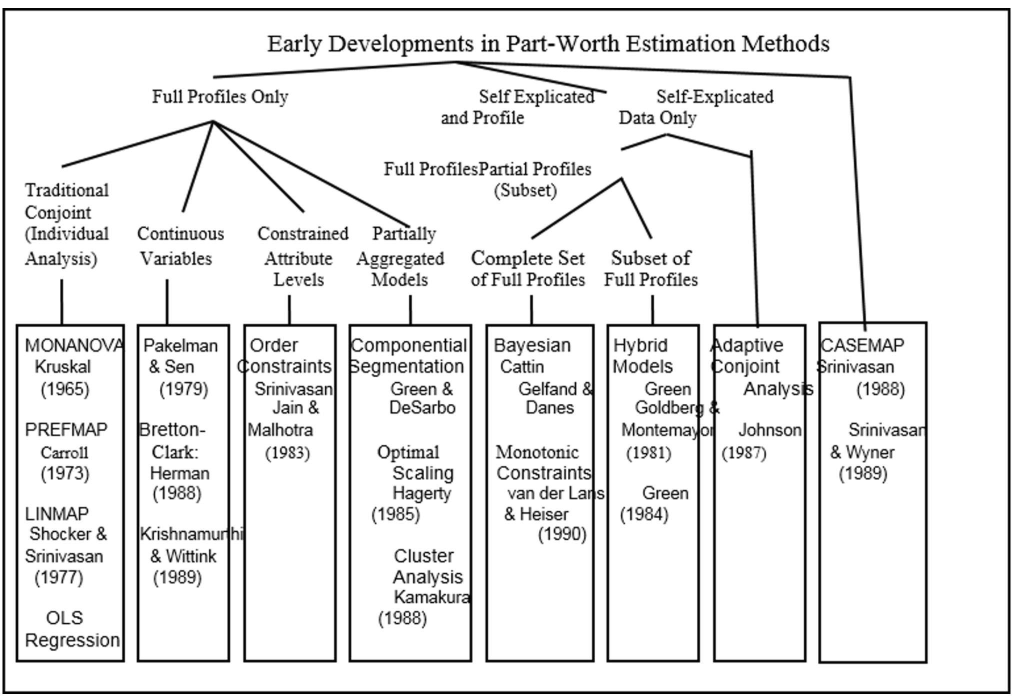
The conjoint models are based on preference or intent to purchase behaviour, not on actual behaviour. There are likely to be attributes excluded from the models that may affect behaviour in the marketplace. Perceptions of a product and its attributes may have to be modelled to incorporate the differences between perceptions and objective or physical features included in the conjoint study. New products may take several years to be developed and marketed, after which the nature of the competition may be different, and systematic changes in customer preferences may have taken place (Cattin & Wittink, 1982). However, conjoint analysis and fMRI together give better results on actual behaviour with e-health applications or products. Relevant information about applications and e-health products or services can be obtained with conjoint analysis resulting proper attributes, which fill the customer needs and with fMRI revealing us information about consumers striatum, ventromedial prefrontal cortex (vmPFC), and dorsolateral prefrontal cortex (dlPFC) how they evaluate predicted values from given products.

An Overview of Different Kind of Conjoint Analysis

C*onjoint analysis* covering both the theory and methods of a variety of different paradigms that can be used to design, implement and analyse judgment data experiments (Green & Srinivasan, 1978), or choice data experiments (Louviere & Hensher, 1982). In a main effects model the preference score for a given attribute level does not depend on any other attribute. In a typical application (Figure 1) a set of attributes is defined prior to the collection of preference judgments (Cattin & Wittink, 1982).

Carroll and Green (1995, p. 385) provides a taxonomy of various approaches and a sampling of early contributions to the field (Figure 1). The far left hand branch of the tree lists techniques for analysing traditional, full-profile-only data. The principal parameter estimation methods are MONANOVA (Kruskal, 1965), the non-metric version of PREFMAP's vector model (Carroll,

Figure 1. Early developments in part-worth estimation methods (Carroll & Green, 1995, p. 386)



1973) and LINMAP (Shocker & Srinivasan, 1977). Ordinary Least Squares (OLS) regression (Cattin & Wittink, 1982) is used for parameter fitting.

