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ASSESSING PAYMENT INSTRUMENT ALTERNATIVES USING COGNITIVE MAPPING AND THE CHOQUET INTEGRAL[1]

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ABSTRACT. ***Technological advances have increased the diversity of payment instruments and transaction channels, heightening consumers' expectations for services in this regard. Coupled with an increasing competitiveness of the banking industry, this has emphasized the great importance of understanding consumers' choices of payment instruments. In order to meet their customers' expectations, banks have to understand what determines their choices of payment instruments. This study aims to uncover these determinants of payment instrument choice, through the use of cognitive mapping to structure the decision problem, and its combination with the Choquet integral to identify the overall preferred payment instrument from the user perspective. The results show that direct debits and electronic cards constitute the preferred payment instruments, and automated teller machines (ATMs) and point-of-sale (POS) the overall preferred transaction channels. Understanding consumers' choices of payment instrument, the factors underlying them and their interactions can contribute to better planning by banks at the distribution channel level. Strengths, limitations and managerial implications of our proposal are also discussed.***

KEYWORDS: Choquet integral, cognitive mapping, decision-making, payment instruments, strategy planning.

JEL classification: C44, C92, M10.

Introduction

Rushing to the bank before it closes, queueing up to cash a check or, indeed, even writing out a check, seem very much things of the past. To some, they may even seem quaint reflections of times gone by. Bank transactions can now be made online or through our phones; we can pay for our purchases immediately or do so later, through the use of credit cards; and automated teller machines (ATMs) can be used to withdraw money or, in some countries, buy a train ticket. Payment instruments, and the distribution channels through which they are made available, have multiplied (Gogoski, 2012; Reis *et al.*, 2013; Dauda, Lee, 2015); and as their options have increased, so have customers' and other bank stakeholders'

levels of demand (Dick, 2008; Khare *et al.*, 2010). Financial institutions must therefore learn to adapt to the new realities of technological development and intensified competition if they are to survive (for a deeper discussion, see Palaima, Auruškevičienė, 2007; Pinto, Ferreira, 2010; Ahmadirezaei, 2011; Dangolani, 2011; Ramos *et al.*, 2011; Gogoski, 2012; Ferreira *et al.*, 2016b). Doing so requires understanding consumers' preferences, behaviors and concerns with regard to payment options, in order for banks to best adjust their strategies and investments at the distribution channel level to customer needs and wants.

The issue is not new. Interest in Internet banking offers, for instance, dates back to the mid-1990s, as the academic community tried to understand *"customers' risk perceptions of electronic payment systems"* (Ho, Ng, 1994, p.26), because *"banking over the Internet* [was] *attracting a great deal of attention in the banking and regulatory communities, and developments in this new delivery channel* [were] *the subject of numerous articles in the banking press"* (Egland *et al.*, 1998, p.25). It is, however, arguably of greater importance now, as new payment instruments have become more commonplace and the environment in which banks must operate has become more competitive.

The current study aims to contribute to this discussion by analyzing consumers' preferences for payment instruments, the determinants of these preferences and, in particular, the factors underlying them. Methodologically, this is done by combining cognitive mapping with the Choquet integral, in order to identify the determinants of users' choices of payment instruments, and determine users' overall preferred payment instrument and transaction channel. Following from the methods applied, the study is process-focused (for discussion, see Bell, Morse, 2013; Ferreira, Jalali, 2015; Ackermann *et al.*, 2016), with special relevance given to the group dynamics developed during the cognitive map creation and application of the Choquet integral.

The next section contextualizes the study, with an overview of the relevant literature. Then, the methodological background of the techniques applied (*i.e.* cognitive mapping and the Choquet integral) is presented. The ensuing section discusses the insights obtained from the application of those techniques with a panel of decision makers. The last section concludes the paper, highlighting the study's contribution and limitations, and presenting avenues for future research.

1. Literature Review

As the importance of financial markets is increasingly recognized, so is the importance of payment systems within them. So essential are they, in fact, that they often assume a "taken for granted" status. As Kahn, Roberds (2009, p.1) put it, they are *"essential, pervasive and boring (until there's a malfunction)"*. According to these authors, *"payment systems are the plumbing of the economy"* (Kahn, Roberds, 2009, p.1), *i.e.* an intermediation network through which exchanges can take place and the stability of the financial sector is ensured.

Payment systems encompass the tools and procedures which allow funds to be transferred from a payer to a payee (Kokkola, 2010), *i.e.* payment instruments. Broadly speaking, these can be divided into cash and non-cash payments (Kokkola, 2010). Cash payments are typically associated with face-to-face operations and low value transactions. Non-cash payments involve fund transfers between banks, and so are typically carried out by the banking system.

Among the most common non-cash payment instruments are *cards*, *credit transfer orders*, *direct debit*, *checks*, *commercial effects* and *electronic currency*. Naturally, each of these has its own specific characteristics, and the use of one over the other is likely to depend on a diversity of factors, ranging from those characteristics, to the relationship between the payer and the payee, to specific customer preferences (Hancock, Humphrey, 1997; Brige, 2006; Baršauskas *et al.*, 2008; Kokkola, 2010; Ramos *et al.*, 2011; Gogoski, 2012).

Likewise, with regard to channels, customers are now presented with a greater diversity of transaction channels for payment processing, ranging from phones to Internet-banking and ATMs. As a result, a significant amount of research has been devoted to understanding what determines customers' choices of one payment instrument or transaction channel in detriment of another, as well as what impediments might hinder the adoption of certain options. Understanding these factors is important, because it can provide banks with strategic guidelines at the distribution channel level, allowing them to better meet and even surpass customer wants and needs. As a result, there has been a significant amount of research interest into understanding customer adoption processes with regard to new payment systems, and the factors promoting or hindering these processes.

Manrai, Manrai (2007), for instance, examine bank service loyalty and switching behavior and relate this to customer satisfaction with bank services, as defined by personnel characteristics, financial aspects, convenience and atmospherics or environment. Their results suggest that *"bank marketers need to pay much more attention in promoting factors like personnel, atmospherics, and convenience than what was done in the past"* in order to *"differentiate their offerings in customers' perceptions and thus attract them from competitors"* (Manrai, Manrai, 2007, p.214). Gholami *et al.* (2010), in turn, look at e-payment in particular, in order to identify the factors influencing its adoption. The authors find that, in the context of their study (Nigeria), adoption is dependent not only on demographics, but also on the perceived benefits and effort associated to the use of e-payment, social influence, trust and awareness (see also Junadi, 2015). Consistently, Al-Somali *et al.* (2009) find, in a different context (Saudi Arabia), that awareness of online banking and its advantages, Internet connection quality, social influence and computer self-efficacy impact the perceived usefulness and ease of use of online banking. The authors further note a significant effect on attitudes toward the adoption of online banking of *"education, trust and resistance to change"* (Al-Somali *et al.*, 2009, p.130). This is consonant with Sohail, Shanmugham's (2003) investigation of online banking adoption in Malaysia, which found Internet accessibility, awareness of e-banking and reluctance to change to significantly impact its use.

