

## **Information Search on the Web as a double-loop learning process**

### **Abstract**

The aim of this study is to re-examine the information search process on the context of the Internet, as a tool that emerges in the stage of searching for information in the consumer decision making process. Using an exploratory and descriptive method, the naturalistic method, one can better understand how the virtually unlimited amount of information can be treated by consumers.

There is no doubt that the Internet has a big impact on the consumer behaviour regarding information search. However, under what conditions and how this impact will be felt is not completely clear yet. The main conclusion that can be currently drawn is that the broad generalizations about the impact of Internet on the consumer behaviour when searching for information are not guaranteed.

The demand for information is no longer limited to looking at so-called search engines or at individual sites. Currently, we are faced with a reality in which the user becomes not only a producer of information, but also able to organize the content that he or she gathers.

This general change justifies further research in the field of accessing and processing information by consumers, and, as this problem gradually interests a larger number of people, an attitude of exploration is generally recommended to tackle this problem.

This research follows a qualitative approach focus on the natural process of searching information generated in a *quasi-experimental* framework. The aim is to directly and almost internally observe the decision making process in searching information on Internet. The frame of observation registers all the events that appear on the computer screen of the participants in a video recording, as well as a sound recording of the participants' commentaries. Finally, the actions undertaken by participants are based on tasks elaborated from direct observation.

The main result obtained is that the information search, on the level of the task, is a generalized learning process, in the following sense: on one hand, it consists, first and

foremost, of an acquisition process of relevant information; on another, it consists, predominantly, of a process of discovery and control of methods of information search. At the end, a general structure emerges as a double-loop learning process. Therefore, the regular use of the methods and heuristics by the consumers is a fundamental challenge for the companies.

**Keywords:** Information Search, Consumer Behaviour, Learning, Search Engine Marketing, Naturalistic Methods.

## **1 Introduction**

In the traditional context of purchase, consumer behavior has received much attention, with a number of models having been developed concerning the buying process (Brassington & Pettitt, 2003; Engel, Blackwell & Miniard, 1995, Hoyer & MacInnis, 2006; Schiffman & Kanuk, 2003), and several general reviews of the literature, for example, Newman (1977) and Srinivasan (1990). In each of these models, the first stage is usually identified as the phase of information search. For companies, this phase is clearly important, since it's when promotional messages should reach the consumer. As in many other phases of the buying process, the demand for information becomes more structured and confined in the new Internet environment. In particular, the ability to collect information about the products and compare different product offerings from different vendors, possibly beyond national borders and in multiple currencies, is often seen as a major competitive challenge of the Web.

For many authors and experts, Internet represents the ultimate panacea for the consumer. In fact, the noise about the alleged benefits that the Internet offers to consumers is unprecedented. Foremost among the claimed benefits is the amount and quality of information individually customized that Internet can provide with a minimum effort and cost, which facilitates better decision making and makes the process of decision-making efficient (Alba, Lynch, Weitz, Janiszewski, Lutz, Sawyer, & Wood, 1997; Bakos, 1991; Widing II & Talarzyk, 1993). For example, Underhill (1999: 216) states that, through the internet, there are limitless amounts of information and other reference materials from one product that can be accessed and stored in that very moment, a far cry from what's made possible by brochures, manuals, and salespeople in the real world. More specifically, Klein & Ford (2003) note that the wealth of information freely available at thousands of sites almost leveled the playing field for both buyers and sellers, even referring that now, in some situations, buyers have the upper hand.

The phase of information searching is directly linked to an amount of uncertainty, either because the task is badly defined or due to an element of uncertainty into what the user is able to obtain and accept as a result of the process. Moreover, inside a non-depreciable repertoire of strategies to employ at this stage of information sought, the problem may be how to know which of the search strategies will prove to be the most effective. On the Web, the distance between the supplier and user of this information is especially acute. For example, often the

user's identity is unknown, and users often do not realize how the search engines they use are conducting the process of search.