The analysis of full-profile conjoint data benefits from a variety of approaches, including models that conserve degrees of freedom by fitting either prespecified functional forms or constrained parameters. If the researcher collects self-explicated data on individual attribute-level desirabilities and attribute importance's, further improvements are possible, as is illustrated by the Bayesian-like method (Cattin, Gelfand, & Danes, 1983) and the parameter constrained approach of van der Lans and Heiser (1992). Considerably more data collection is entailed because each of these methods assumes that a large enough set of full profiles is obtained to estimate part-worths from either profile or self-explicated data.

The hybrid models (Green, 1984; Green, Goldberg, & Montemayor, 1981) and the ACA model (Johnson, 1987) collect a limited number of full or partial profiles that serve as ways to refine self-explicated part-worths (ACA) or estimate additional group-level parameters (hybrid models). Because these latter approaches have fewer data demands than the Bayesian methods, they have received extensive commercial application. Fewer data is preferable also in fMRI because of limited time and high costs of use.

In the right-hand branch, we note that in CASEMAP (Srinivasan, 1986, 1988), there are no profile data (Figure 1). The entire exercise consists of self-explicated data collection and modelling.

Preference Conjoint Structure Measurements

According to Green and Srinivasan (1990) there are three measuring structures in conjoint analysis: compositional (self-explicated) approach, decompositional (conjoint analysis) and compositional/decompositional (e.g. hybrid, ACA).

*Compositiona*l methods ask respondents to assess values for attribute levels, and use these values to build up preferences for attribute bundles or profiles (Huber, Wittink, Fiedler, & Miller, 1993). *Decompositional* methods begin with overall evaluations of objects defined on multiple attributes and derive values for attribute levels from these evaluations. Once individual choice has been modelled, the prediction of choice shares in simulators to estimate the impact of a change in product formulation and/or price (Green & Srinivasan, 1990; Huber et al., 1993). Both decompositional and compositional methods typically take judgment as inputs, which are often assumed to be intervally scaled measures of preferences or of the importances of attributes (Huber et al., 1993).

With *decompostional technique* (De Bont, 1992, p. 51) consumers evaluate, or choose between, the concepts. The overall preference ratings (or rankings) of the concepts are decomposed into the separate contributions of the attribute levels. Statistical procedures are applied to estimate the attribute importances (sensitivies), and the attribute-level preferences (part-worths), from the overall preference ratings (rankings).

In *Compositional techniques* or self-explicated model (Green & Srinivasan 1978) a limited number of concepts are sequentially presented. The overall utility of concepts is determined by the weighted sum of the attribute-level ratings. With compositional methods, the preferences for the attribute levels and the importances of the attributes are obtained from consumers by means of direct questioning. *Hybrid* conjoint analysis (Green, 1984) models were developed to cope with the need to incorporate everlarger numbers of attributes and attribute levels in conjoint analysis. They aim at (sub)group estimation of part-worths while at the same time retaining individual differences by inclusion of individual self-explicated utilities. In the data collection phase each respondent has to give evaluations of attribute levels, attach importance weights to attributes, and to evaluate a subset of stimuli from a fractional factorial orthogonal design. Part-worths are estimated at the individual level (van der Lans & Heiser, 1992, p. 326).

Questionnaire Card and Its Measurement Method in Conjoint Analysis

Reasons for using *rank order* judgments include ease of use, ease of administration, and a desire to keep the judgment task as close as possible to consumer's usual behavior. Rating scales are favoured because they are less time-consuming for an interviewee and convenience and ease of analysis (Cattin & Wittink, 1982). Rank orders said to provide greater reliability (Green & Srinivasan, 1978). If rank order preference judgments are used, researchers should consider the number of levels used for the attributes may have a systematic influence on the substantive results (Cattin & Wittink, 1982). Pictorial representations are more likely to produce configural processing of the information presented (Holbrook & Moore, 1981).

Hagerty (1985, p. 170) assumed that the *ordinary least squares regression* model is the true model for each subject's responses. Cattin and Wittink (1982) have shown that ordinary least square (OLS) has high predictive validity for conjoint data. Hagerty (1985) has shown that the typical R^2 conjoint value is about 0.85. Nearly every conjoint study examines subjects for heterogeneity and then applies some regression model to estimate partworths (Hagerty, 1985, pp. 180-182).