The issue of trust is also raised by Masrek *et al.* (2014). The authors focus on "technology trust", which they disaggregate into network, website and phone trust, and find all three types of trust to *"have a positive relationship with mobile banking satisfaction"* (Masrek *et al.*, 2014, p.53). In Montazemi, Qahri-Saremi's (2015) structural model of online banking adoption, in turn, structural assurances were the key significant antecedent of trust in online banking, with, surprisingly, no effect of either trust in the physical bank or customers' propensity to trust, on online banking.

Demographics have also been variously considered. Sohail, Shanmugham (2003, p.207), for instance, find *"no significant differences between the age and educational qualifications of the electronic and conventional banking users"*, whereas in the context of attitudes toward multi-national banks in India, Khare (2011, p.208) finds significant differences in quality perceptions between genders and age categories, with the younger

generation, in particular, being *"more conscious about the multinational bank's image and its effect on service delivery"*, and more likely to consider such banks *"more efficient and responsive"*. Calisir, Gumussoy (2008) also focused on "younger customers", and found that for this group, Internet banking, phone banking and ATM essentially serve as substitutes, with ease of use and access being the major advantages of such options. Despite the significant advances provided by past research, it is important to note that this is a field under perpetual change. Indeed, there is no reason to assume that the preferred payment instruments today will be the preferred instruments in five or even two years; or, indeed, that the factors promoting or inhibiting the use of a certain payment instrument will remain static. In addition, much of the past research has focused on one or a few payment instruments at a time. Although this can be of value, the idiosyncrasies of the different instruments mean it provides limited insight into customer payment instrument choices as a whole. Relatedly, there is still little research on the manner in which the determinants of payment instruments inter-relate and connect with each-other.

This study hopes to help fill these gaps, by providing an overall description of the determinants that influence the use of payment instruments and transaction channels, and the cause-and-effect relationships among them. In addition, we aim to identify customers' perceptions of overall preferred payment instruments and transaction channels by combining cognitive mapping with the Choquet integral. The next section presents the adopted methodologies.

2. Methodology

2.1 Background on Cognitive Mapping

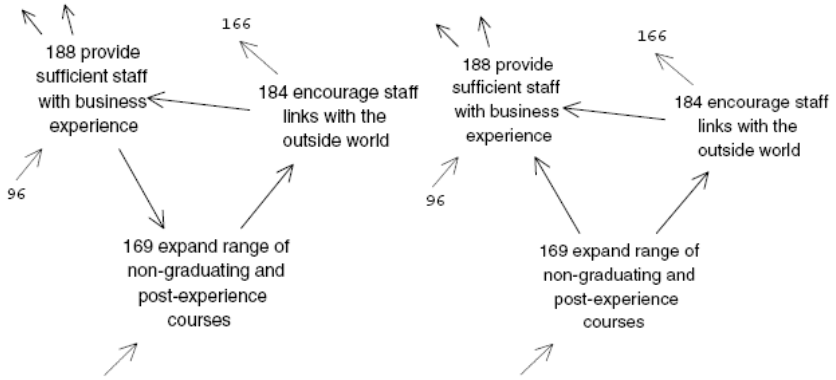
Cognition is defined in the dictionary as the *"the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses"* (www.oxforddictionaries.com). Human cognition can be conscious or unconscious (Bargh, Chartrand, 1999), intuitive or analytical (Hammond *et al.*, 1987), and even artificial (Indiveri *et al.*, 2009). It is a complex system comprising processes ranging from knowledge, attention and memory, to evaluation, computation and decision-making, and even to the production of language. Cognitive science, then, *"studies latent, unobservable cognitive processes that generate observable behaviours"* (Frank, Brade, 2015, p.14), and cognitive maps provide one way to do this.

The advantages of cognitive maps lie in the interactive nature through which they are formed, their flexibility and ease of use (*cf.* Ackermann, Eden, 2001; Filipe *et al.*, 2015; Jalali *et al.*, 2016). They help clarify complex decision problems, and structure them in an easy to grasp visual way, which facilitates communication and promotes mental associations (Kang *et al.*, 2012; Gavrilova *et al.*, 2013; Martins *et al.*, 2015). Cognitive maps are thus highly descriptive and, according to Fiol, Huff (1992), help uncover the informational context in which people operate.

Indeed, the proposed importance of this context was one of the underlying motivations for the use of cognitive maps as a methodological approach by Tolman (1948). In Tolman's (1948) perspective, behaviors, emotions and reactions to situations do not occur in a vacuum or as mere responses to stimuli, but are rather based on underlying attitudes, beliefs, surrounding conditions and goals. Cognitive mapping, then, can help describe the way

individuals think about a problem, in the context of their underlying values, attitudes and beliefs. A cognitive map *"is the representation of thinking about a problem that follows from the process of mapping"* (Eden, 2004, p.673).

With regard to decision-making in particular, cognitive maps are increasingly seen as an important decision tool, because they provide *"a means of representing the way in which a decision-maker models his decision-making environment, in terms of the concepts he himself uses"* (Klein, Cooper, 1982, p.64). They furthermore do so while allowing the cause-and-effect relationships between those concepts to be analyzed and represented (Wellman, 1994). In this conception of cognitive maps, introduced by Axelrod (1976), individuals' beliefs are represented by nodes, representing concepts; and by arrows, connecting those concepts in terms of their cause-and-effect relationships, with a positive sign (+) when the influence between concepts is positive and a minus sign (–) when a factor influences the higher order concept in a negative way. *Figure 1* exemplifies a cognitive map.



Source: Eden, 2004, p.682.