## **2 Theoretical elements**

The increasing interest on the Web and, in particular, the business transactions through this medium, as well as the widespread recognition that the Internet is beginning to be seen as a serious alternative purchasing channel to traditional markets, has produced several approaches to the challenges associated with this phenomenon. A set of approaches is linked to areas such as business models and competition (Bakos & Brynjolfsson, 2000; Brynjolfsson & Smith, 2000; Chatterjee, 2004; Dai & Kauffman, 2002; Lynch & Lundquist, 1996), and other authors sought to exploit the nature of the shopping experience in order to try and understand the consumer behavior on this new channel (Alba *et al.*, 1997; Gupta, Bo-Chiuan & Walter, 2004; Häubl & Trifts, 2000; Lynch & Ariely, 2000). Particularly interesting to our case are the approaches to the point of view of information searching on the Web (Butler & Peppard, 1998, Dandouau, 2001; Johnson, Moe, Fader, Bellman & Lohse, 2004; Klein & Ford, 2003; Peterson & Merino, 2003; Ylikoski, 2005). Others still, accepting the fact that the purchases, in a consumer society, are a major arena for social interaction, recognized the potential of the Web to redefine social relations and community. Thus, it is not surprising to find, in this environment, the reality of the existence of a growing sense of community with little awareness of national and cultural borders (Belk & Tumbat, 2005; Cova & Cova, 2001; Kozinets, 2001, 2002; Muñiz & O'Guinn, 2001; Muñiz & Schau, 2005; Tapscott, 1998).

The information searching in marketing got its first publications in the late 1960s, particularly in the accuracy of the influence of various sources of information on consumers (Claxton, Fry & Portis, 1974; Robertson, 1971; Udell, 1966). Newman & Staelin (1972), for example, identify as main sources of information: the point of sale, friends and neighbors, print brochures, advertising on television, and articles and other published works. The consumer experience had already been identified by Udell (1966) as the main and most significant source, representing a third of the total percentage of the sources used by consumers. Robertson (1971) identifies friends as responsible for half the percentage of all sources of information used by consumers, and reveals the existence of the opinion and advice from experts as a valid source to consider as well. All these sources of information in the search process had a fundamental importance in the role that advertising has come to play in the process of consumer purchase.

Consumer behavior when searching for information includes what is called the demand of internal and external information search (Bettman, 1979; Engel, Blackwell & Miniard, 1995). By definition, the demand for internal information involves memory and occurs before the search of external information. The demand for external information refers to everything that does not include the memory usage. Although the internal and external information searching behaviors are conceptually distinct, in reality they are closely related because the demand for external information is dependent on the memory and the global information searching process is iterative. Unless a consumer is a complete blank slate with respect to a particular subject or topic, memory must be involved somehow in every task of searching information and, by necessity, must be the starting point for anyone searching information (Bettman, 1979).

Most of the research on external demand for information focused on the conscious efforts of consumers to gather information on certain specific purchases, with the overall purpose of reducing uncertainty and risk. The research focused on the continued searching information investigated information search as a hedonic recreation or entertainment (Babin, Darden & Griffin 1994; Dhar & Wertenbroch, 2000; Hirschman & Holbrook, 1982), as the role of the market maven (Abratt, Nel & Nezer, 1995; Feick & Price, 1987; Wiedmann, Walsh & Mitchell, 2001; Williams & Slama, 1995), and in the long-term involvement with a product or service (Bloch, Sherrell & Ridgway, 1986).

Searching information on the Web is like surfing on the ocean, i.e. with widespread availability of time and complexity. Unfortunately for the consumer, on a search engine there are often situations where the first search does not provide satisfactory results. For example, it can lead to an outcome in which neither sites nor information sources are available, or a large number of sites can be found, and, although these sites may be listed in order of relevance through an algorithm, it may still be difficult to find what you want. Such situations will force the user to develop a search strategy, during which he will attempt an alternative set of terms and combinations of these terms. Often, this involves widening or narrowing the strategy.

The evidence in the process of searching information gives the idea of a succession of decisions that guide subsequent actions. A deeper look gives the idea of a succession of operations sequence of actions/evaluations, so the learning aspect is important. This approach of micro-decisions leads to the classic literature of decision making (March & Simon, 1958, Payne, Bettman & Johnson, 1993; Tversky & Kahneman, 1974).

### **3 The research strategy**

The research focuses our attention on the real people who perform real tasks in real conditions (Klein, Orasanu, Calderwood & Zsombok, 1993; Lipshitz, Klein, Orasanu & Salas, 2001), focusing on the process by which decisions are taken. The research is about observing the performance of online information searching in the personal environment of the computer of each participant, i.e., a real situation. Indeed these are real sites, not web pages created for the "experience" as it is generally applied in other researchs (Ariely, 2000; Bruner & Kumar, 2000; Coyle & Thorson, 2001; Häubl & Trifts, 2000; Lynch & Ariely, 2000; Mandel & Johnson, 2002). The set of participants consists of people who use Internet in their professional activities, and therefore consists mainly of skilled participants.