An *orthogonal array* is a subset of all of the possible combinations that allows estimation of the part-worths for all main effects. In virtually all conjoint application use orthogonal arrays to implement full profile presentations (Green, Helsen, & Shandler, 1988; Green & Srinivasan, 1978, p. 392). Interactions, where the part-worth for a level of one factor depends on the level of another factor, are assumed to be negligible. Three main attributes may have five attribute levels, and 243 combinations would result (=3^5). Ranking or evaluating 243 objects is by no means easily resolved. In a factorial design 3^5 would still require 81 combinations. An orthogonal array of 27 combinations could test main effects for even a 3^{13} factorial design (Green, 1984). Orthogonality decrease the number of questionnaire cards and the use of fractional factorial designs avoid respondent fatigue. The number of profiles presented increases multiplicatively with the number of attributes and levels, an approach that reduces the task for respondents seems attractive (Reibstein, Bateson, & Boulding, 1988).

Orthogonal designs provide a higher degree of robustness over various task simplifications that subjects may employ in coping with the job of profile evaluation. In particular, orthogonal designs could guard against possible sources of misspecification error that may occur when various simplifying decision strategies are employed (Green et al., 1988). The advantage of using orthogonal contrasts to define effects and interactions arises from the orthogonal polynomials which are so constructed that any term of the polynomial is independent of any other term. This property of independence permits one to compute each regression coefficient independently of the others and facilitates testing the significance of each coefficient (Green & Rao, 1971; Green & Srinivasan, 1978).

The two main alternative procedures are the full profile or concept evaluation approach. Cattin and Wittink (1982) favoured the full profile approach because it is more realistic reflection, as exemplified by the statement, "It is the most realistic reflection of the choice environment." Reasons given for the use of interactive approaches include speed of data collection, management interest, data utility and breadth of coverage (Cattin & Wittink, 1982).

The time taken by respondents to answer the questionnaire varied considerably both by respondent and questionnaire structure. In Reibstein, Bateson, and Bouldings (1988) study the mean time taken for the questionnaires containing only the full profile and trade-off tasks was 35 minutes. Questionnaires containing the paired comparison task took longer, and the mean time was approximately 50 minutes (Reibstein et al., 1988, p. 277). However in practice 35 minutes is preferred compared to 50 minutes of lying down inside the fMRI and answering questions or evaluating conjoint cards regarding e-health and mobile applications attributes.

Sample size is determined partly by the purpose of the study and the allocated budget. The Cattin and Wittink's (1982) results show that the median sample size varies across the respondents from 100 to 1,000, although the median is in the 300 to 550 range for most respondents (Cattin & Wittink, 1982).

Attributes in Conjoint Analysis

Reibstein, Bateson and Bouldings (1988) showed that attribute set reliability is very high. The high reliability implies that in designing a conjoint study one does not have to be overly concerned with having all the attributes included in the design. The study shows that if the key attributes are included, which of the other attributes are or are not also included will have minimal bearing. The conjoint method compared to a variety of methods of data collection and across a number of product categories appears to be reliable in an absolute sense. The nature of the attributes selected has a minimal bearing on the techniques reliability (Reibstein et al., 1988). For compensatory models with approximately normally distributed part worths for the attribute levels, the external validity was highest for regression analysis (Cattin & Wittink, 1982).

According to Olshavsky and Granbois (1979) consumers do not generally seem to seek and process large amounts of information when dealing with problems related to purchasing, and that an extensive problem solving process is quite unusual even in connection with major durable appliances (Rajaniemi, 1992, p. 7). According to Munson (1984, p. 16) values have sometimes been defined as being equivalent to and/or synonymous with needs, beliefs or motives.

The attributes should include those most relevant to potential customers and those which satisfy the managerial constraint (Cattin & Wittink, 1982). Most companies are unable to link engineering/operations attributes to customer perceptions of services through statistical models, managers tend to prefer survey items that reflect a compromise between language that is meaningful to customers and language that seems actionable to managers (Bolton & Drew, 1994, p. 179). For example e-health and ITC phrases, words and jargon might be not clear for customers.