Figure 1. **Example of a Cognitive Map [partial view]**

2.2 The Choquet Integral

The Choquet integral, introduced by Choquet in 1953, is a flexible aggregation operator, belonging to the group of non-additive measures (NAM). These measures serve to overcome the limitations presented by additive measures, in situations where the criteria used for evaluating decision-making problems present interdependencies or interactions. NAM approaches are able to model many types of interactions in decision-makers' preference structures. The Choquet method, in particular, is a fuzzy integral method whereby a weight is assigned to every possible set of criteria, and the weighted average of the values of all the sets are then calculated. In this way, rather than taking into account single criteria, as per the weighted average method, combinations of criteria can be taken into account (Bottero *et al.*, 2011). Given its advantages, the Choquet integral has been variously applied in the literature on multiple criteria decision analysis (MCDA), addressing issues ranging from logistic processes to economic evaluation and social analysis (*cf.* Bottero *et al.*, 2014; Lopes *et al.*, 2014; Gomes *et al.*, 2015).

As the number of parameters increases, so does the numerical complexity of the integral: for any n number of criteria, the Choquet integral represents all their possible combinations, by specifying 2^N parameters. If 2^N is the power set of N (which includes all the

subsets of the set of criteria N), a fuzzy measure (or capacity) on N is defined as a set function μ: $2^N \rightarrow$ [0, 1], with the following properties:

$\mu(0) = 0$; $\mu(N) = 1$ (boundary conditions); (1)

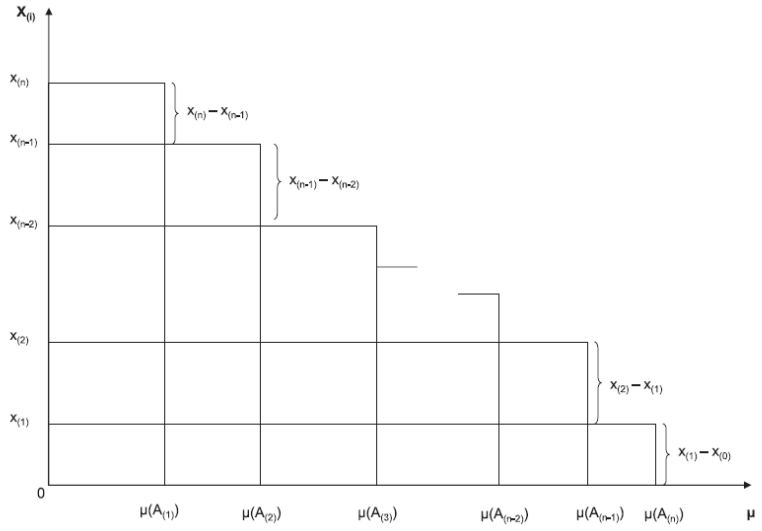
$\forall\, S \subseteq T \subseteq N$, $\mu(S) \leq \mu(T)$ (monotonicity condition). (2)

The value given by a fuzzy measure μ to a set of criteria S is represented by $\mu(S)$. In a multiple criteria decision problem framework, this is related to the importance given by the decision-maker to the set of criteria S (Grabisch, 1996; Bottero *et al.*, 2014; Gomes *et al.*, 2015). A fuzzy measure is then said to be additive if $\mu(S \cup T) = \mu(S) + \mu(T)$ for any S, $T \subseteq N$ such that $S \cap T = \phi$; or non-additive otherwise. A fuzzy measure can also be super-additive if $\mu(S \cup T) \geq \mu(S) + \mu(T)$, in which case there is a so-called synergic effect; or sub-additive if $\mu(S \cup T) \leq \mu(S) + \mu(T)$, in which case a redundant effect is modelled.

Given a non-additive measure μ, and the criteria values of a particular alternative [x_1, x_2, …, x_n], the Choquet integral of the vector [x_1, x_2, …, x_n] with reference to a capacity μ is given by:

$$Ch([x_1, x_2, \ldots, x_n], \mu) = \sum_{i=1}^{n} \left(x_{(i)} - x_{(i-1)}\right) * \mu\left(A_{(i)}\right), \quad (3)$$

where (.) is an index permutation so that $x_{(i)} \leq x_{(i+1)}$, i = 1, 2, …n-1, $x_{(0)}$ = 0. A geometrical representation of the Choquet integral is presented in *Figure 2*.



Source: Bottero *et al.*, 2014, p.28.

Figure 2. **Geometrical Representation of the Choquet Integral**

In terms of practical applications, it is fundamental to determine capacity in order for the Choquet integral to reflect the preferences of the decision-makers. Because capacity is defined on the power set of N, however, the complexity of the problem becomes unmanageable for larger sets of criteria. As a response, simpler models have been proposed, such as k-additive capacities (Grabisch, 1997). Indeed, there are several applications of the Choquet integral with bi-capacities (which can be k-additive) (*e.g.* Grabisch *et al.*, 2002; Bottero *et al.*, 2014), offering a compromise between model flexibility and complexity. The use of the Choquet integral with a 2-additive capacity starts with the Mobius transformation (*cf.* Grabisch *et al.*, 2003; Bottero *et al.*, 2014) of the capacity μ as per equation (4):

$$a_T = \sum_{S \subseteq T} (-1)^{t-s} \mu(S) \; \forall T \subseteq N, s = |S|, t = |T|. \quad (4)$$

If $T = \{i\}$ is a singleton, then $\mu(\{i\}) = a(\{i\})$. Also, if $T = \{i, j\}$ is a couple of criteria, then $\mu(\{i, j\}) = a(\{i\}) + a(\{j\}) + a(\{i, j\})$. That said, a capacity μ on N is said to be 2-additive if, for all subset T of N such that $|T| \succ 2$, $a_T = 0$, there is a subset B of N such that $|B| = 2$, $a_B \neq 0$ (*cf.* Mayag *et al.*, 2011; Bottero *et al.*, 2014). Indices such as the Shapley value (Shapley, 1953) and the interaction index can be used in the MCDA context to measure the importance and interaction among criteria, respectively. The importance index (or Shapley value) of a criterion $i \in N$ with respect to a capacity μ is given by equation (5):

$$\varphi(\{i\}) = \sum_{T \subseteq N \{i\}} \frac{a(T \cup \{i\})}{|T| + 1}. \quad (5)$$

The interaction index between criteria $i, j \in N$ with respect to the capacity μ can be represented by formulation (6) (Murofushi, Soneda, 1993):

$$\varphi(\{i, j\}) = \sum_{T \subseteq N \{i,j\}} \frac{a(T \cup \{i, j\})}{|T| + 1}. \quad (6)$$

The Shapley index and the interaction index can fully describe a Choquet integral with reference to a 2-additive capacity, needing only n(n+1)/2–1 values to be defined. This is shown in equation (7) (Mayag *et al.*, 2011):

$$Ch([x_1, x_2, \ldots, x_n], \mu) = \sum_{i=1}^{n} \varphi(\{i\}) x_i - \frac{1}{2} \sum_{\{i,j\} \subseteq N} \varphi(\{i, j\}) |x_i - x_j|. \quad (7)$$

3. Application and Results

In this study, the Choquet integral was combined with cognitive mapping with the aim of identifying which payment instrument is overall preferred from users' perspective, and what determinants underlie payment instrument preferences in general. Following Ackermann, Eden (2001) and Ferreira *et al.* (2016a), the development of the cognitive map was initiated through a group meeting, *i.e.* a face-to-face session with experts or decision-makers with knowledge about the subject in question. In the current study, participants had to be available for two group meetings with an approximate duration of 4 hours each.

