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| 称号及び氏名 | 博士（工学） Dennis Castel |
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| 論文審査委員 | 主査　辻　洋 |
| | 副査　松本　啓之亮 |
| | 副査　本多　克宏 |

## 論　文　要　旨

In marketing analysis, product designers want to understand and measure the demand of a specific market in order to design the most attractive product or service. Among a lot of marketing analysis techniques, conjoint analysis is one of the most popular market research tools for designing products or services. Many companies have already used questionnaires designed for the conjoint analysis in order to collect the preferences' strength about future products or services. These days, most of these questionnaires can be answered with web-based surveys, allowing customers to respond to them any time, any place. Moreover, with the help of IT science, it is a simpler way to collect and analyze a variety of respondents' preferences.

When marketers design a product, they usually decide the options of the product that will bring satisfaction to the consumers. In economic terms, the total satisfaction received from consuming a product is called "utility". To point out the best utility of a product (or a service), consumers are solicited to respond to a questionnaire about the option design of this product. For good design, marketers need to understand the tacit preferences and choices of these consumers. For this, consumers are asked to assign a utility to the product. This utility, a cardinal or ordinal value, allows marketers to quantify the preference of consumers. Indeed, one of the main problems to this analysis method is the difficulty to translate the tacit preference of the consumers into fine value. How are marketers to be sure that the assigned utility corresponds actually to the true utility that consumer has in mind? Is there a way for consumers to confirm that and validate their answers without inconsistencies?

Moreover, the tacit preferences of respondents may depend on many options as parameters, and it may be difficult for the marketers to be sure of the consistency of consumers' responses. These parameters are linked to the product itself, like a description that is too complex, and to the questionnaire itself, with too many choices. Although, Internet surveys are convenient for the respondents and marketers, by giving more freedom to the respondents, it may create new problems. How are marketers to be sure that the choices of the respondents are not influenced by external

elements? If the product or questionnaire is too complex, how are marketers to be sure that the answers of the customers match with his or her preferences and to be sure of the consistency of the collected data? Some issues coming from the design of the questionnaire may have an important impact on the respondents' answers.

This thesis proposes an alternative solution to the traditional conjoint analysis. With the interactive conjoint analysis, the respondents have the tool to correct their own responses and consider their answers. With this tool, marketers collect more precise and accurate utility for the product/service of the study. It helps to externalize the respondent's tacit preferences and offer new information as explicit preferences for the marketers for the product analysis.

This thesis is organized as follows: Chapter 2 presents the background of this research by explaining why conjoint analysis was chosen among other analysis methods. This chapter details the four alternatives of the conjoint analysis, known as choice-based conjoint, conjoint value analysis, menu-based conjoint and adaptive conjoint analysis. This chapter also presents the terms and basic scenario for the traditional conjoint analysis. Then, with preliminary experimentation, the limitations of the traditional method are pointed out. To solve these limitations, the method called "interactive conjoint analysis" is presented by introducing the three main parts: the spiral conjoint analysis, the stepwise refinement and the social norm comparison.

Chapter 3 presents in detail the design of the web-based questionnaire named "CASIMIR" (Conjoint Analysis Spiral Interactive Mining based on Regression analysis). This interactive system is configurable and modifiable depending on the needs of the marketers. This system has been designed to be adaptable to any questionnaire that a marketer wants to create. However, it allows the respondents to receive feedback on their evaluation and allows them to validate and improve their responses. Then, this chapter introduces the diagnosis method, a clear visual method, which can be understood by any respondents. With this diagnosis, the concept of attribute importance, personal consistency and social norm with bias effect will be detailed, based on a SECI model (Socialization-Externalization-Combination-Internalization), a knowledge management model created by Ikujiro Nonaka allowing interaction between tacit and explicit knowledge. A first experiment based on an interactive evaluation system, with a simple diagnosis solution, will validate the introduced concepts to help respondents to externalize their rough tacit preferences and compare them with other respondents. Finally, the choices made to decide the actual design this system will be presented and discussed.

Chapter 4 focuses on the stepwise refinement in the CASIMIR system. As explained before, the system must be usable by marketers and non-professional consumers. Moreover, it must allow consumers to consider and evaluate with precision the product. This chapter presents the first experimentation and the result that helped to design the proposed system. Based on an advanced version of the CASIMIR system and larger experimentation, the possibility that enables this system to understand the tacit knowledge of questionnaire respondents is discussed. Marketers also use these responses to get a more precise idea of the preferences of the consumers.

Chapter 5 introduces the principle of social comparison in the interactive conjoint analysis system. With this method, respondents share and learn from other respondents in order to improve their evaluation. This chapter will focus on the diagnosis page of the CASIMIR system and discusses about the side effects of this feedback on the evaluation of the respondents. To respond to these effects, this chapter will present an overview of diagnosis classification by social comparison in three points: the relative attribute importance, relative preference intensity and segmentation with cluster analysis. Then, this chapter illustrates the potential of clusters analysis for marketers with a case study. With these new notions, this chapter concludes by introducing a possible evolution of the CASIMIR system with the incorporation of a group decision support system named “CASIMIR-D”.

Finally, Chapter 6 concludes this work and presents the potential evolutions of the research.

## 審 査 結 果 の 要 旨

本論文は，コンジョイント分析と呼ぶ計算機を用いた定量的な市場分析手法に関するもので，特にＷｅｂが普及した今日，消費者のニーズをより精度高く収集するために考案した対話的な手法を述べたものである．製品においてもサービスにおいてもオプションは多数の組み合わせが可能となっていることが多く，どのような消費者がどのようなオプションを好むかを迅速かつ精度高く収集することは重要になっており，提案されている手法は実用的でかつ重要な研究成果をあげていると考えられる．

本論文の特徴は，従来，市場分析者のみが利用者であると考えて用意されたバッチ的なコンジョイント分析に対し，消費者も自己の暗黙に所有する選好を段階的に形式化していく対話的な分析手法について言及したことであり，次の成果をあげている．

（１）従来のバッチ的なコンジョイント分析とそれを直接の拡張形である 4 種類のコンジョイント分析手法を精査し，簡単な実験を用いて，暗黙な消費者の選好をスパイラルに繰り返していくこと，段階的に陽な（数値として表される）選好に表現していくこと，消費者グループによって分類することにより，選好の差異を見出すことを課題として提示した．

（２）CASIMIR (Conjoint Analysis Spiral Interactive Mining based on Regression Analysis)と呼ぶ対話型の Web システムを設計し，消費者が具備している暗黙知を表出化していく中で選好の偏りを指摘したり首尾一貫性の欠如をしたりしていくことが可能なデータベースを設計している．

（３）提案した CASIMIR の診断機能を設計し，段階的に選好に関する暗黙知を精度よくしていくユーザインタフェースを明らかにしている．実際に試作したシステムにより，5 属性 3 水準の実験データを用いて実験を行い，段階的に精緻化される選好がどのように計算されるかを示している．

（４）商品の選好は一般に年齢層，性別，職業，ライフスタイルなどによっていくつかにカテゴリ化されると考えるのが自然である．提案している CASIMIR に相対的な商品そのものに対する選好の強弱や個々のオプションに対する選考の強弱でクラスタ分析を行った知

見から，具備すべき診断機能を提案し，実験でその必要性を論じている．

以上の研究成果は，知能情報工学分野における定量的な市場分析手法としてのコンジョイント分析に対する新しいアプローチを示唆しており，特に知能情報工学分野の発展に貢献したと考えられる．また，申請者が自立して研究活動を行うに必要な能力と学識を有することを証したものである．