Salient beliefs tend to take the form of consequences of using that brand (Lutz, 1975), and consequences give the meaning to the attributes. Besides the benefits derived from the use and consumption of a product, the possessing and collecting of this product can also serve as a source of benefits (Belk, 1982). The attributes do not have a meaning in themselves but only to the degree they serve as a means for achieving the desired consequences (Rajaniemi, 1992, p. 145). Taylor (1981) found that involvement is anchored not to a product itself, but to purchasing or using the product. Mobile application or software might have same involvement.

NEUROMARKETING ANALYSING METHODS

Neuromarketing highlights a major fact: the consumer makes decisions to a mental, emotional and instinctive level. Neuropsychology studies the relationship between the brain and human cognitive and psychological functions; neuromarketing promotes the value of looking at consumer behaviour from a brain perspective (Morin, 2011). The main objective of neuromarketing is decoding the processes that take place in the consumer's mind, in order to discover the desires, wishes and the hidden causes of their choices, so that there is a possibility to satisfy them what they want. This thing has been made possible by the use of medical imagery technology, which brings a major change in the relationship of the companies and their customers (Boricean, 2009).

There are only three well established non-invasive methods for measuring and mapping brain activity: electroencephalography (EEG), magneto encephalography (MEG), and fMRI. All three imaging techniques are non-invasive and therefore can be used safely for marketing research purposes. EEG is an old technology in neurology but is still considered a good way to measure brain activity. Brainwaves can be recorded at very small time intervals, but the limitation of EEG is that it does not have good spatial resolution or where the neurons are firing in the brain. The first psychological studies using EEG date as far as 1979 (Morin, 2011). MEG has excellent temporal resolution, but a better spatial resolution than EEG. However, like EEG, MEG is somewhat limited to picking up activity at the surface of the brain; hence it is not a good method for imaging subcortical areas. The fMRI modality is based on using an MRI scanner to image the change of blood flow in the brain. When neurons fire, they need to use energy which is transported by the blood flow and quickly metabolized. The key element is the contrast of the Blood Oxygen Level Dependant (BOLD) signal measured by the fMRI. When faced with a particular stimulus, areas of a subject's brain receive more oxygenated blood flow than they do at rest time. This change creates distortions in the magnetic field emitted by hydrogen protons in the water molecules of our blood. The basis for all fMRI studies is to consider that the change in the BOLD signal is an accurate measure of neuronal activity. fMRI has the major advantage of being able to image deep brain structures, especially those involved in emotional responses (Morin, 2011).

Neuroscience (Plassmann, Ramsøy, & Milosavljevic, 2012) is the study of the nervous system that seeks to understand the biological basis of behaviour. Neuroscience research ranges from studying single cells (cellular neuroscience) to studying how different brain areas or complex brain systems, such as the visual system, interact (systems neuroscience). Because of the complexity of consumer behaviour, insights from systems neuroscience are crucial for consumer neuroscience, whereas those from cellular neuroscience currently are limited. Most consumer neuroscience studies investigate mental processes in human subjects. Another important distinction is between clinical and non-clinical research in neuroscience. Non-clinical research consumer neuroscience studies consumer responses in healthy subject populations. A last critical distinction is between consumer neuroscience, which refers to academic research at the intersection of neuroscience and consumer psychology, and neuromarketing, which refers to practitioner and commercial interest in neurophysiological tools, such as eye tracking, skin conductance, EEG, and fMRI, to conduct company-specific market research (Plassmann et al., 2012).

The amount of information the consumers are exposed to is enormous, yet our processing capacity is limited. Each second we are exposed to an estimated 11 million bits of information that reach us through all our senses, yet humans are capable of processing only about 50 bits of that information, letting most of the input to go by unnoticed (Wilson, 2002). How consumers represent, attend to, and perceive incoming information may have a profound influence on their behaviour.