Because the literature on group decision-making suggests that the groups *"should have between 6 and 10 key individuals"* (Eden, Ackermann, 2004, p.618), our panel included four professionals from the banking sector and two bank customers, thus allowing different points of view (the banks' and the customers') to be confronted. The banking professionals were from different institutions and different hierarchical levels within them, and participant ages ranged from 20 to 50 years old. Because the emphasis with methods such as cognitive mapping is less *"on outputs per se and more* […] *on process"* (Bell, Morse, 2013, p.962), the procedures used can work well with any given group of decision-makers, as long as basic conditions (such as participants' familiarity with the topic and facilitator expertise) are met.

The process is inherently subjective, meaning that different results might be obtained with a different group; but this subjectivity is acknowledged as part of the method, and integrated within it. The constructivist nature of the method places the emphasis on the process; in particular, on the learning, negotiation and confrontation of different views which emerge in the development of cognitive maps. The following sections describe the steps followed in developing the collective cognitive map.

3.1 Developing the Collective Cognitive Map

The development of the map was kicked off in an initial group session, where participants were briefed on the purpose of the study, and the basic principles and procedures of the methods under use. They were then presented with a trigger question, aimed at initiating the debate and guiding the discussion throughout: *"Based on your values and personal experience, what factors influence customers' choice of payment instruments?"*.

Answers to this question were recorded through the "post-its technique" (Ackermann, Eden, 2001). Specifically, the participating decision-makers were asked to write down the determinants or factors underlying payment instrument choices (from their perspective) on post-its, following two basic rules: (1) each post-it should contain only a single factor; and (2) factors with a negative impact on choice should be signalled with a minus sign (–). The post-its were then stuck on large sheets of paper affixed to the wall, where they could easily be seen by all, and the process continued until participants felt they had reached "saturation" and, along with the facilitator, indicated they were content with the depth and breadth of determinants identified.

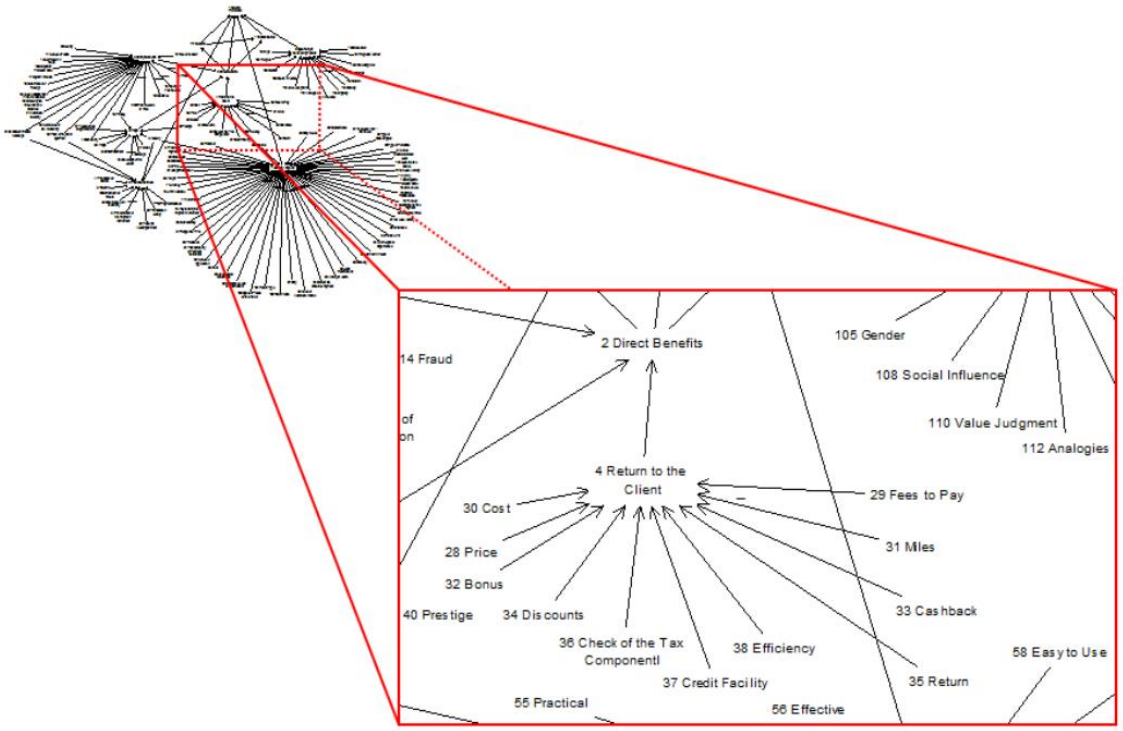
In the second stage, participants were then asked to group the post-its into clusters of related determinants, called "areas of interest". Like the first stage, this process was heavily based on discussion and the mutual exchange of ideas by all the participants. This process of learning and negotiation was then further reinforced in the third stage, in which participants were asked to examine and discuss each area of interest individually, in order to organize the determinants in each one hierarchically, in terms of importance and connection or causality to the others. Snapshots of the different stages of the structuring process described above can be seen in *Figure 3*.

Source: created by authors.

Figure 3. **Snapshots of the Application of the "Post-Its Technique"**

The resulting post-it map was recorded using the *Decision Explorer* software (www.baxia.com), and presented to the participants for further discussion and validation. *Figure 4* illustrates the final and validated version of the collective cognitive map obtained, in

which six main areas of interest were identified, reflecting the clusters of determinants that participants considered most relevant to payment instrument choices. These were: *security issues*; *profitability for the customer*; *image*; *services provided*; *usability aspects*; and *specific restrictions*.



Source: created by authors.

Figure 4. **Collective Cognitive Map**

Specifically, security issues pertain to customers' preoccupation in choosing payment instruments with issues such as the probability of exposure to fraud or forgery, the existence of additional security features an instrument might have, or the ability to check debited amounts and receive confirmation messages. Further determinants of security issues are the issue of privacy and credibility, which also affect the perceived image of the payment instrument. Other image-related determinants include the novelty of the payment instrument, its design and its perceived image, prestige and status.

Profitability for the customer is determined by the cost and any fees associated to a particular payment instrument, its price, bonuses or discounts associated to its use and its tax implications, among others. Clients' preferences are also affected by the services provided by different payment instruments, such as the level of control they allow, the existence of personal accompaniment in their use or the provision of transaction details; and are negatively affected by any prior communication failures associated to their use.

With regard to usability aspects, this is the largest cluster, encompassing over 45 determinants. These include speed, ease of use, convenience and usage restrictions of the method; as well as a negative impact of any bureaucratic aspects related to its application, or the need for additional funds or minimum amounts. Finally, specific restrictions (*i.e.* factors constraining the choice of payment methods) include gender, age, religion, culture and even the extent to which one is subject to external influence.

The importance of these six sets of factors, as measured by their degree of centrality, can be seen in *Table 1*. As the table also shows (see last column), some of the criteria (CRT) affect the decision problem under analysis positively, while others have a negative impact on the decision, thus in this case the corresponding attributes should be minimized rather than maximized (*cf.* Bottero *et al.*, 2014).

Table 1. **Degree of centrality of customer's preference factors**

Criterion	Map reference	CRT	Centrality score[(a)]	Effect
Usability aspects	7	01	50	↑
Security issues	3	02	21	↑
Specific restrictions	8	03	15	↓
Profitability for the customer	4	04	12	↑
Services provided	6	05	12	↑
Image	5	06	11	↑

Notes: (a) Centrality Score = (#In) + (#Out).

Source: created by authors.

In the next stage, during a second group meeting, combinations of criteria were analyzed for the application of the Choquet integral.

3.2 Application of the Choquet Integral

Based on the criteria identified in *Table 1*, the decision-makers were invited to analyze hypothetical combinations of criteria. A battery of questions of the type: *"How do you evaluate a scenario where usability aspects and security issues are good, while all the other criteria are bad?"* allowed the last column of *Table 2* to be filled in based on a 10-point scale, where "0" indicated a combination that was not desirable at all, and "10" indicated a combination considered highly attractive (Bottero *et al.*, 2014). As with the mapping stage described above, this process was based on continuous discussion between the participants. *Table 2* presents all the possible combinations among the six criteria (*i.e.* 2^6), and their respective evaluations, where "B" stands for a bad performance and "G" for a good one.

Table 2. Criteria interaction

CRT01	CRT02	CRT03	CRT04	CRT05	CRT06	Evaluation
B	B	B	B	B	B	0
G	B	B	B	B	B	2
B	G	B	B	B	B	2
B	B	G	B	B	B	1
B	B	B	G	B	B	1
B	B	B	B	G	B	2
B	B	B	B	B	G	1
G	G	B	B	B	B	5
G	B	G	B	B	B	4
G	B	B	G	B	B	3
G	B	B	B	G	B	4
G	B	B	B	B	G	3
B	G	G	B	B	B	3
B	G	B	G	B	B	3
B	G	B	B	G	B	4
B	G	B	B	B	G	3
B	B	G	G	B	B	3
B	B	G	B	G	B	4

Table 2 *(continuation)*. Criteria interaction

B	B	G	B	B	G	3
B	B	B	G	G	B	4
B	B	B	G	B	G	3
B	B	B	B	G	G	3
G	G	G	B	B	B	6
G	G	B	G	B	B	7
G	G	B	B	G	B	7
G	G	B	B	B	G	6
G	B	G	G	B	B	5
G	B	G	B	G	B	6
G	B	G	B	B	G	5
G	B	B	G	G	B	6
G	B	B	G	B	G	5
G	B	B	B	G	G	5
B	G	G	G	B	B	6
B	G	G	B	G	B	6
B	G	G	B	B	G	5
B	G	B	G	G	B	6
B	G	B	G	B	G	5
B	G	B	B	G	G	6
B	B	G	G	G	B	4
B	B	G	G	B	G	4
B	B	G	B	G	G	4
B	B	B	G	G	G	3
G	G	G	G	B	B	8
G	G	G	B	G	B	7
G	G	G	B	B	G	6
G	G	B	G	G	B	8
G	G	B	G	B	G	7
G	G	B	B	G	G	7
G	B	G	G	G	B	6
G	B	G	G	B	G	5
G	B	G	B	G	G	6
G	B	B	G	G	G	6
B	G	G	G	G	B	6
B	G	G	G	B	G	5
B	G	G	B	G	G	6
B	G	B	G	G	G	7
B	B	G	G	G	G	5
B	G	G	G	G	G	7
G	B	G	G	G	G	7
G	G	B	G	G	G	8
G	G	G	B	G	G	9
G	G	G	G	B	G	8
G	G	G	G	G	B	9
G	G	G	G	G	G	10

Source: created by authors.

Noteworthy in *Table 2* are the combinations indicative of synergies among criteria. For instance, the combination of CRT01 and CRT02 presents an evaluation of 5, which is higher than the "simple" sum of the importance of the two criteria (2+2). As shown in *Table 2*, situations like this are frequent, revealing the interactions and interdependencies among the criteria considered, an indication that conventional additive measures, such as the weighted average method, would not be suitable in this context (Bottero *et al.*, 2014).

In the following step, participants were asked to evaluate payment instrument alternatives *Ai* (with $i = 1, 2, \ldots, 5$) (*i.e.* cash (A1), electronic cards (A2), credit transfer orders (A3), direct debit (A4) and checks (A5)), with reference to each criterion. A similar exercise

was performed for different transaction channels *Cj* (with *j* = 1, 2, …, 4) (*i.e.* Internet (C1), ATM/POS (C2), Phone banking (C3) and Mobile services (C4)). The judgments were made based on a 10-point scale, where "0" indicated a very low performance of the respective *Ai* or *Cj*, and "10" a very high performance. *Table 3* exemplifies this exercise with the value judgments obtained for A2.

Table 3. Evaluation of alternative A2

Alternative	CRT01	CRT02	CRT03	CRT04	CRT05	CRT06
A_2	8	4	8	2	1	3

Source: created by authors.