Humans are predominately visual creatures, and most of the incoming information we receive is visual (Koch 2004). Our visual system contains two cortical routes that are involved with visual processing. The dorsal visual pathway is involved with the spatial deployment of attention and proceeds from the primary visual cortex in the occipital lobe, through the posterior parietal cortex, to the dorsolateral prefrontal cortex (dlPFC). The ventral visual pathway is responsible for object recognition and originates in visual cortex, then continues to the inferotemporal cortex, and to the ventrolateral PFC. Visual system allows for rapid product identification. (Plassmann et al., 2012) The predicted value of each product that is available for choice represents the consumer's belief about the experienced value of that product at some time in the future. At least three brain structures might be of particular importance when consumers evaluate predicted values: the striatum, the ventral medial prefrontal cortex (vmPFC), and the dorsolateral prefrontal cortex (dlPFC) (Plassmann et al., 2012). Knutson and colleagues (2007) showed that a structure within the ventral striatum (VS), the nucleus accumbens (NAcc), is involved in encoding anticipated rewards of monetary payoffs (Knutson, Rick, Wimmer, Prelec, & Loewenstein, 2007). Experienced value is based on the pleasure derived from consuming a product. According to early notions of utility or value, experienced value is the "true value" that should matter the most for value-based decision making (Kahneman & Tversky, 1979). Studies have shown that activity in the orbitofrontal cortex (OFC), in particular its medial parts at the time a reward is being enjoyed correlates with subjective reports about the pleasantness or valence of the experience (Plassmann et al., 2012).

Remembered value refers to how different product associations are encoded, consolidated, and retrieved in the consumer's memory. Studies have demonstrated that explicit memories – also known as declarative memories – rely on specific brain regions such as the hippocampus and surrounding medial temporal lobe (MTL) region, in synchrony with other brain regions such as the dlPFC (Squire & Zola, 1996).

Empirical studies in consumer neuroscience and neuromarketing employ neuroimaging tools as biomarkers to assess responses to marketing stimuli such as brands, advertisements, packaging and to predict consumer choice (Plassmann et al., 2012) or e-health products and ICT technologies.

E-SERVICES, MOBILE APPLICATIONS, FMRI AND CONJOINT

E-health means many categories, including computerized self-help strategies, online psychotherapy, websites that provide information, social media approaches including Facebook, Internet forums for health discussions, personal blogs, and videogames (Parikh & Huniewicz, 2015). Several authors have noted the variable usage in the term, from being specific to the use of the Internet in healthcare to being generally around any use of computers in healthcare (Eysenbach, 2001). Various authors have considered the evolution of the term and its usage and how this maps to changes in health informatics and healthcare generally (Ahern, Kreslake, Phalen, & Bock, 2006; Pagliari et al., 2005) Oh, Rico, Enkin, Jada, Powell and Pagliari (2005) made a systematic review of the term's usage, offered the definition of eHealth as a set of technological themes in health today, more specifically based on commerce, activities, stakeholders, outcomes, locations, or perspectives. One thing that all sources seem to agree on is that e-Health initiatives do not originate with the patient, though the patient may be a member of a patient organization that seeks to do this.

Skinners shaping behaviour is perhaps more than enough in the low commitment marketplace; reinforcement and repetition may well be sufficient (Kassarjian, 1978; Rajaniemi, 1992). Buying a painkiller or an almost free of charge mobile application is a low-commitment purchase. When involvement is low, consumer behaviour is characterized by limited information processing and evaluative activity (Krugman, 1965; Ray, 1973; Robertson, 1976). The critical problem (Gutman, 1982, p. 66) with low-involvement products in terms of the model is the lack of linkage between consequences from causing the product and the consumer's values. The parts are conceived to be arranged along a central-peripheral dimension wherein the more central parts are more salient or important, more resistant to change, and if changed, exert relatively greater effects on other parts (Rokeach, 1968, p. 117). Another interpretation of centrality characteristic is to view it to be quite synonymous with the importance or saliency of a value to an individual (Rajaniemi, 1992, p. 168). Olson's (1988, p. 28) suggestion for specifying the concept of involvement, which he sees as referring to how closely a product is related to a consumer's self-concept. The attributes of a product should be seen as leading to the satisfaction of a self-related such as important value and the perceived links (beliefs) between attributes, consequences and values should be strong and salient; accessible in memory.

In some conjoint studies, many of the attributes may be monotonic in the sense that most respondents would order the attribute levels the same way; that is, "more is better". Examples include product durability, length of guarantee, price, convenience of the mobile application, and so on. If such is the case, some profiles could dominate others in an orthogonal array. Although this situation would make the preference task easier to perform, in the real marketplace, buyers would not be likely to find dominances; and even if dominances were found, buyers would be presumed to recognize them and to eliminate dominated options at the outset (Green et al., 1988). With e-health applications the dominating option could be a cheap price.