Having obtained the evaluations for all the hypothetical combinations of criteria (*Table 2*), as well as the appraisals of *Ai* and *Cj*, we were able to apply the Choquet integral and aggregate the indicators. Taking A2 as an example, mathematically this means that the initial scores of A2 (*i.e.* 8, 4, 8, 2, 1 and 3 for CRT01, CRT02, CRT03, CRT04, CRT05 and CRT06, respectively) were aggregated according to formulation (3), and using the weights established in *Table 2*. The result was 46. This procedure was conducted for all the payment instruments and transaction channels considered in this study. *Figure 5* summarizes the results obtained.

Payment Instruments

	Alternative 1 [Cash]		Alternative 2 [Cards]		Alternative 3 [Credit Transfer Orders]		Alternative 4 [Direct Debit]		Alternative 5 [Checks]	
Usability Aspects	8		8		7		8		5	
Security Issues	4		7		8		7		7	
Specific Restrictions	8	46	5	56	5	51	4	57	6	42
Profitability for the Customer	2		2		2		4		1	
Services Provided	1		4		3		5		2	
Image	3		5		2		2		2	

Transaction Channels [Non-Cash]

	Alternative 1 [Internet]		Alternative 2 [ATM/POS]		Alternative 3 [Phone Banking]		Alternative 4 [Mobile Services]	
Usability Aspects	7		8		4		5	
Security Issues	5		8		5		5	
Specific Restrictions	5	59	5	72	5	45	5	54
Profitability for the Customer	6		7		5		6	
Services Provided	7		8		4		6	
Image	4		4		3		5	

Source: created by authors.

Figure 5. **Overall Results of the Performed Evaluation**

The results indicate that the participants considered *direct debits* and *electronic cards* as the most important payment instruments in current use, while *checks*, perhaps unsurprisingly, were ranked last. With regard to transaction channels, participants considered

users' overall preferences lie with ATMs and POS. These results were provided to the participants for confirmation and discussion. This not only served to boost further analysis and debate, but allowed the results to be "validated" by the participants, who not only considered them an accurate reflection of their perceptions, but saw great value in the methods used for structuring the decision problem and helping assess payment instruments and transaction channels.

At a practical level, the results obtained are likely to be of particular interest in terms of banks' strategy development and investment planning at the distribution channel level.

Conclusion and Recommendations

Technological developments have justified an increase in the number and diversity of methods and instruments through which customers can make payments or transfer money. As these options have increased, so too have customers' expectations with regard to their characteristics. For banks, understanding these expectations is important, because they can help guide investment decisions, and ensure they are in accordance with (or even anticipate) customer demand. Banks must not only keep up with new technology; ideally, they should be able to incorporate it into products (payment instruments, in this case) which are compelling for their customers. Understanding the factors underlying payment instrument choices can help do that.

Accordingly, the aim of this study was to examine the determinants of payment instrument and transaction channel choices, with recourse to methodologies that would not only allow these elements to be identified, but might also be able to plot the cause-and-effect relationships between them, and evaluate the overall attractiveness of different alternatives. This was done through a combination of cognitive mapping with the Choquet integral. Cognitive maps are highly descriptive tools, and can serve to not only structure complex decision problems, but also identify the cause-and-effect relationships between the factors underlying them. As such, they serve an important role in terms of decision support (*cf.* Kitchin, Freundschuh, 2000; Ackermann, Eden, 2001; Canas *et al.*, 2015).

In the current study, six decision-makers were brought together for the development of a collective cognitive map pertaining to payment instrument choices. A total of 118 determinants were thus identified, and later divided into clusters and sorted in terms of importance within them. It is worth noting that in addition to the richness of information resulting from this exercise, the process through which it was developed itself, and the discussions on which it was based, were also part of the fundamental benefits provided by this methodological tool.

The six major clusters of determinants identified were: *security issues*; *profitability for the customer*; *image*; *services provided*; *usability aspects*; and *specific restrictions*. These were then combined for application of the Choquet integral, from which *direct debit* and *electronic cards* emerged as the preferred payment instruments, and ATMs and POS as the preferred transaction channels.

Despite the results obtained, and the advantages of the methodological tools used to do so, it is important to note their limitations. Assembling a panel of experts for the group sessions is almost always a challenge with such methods, which are furthermore characterized by high levels of subjectivity. While this is recognized and inherent to the process of cognitive mapping, it does limit the generalizability of the results. In this sense, it would be of interest

to replicate this study with a different group of decision-makers, for example, or in different cultural contexts. Methodological comparisons with other MCDA techniques would also be of great interest (for examples, see Zavadskas, Turskis, 2011; Zavadskas *et al.*, 2014). Advances are welcome and can reinforce the proposal presented here.

References

Ackermann, F., Eden, C. (2001), "SODA – Journey making and mapping in practice", in: Rosenhead, J., Mingers, J. (eds.), *Rational Analysis for a Problematic World Revisited: Problem Structuring Methods for Complexity, Uncertainty and Conflict*, Chichester: John Wiley & Sons, pp.43-60.

Ackermann, F., Eden, C., Pyrko, I. (2016), "Accelerated multi-organization conflict resolution", *Group Decision and Negotiation*, http://dx.doi.org/10.1007/s10726-016-9472-z.

Ahmadirezaei, H. (2011), "The effect of information technology in Saderat banking system", *Procedia – Social and Behavioral Science*, Vol. 30, No 1, pp.23-26.

Al-Somali, S., Gholami, R., Clegg, B. (2009), "An investigation into the acceptance of online banking in Saudi Arabia", *Technovation*, Vol. 29, No 2, pp.130-141.

Axelrod, R. (1976), *Structure of Decision the Cognitive Maps of Political Elites*, New Jersey: Princeton University Press.

Bargh, J., Chartrand, T. (1999), "The unbearable automaticity of being", *American Psychologist***,** Vol. 54, No 7, pp.462-479.

Baršauskas, P., Šarapovas, T., Cvilikas, A. (2008), "The evaluation of e-commerce impact on business efficiency", *Baltic Journal of Management*, Vol. 3, No 1, pp.71-91.

Bell, S., Morse, S. (2013), "Groups and facilitators within problem structuring processes", *Journal of the Operational Research Society*, Vol. 64, No 7, pp.959-972.

Bottero, M., Ferretti, V., Mondini, G. (2011), "Towards an integration in sustainability assessment: the application of the Choquet integral for siting a waste incinerator", in: *Proceedings of the 74th Meeting of the European Working Group "Multiple Criteria Decision Aiding"*, Yverdon-Les-Bains, Switzerland, pp.1-15.

Bottero, M., Ferretti, V., Pomarico, S. (2014), "Assessing different possibilities for the reuse of an open-pit quarry using the Choquet integral", *Journal of Multi-Criteria Decision Analysis*, Vol. 21, No 1/2, pp.25-41.

Brige, A. (2006), Building relationship with customers by using technological solutions in commercial banks of Latvia, *Baltic Journal of Management*, Vol. 1, No 1, pp.24-33.

Calisir, F., Gumussoy, A. (2008), "Internet banking versus other banking channels: young consumers' view", *International Journal of Information Management*, Vol. 28, No 3, pp.215-221.

Canas, S., Ferreira, F., Meidutė-Kavaliauskienė, I. (2015), "Setting rents in residential real estate: a methodological proposal using multiple criteria decision analysis", *International Journal of Strategic Property Management*, Vol. 19, No 4, pp.368-380.

Dangolani, S. (2011), "The impact of information technology in banking system: a case study in bank Keshavarzi Iran", *Procedia – Social and Behavioral Sciences*, Vol. 30, No 1, pp.13-16.

Dauda, S., Lee, J. (2015), "Technology adoption: A conjoint analysis of consumers' preference on future online banking services", *Information Systems*, Vol. 53, No 1, pp.1-15.

Dick, A. (2008), "Demand estimation and consumer welfare in the banking industry", *Journal of Banking & Finance*, Vol. 32, No 8, pp.1661-1676.

Eden, C. (2004), "Analyzing cognitive maps to help structure issues or problems", *European Journal of Operational Research*, Vol. 159, No 3, pp.673-686.

Eden, C., Ackermann, F. (2004), "Cognitive mapping expert views for policy analysis in the public sector", *European Journal of Operational Research*, Vol. 152, No 3, pp.615-630.

Egland, K., Gurst, K., Nolle, D., Robertson, D. (1998), "Banking over the Internet", *Quarterly Journal*, Vol. 17, No 4, pp.25-30.

Ferreira, F., Jalali, M. (2015), "Identifying key determinants of housing sales and time-on-the-market (TOM) using fuzzy cognitive mapping", *International Journal of Strategic Property Management*, Vol. 19, No 3, pp.235-244.

Ferreira, F., Jalali, M., Ferreira, J. (2016a), "Integrating qualitative comparative analysis (QCA) and fuzzy cognitive maps (FCM) to enhance the selection of independent variables", *Journal of Business Research*, Vol. 69, No 4, pp.1471-1478.

Ferreira, F., Jalali, M., Ferreira, J., Stanckevičienė, J., Marques, C. (2016b), "Understanding the dynamics behind bank branch service quality in Portugal: pursuing a holistic view using fuzzy cognitive mapping", *Service Business*, Vol. 10, No 3, pp.469-487.

Filipe, M., Ferreira, F., Santos, S. (2015), "A multiple criteria information system for pedagogical evaluation and professional development of teachers", *Journal of the Operational Research Society*, Vol. 66, No 11, pp.1769-1782.

Fiol, C., Huff, A. (1992), "Maps for managers: where are we? Where do we go from here?", *Journal of Management Studies*, Vol. 29, No 3, pp.266-285.

Frank, J., Brade, D. (2015), "How cognitive theory guides neuroscience", *Cognition*, Vol. 135, No 1, pp.14-20.

Gavrilova, T., Carlucci, D., Schiuma, G. (2013), "Art of visual thinking for smart business education", in: *Proceedings of the 8th International Forum on Knowledge Asset Dynamics (IFKAD-2013)*, Zagreb, Croatia, pp.1754-1761.

Gholami, R., Ogun, A., Koh, E., Lim, J. (2010), "Factors affecting e-payment adoption in Nigeria", *Journal of Electronic Commerce in Organizations*, Vol. 8, No 4, pp.51-67.

Gogoski, R. (2012), "Payment systems in economy: present and future tendencies", *Procedia – Social and Behavioral Sciences*, Vol. 44, No 1, pp.436-445.

Gomes, L., Machado, M., Rangel, L. (2015), "The multiple choice problem with interactions between criteria", *Pesquisa Operacional*, Vol. 35, No 3, pp.523-537.

Grabisch, M. (1996), "The application of fuzzy integrals in multicriteria decision making", *European Journal of Operational Research*, Vol. 89, No 3, pp.445-456.

Grabisch, M. (1997), "K-order additive discrete fuzzy measures and their representation", *Fuzzy Sets and Systems*, Vol. 92, No 2, pp.167-189.

Grabisch, M., Duchêne, J., Lino, F., Perny, P. (2002), "Subjective evaluation of discomfort in sitting position", *Fuzzy Optimization and Decision Making*, Vol. 1, No 3, pp.287-312.

Grabisch, M., Lebreuche, C., Vasnick, J. (2003), "On the extension of pseudo-boolean functions for the aggregation of interaction criteria", *European Journal of Operational Research*, Vol. 148, No 1, pp.28-47.

Hammond, K., Hamm, R., Grassia, J., Pearson, T. (1987), "Direct comparison of the efficacy of intuitive and analytical cognition in expert judgment", *IEEE Transactions on Systems, Man and Cybernetics*, Vol. 17, No 5, pp.753-770.

Hancock, D., Humphrey, D. (1997), "Payment transactions, instruments, and systems: a survey", *Journal of Banking & Finance*, Vol. 21, No 11/12, pp.1573-1624.

Ho, S., Ng, T. (1994), "Customers' risk perceptions of electronic payment systems", *International Journal of Bank Marketing*, Vol. 12, No 8, pp.26-38.

Indiveri, G., Chicca, E., Douglas, R. (2009), "Artificial cognitive systems: from VLSI networks of spiking neurons to neuromorphic cognition", *Cognitive Computation*, Vol. 1, No 2, pp.119-127.

Jalali, M., Ferreira, F., Ferreira, J., Meidutė-Kavaliauskienė, I. (2016), "Integrating metacognitive and psychometric decision making approaches for bank customer loyalty measurement", *International Journal of Information Technology & Decision Making*, Vol. 15, No 4, pp.815-837.

Junadi, S. (2015), "A model of factors influencing consumer's intention to use e-payment system in Indonesia", *Procedia – Computer Science*, Vol. 59, No 1, pp.214-220.

Kahn, C., Roberds, W. (2009), "Why pay? An introduction to payments economics", *Journal of Financial Intermediation*, Vol. 18, No 1, pp.1-23.

Kang, B., Deng, Y., Sadiq, R., Mahadevan, S. (2012), "Evidential cognitive maps", *Knowledge-Based Systems*, Vol. 35, No 1, pp.77-86.

Khare, A. (2011), "Customers' perception and attitude towards service quality in multinational banks in India", *International Journal of Services and Operations Management*, Vol. 10, No 2, pp.199-215.