Computer programs, self-help strategies, online videos and many kind of computerized connections can be viewed as products which can be analyzed by their parts, or attributes as in conjoint analysis. Attributes for evaluating e.g. a software program could be 'technically easy to use', 'handy', 'fast', 'supportive' etc. or any kind of adjectives which might help to describe the program or the software. Conjoint cards provide a useful tool for this kind of analyzing. Conjoint cards do not reveal how consumers appreciate the specific software. For this analysis fMRI is needed. Thus a combination conjoint analysis and fMRI will reveal the best features of mobile applications and e-services.

CONCLUSION

Modern E-services and mobile applications need modern marketing analysing methods like companied conjoint analysis with fMRI. Computerized self-help programs, online psychotherapy, websites and social media approaches for e-health mobile applications should be evaluated before marketing launch. Conjoint analysis will reveal which categories (main attributes, e.g. colour) means the most and which sub categories (e.g. yellow or blue) the customers prefer. Combined with with fMRI it can be found out if these attributes also activate customer's brains – do they like or do they not prefer the selected attributes or attribute bundles and how high is their willingness to purchase the product.

Conjoint measurement (Krantz & Tversky, 1971) has primarily been concerned with the conditions for both the dependent and independent variables, given the order of the joint effects of the independent variables and a prespecified composition rule. The hybrid models (Green, 1984) and the Adaptive Conjoint Analysis (ACA) model (Johnson, 1987) collect a limited number of full or partial profiles approaches and have fewer data demands than other conjoint methods, and they have received extensive commercial application. These computer programs are easy to use in fMRI with conjoint cards. In full factorial designs all possible attribute combination which figure in the master design can be found in the attribute profiles. By contrast, in fractional factorial designs, only a fraction of the master design is reflected in the attribute profiles (De Bont, 1992, p. 30). Full factorial design suits very well the research using fMRI and conjoint analysis.

Goods are treated as tied packages of characteristics or attributes, according to Lancaster (1966). When inviting participants to evaluate attribute-profiles in fMRI, it is better to restrict the attribute-level information to a maximum of 5 to 6 attributes (Green & Srinivasan, 1978). Conjoint cards decrease the time spent inside the fMRI, while subjects are evaluating attributes. Orthogonality helps to shorten subjects' time (Reibstein et al., 1988) inside the fMRI, which usually takes one hour per person. Shorter time in fMRI tube yield better results and sharpens participant's action time. The full profile approach is a more realistic reflection, but reasons given for the use of interactive approaches include speed of data collection, management interest, data utility and breadth of coverage (Cattin & Wittink, 1982). Rating scales are less time-consuming for an interviewee and convenience and ease of analysis (Cattin & Wittink, 1982) and rank orders provide greater reliability (Green & Srinivasan, 1978).

Attributes in conjoint cards could be figures, words, pictures or any kind of material that can be evaluated in the fMRI. Different conjoint cards' attributes will reveal with combined fMRI sub-parts activity in the brain and same time full-factorial preferences from subjects. These two methods, fMRI and conjoint analysis combined, make it easier to evaluate more material or attributes between products or services to understand user´s preferences and decision making in e-health and information and communication technologies.

Future Research Directions

Several studies have demonstrated the ability of conjoint analysis to predict actual choice behaviour (Green & Srinivasan, 1990). If one chooses to use full-profile conjoint, results (Huber et al., 1993) provide two suggestions on how performance can be improved. First, the sensitivity of full profile's predictive validity to the number of attributes reinforces the recommendation by Green and Srinivasan (1990) that hybrid conjoint or ACA be used when the number of attributes is much over six. Secondly, the order effect found indicates that full profile is likely to be more effective when it is preceded by a warm-up task that familiarizes respondents with the attributes and their levels (Huber et al., 1993). By using fMRI and conjoint analysis together we can avoid subject fatigues, we have enough time in fMRI, more attributes, and also more e-services and mobile applications for the market. Accurate marketing needs precise marketing research method, like companied fMRI and conjoint analysis.

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