Khare, A., Khare, A., Singh, S. (2010), "Role of consumer personality in determining preference for online banking in India", *Journal Database Marketing & Customer Strategy Management*, Vol. 17, No 3/4, pp.174-187.

Kitchin, R., Freundschuh, S. (2000), *Cognitive Mapping Past, Present and Future*, London and New York: Routledge.

Klein, J., Cooper, D. (1982), "Cognitive maps of decision makers in a complex game", *Journal of the Operational Research Society*, Vol. 33, No 1, pp.63-71.

Kokkola, T. (2010), *The Payment System*, Frankfurt: AM Main.

Lopes, D., Bana e Costa, C., Oliveira, M., Morton, A. (2014), "Using MACBETH with the Choquet integral fundamentals to model interdependencies between elementary concerns in the context of risk management", in: *Proceedings of the 3rd International Conference on Operations Research and Enterprise Systems*, Angers, pp.1-11.

Manrai, L., Manrai, A. (2007), "A field study of customers' switching behavior for bank services", *Journal of Retailing and Consumer Services*, Vol. 14, No 3, pp.208-215.

Martins, V., Filipe, M., Ferreira, F., Jalali, M., António, N. (2015), "For sale… but for how long? A methodological proposal for estimating time-on-the-market", *International Journal of Strategic Property Management*, Vol. 19, No 4, pp.309-324.

Masrek, M., Mohamed, I., Duad, N., Omar, N. (2014), "Technology trust and mobile banking satisfaction: a case of Malaysian consumers", *Procedia – Social and Behavioral Sciences*, Vol. 129, No 1, pp.53-58.

Mayag, B., Grabisch, M., Labreuche, C. (2011), "A representation of preferences by the Choquet integral with respect to a 2-additive capacity", *Theory and Decision*, Vol. 71, No 3, pp.297-324.

Montazemi, A., Qahri-Saremi, H. (2015), "Factors affecting adoption of online banking: a meta-analytic structural equation modeling study", *Information & Management*, Vol. 52, No 2, pp.210-226.

Murofushi, T., Soneda, S. (1993), "Techniques for reading fuzzy measures (iii): interaction index", in: *Proceedings of the Ninth Fuzzy Systems Symposium*, Sapporo, Japan, pp.693-696.

Palaima, T., Auruškevičienė, V. (2007), "Modeling relationship quality in the parcel delivery services market", *Baltic Journal of Management*, Vol. 2, No 1, pp.37-54.

Pinto, S., Ferreira, F. (2010), "Technological dissemination in the Portuguese payments system: an empirical analysis to the region of Santarém", *International Journal of Human Capital and Information Technology Professionals*, Vol. 1, No 4, pp.55-75.

Ramos, J., Ferreira, F., Monteiro-Barata, J. (2011), "Banking services in Portugal: a preliminary analysis to the perception and expectations of front office employees", *International Journal of Management and Enterprise Development*, Vol. 10, No 2/3, pp.188-207.

Reis, J., Ferreira, F., Monteiro-Barata, J. (2013), "Technological innovation in banking services: an exploratory analysis to perceptions of the front office employee", *Problems and Perspectives in Management*, Vol. 11, No 1, pp.34-49.

Shapley, L. (1953), "A value for n-person games", in: Kuhn, H. and Tucker, A. (eds.), *Contribution to the Theory of Games II*, Princeton: Princeton University Press, pp.245-266.

Sohail, M., Shanmugham, B. (2003), "E-banking and customer preferences in Malaysia: An empirical investigation", *Information Sciences*, Vol. 150, No 3/4, pp.207-217.

Tolman, E. (1948), "Cognitive maps in rats and men", *The Psychological Review*, Vol. 55, No 4, pp.189-208.

Wellman, M. (1994), "Inference in cognitive maps", *Mathematics and Computers in Simulation*, Vol. 34, No 2, pp.137-148.

Zavadskas, E., Turskis, Z. (2011), "Multiple criteria decision making (MCDM) methods in economics: an overview", *Technological and Economic Development of Economy*, Vol. 17, No 2, pp.397-427.

Zavadskas, E., Turskis, Z., Kildienė, S. (2014), "State of art surveys of overviews on MCDM/MADM methods", *Technological and Economic Development of Economy*, Vol. 20, No 1, pp.165-179.

MOKĖJIMO PRIEMONIŲ ALTERNATYVŲ VERTINIMAS TAIKANT KOGNITYVINĮ PLANAVIMĄ IR CHOQUETO INTEGRALĄ

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SANTRAUKA

Vykstant technologinei pažangai, taip pat augant pirkėjų lūkesčiams, susijusiems su paslaugomis, padidėjo mokėjimo priemonių ir perdavimo kanalų pasirinkimas. Tyrime siūloma metodologinė sistema, kuria siekiama atskleisti veiksnius, lemiančius vartotojų tam tikrų mokėjimo priemonių pasirinkimą, taip prisidedančius prie geresnio bankų pasirengimo paskirstymo kanalo. Tyrime, siekiant sudaryti pasirinkimo problemą, pasitelkus socialinio konstruktyvizmo epistemologinį požiūrį, taikomas kognityvinis modeliavimas ir Choqueto integralas bandant nustatyti bendrai vartotojams labiausiai priimtiną mokėjimo priemonę. Iš gautų rezultatų matyti, kad *tiesioginio debeto operacijos* ir *elektroninės kortelės* yra dažniausiai pasirenkamos mokėjimo priemonės, o *bankomatai* ir *pardavimo vietos terminalai* – dažniausiai pasirenkami perdavimo kanalai. Nors tyrime susitelkiama ties procesu (t. y. turi būti atsižvelgta į aplinkybes ir tyrimo dalyvius, ekstrapoliacijos neatlikus derinimo nepatartinos), šiame tyrime dalyvavę ekspertų grupės nariai įvertino sistemą kaip informatyvią ir praktiškai svarbią strateginiam planavimui.

Siekiant suprasti pirkėjų mokėjimo priemonių pasirinkimą, jį lemiančius veiksnius ir jų sąveiką, bendras kognityvinio modeliavimo ir Choqueto integralo naudojimas gali būti labai naudingas. Nebuvo rasta jokio ankstesnio tyrimo, kuriame tokiame kontekste būtų bendrai naudojamos šios dvi metodologijos.

REIKŠMINIAI ŽODŽIAI: Choqueto integralas, kognityvinis modeliavimas, sprendimų priėmimas, mokėjimo priemonės, strateginis planavimas.