The data consists of three different types of material, specifically: records and videos of sessions of information searching; observation notes; and a questionnaire. The data used was compiled into two sessions of information searching.

Thus, in this study, we used a non-probabilistic and unintentional sampling methodology administered by criteria of convenience and availability of participants (Schiffman & Kanuk, 2003). The convenience sampling is particularly suited and often used for generating ideas in exploratory researches. The convenience samples can easily be justified in an exploratory stage of research as a basis for hypothesis generation (Kinnear & Taylor, 1995, Churchill & Iacobucci, 2001) and also for studies where there is not the risk of imprecision about the generalized result of the study (Kinnear & Taylor, 1995).

The observation of various forms of online searching information is thus favored for its relationship with reality. The process of searching information on Internet by the participants is initiated by a project that takes the form of a set of scenarios. Four scenarios are designed. The first scenario is about finding a route between two cities, corresponding to a situation of information searching where the challenge and motivation are weak. The second scenario is about finding a DVD movie, redirecting to a situation where the challenge is weak and the motivation is high. The third scenario is to find a trip or holiday, which corresponds to a situation where the challenge and motivation are both high. Finally, the fourth scenario to find a laptop returns to a situation where the challenge is high and motivation is weak.

The sessions were held in a room properly arranged. A microphone was connected to the converter and it was asked of the participants to talk aloud during the sessions, so it was easier

to identify their intentions and goals (Newell & Simon, 1972, Ericsson & Simon, 1984). Their comments were recorded on video simultaneously. 1184 actions were coded. The task of data encoding used the process-tracing techniques originally applied in experimental studies in psychology and especially adopted for studies on decision making (Beach & Mitchell, 1978, Newell & Simon, 1972; Payne, Bettman & Johnson, 1993). More recently, Lurie (2004) used the same techniques in his study of interactivity on the Web.

The research in this area often completes the analysis of choice and judgment conducted with the process-tracing, with the verbal reports of the process during the task execution, and the monitoring of information searching and response time (Svenson, 1996). It seems to us essential to reaffirm that the use of the method based on process-tracing is consistent with the idea that understanding the decision process should be analyzed from a microscopic point of view and not by indirect interpretations of large global data (Simon, 1982).

#### **4 The process of data analysis**

The direction of the analysis proposed above was initiated with the categorization of the operations performing dependent of their nature. We found eight categories of operations, described in Table 1.

Table 1:  
**Categorization of the operations**

<b>Operation</b>	<b>Description</b>
External search	Categorizes operations mainly on the search engines;
Internal search	Categorizes the search operations carried out only from the information contained on the site;
Direct address	Categorizes operations directly from the address bar of the browser;
Favorite	Categorizes operations using shortcuts site addresses registered on the browser favorites;
Action	Categorizes the operations performed by the user, for example, filling out a form;
Failure	Categorizes the operations that indicate that the user did not finish the task;
Evaluation	Categorizes the operations in the course of which the user becomes aware of the offer alternatives;
Decision	Categorizes the operations choose by the user between all the alternatives.

The process of searching information can be examined more clearly by studying the types of operations employed in accordance with their transition probabilities. Figures 1, 2, 3 and 4 represent the observed frequency in each category for the whole set of transactions. Table 3 presents the general matrix of transition of the operations in all of the tasks performed. For its calculation, a reclassification of the initial coding was performed following two stages of evolution, considering for each elementary operation its position at a time  $t$  and  $t + 1$ . Therefore, through all the operations, we can measure the likelihood of transaction from an operation to another.

#### 4.1 The general analysis of the operations transitions

In order to provide better readability of the entire dynamics of the process, we represent the context of transitions in the form of graphic representation in Figure 1. The graph shows all transitions whatever their probabilities, i.e. the representation is complete regardless of the significance of the transition.

Table 2:  
**Chi-square test for the transitions matrix**

	Value	ddl	Sig.
Pearson Chi-2	1123,576(a)	49	,000
Likelihood Ratio	1029,290	49	,000
Linear-by-Linear Association	20,516	1	,000
N Valid	1117		

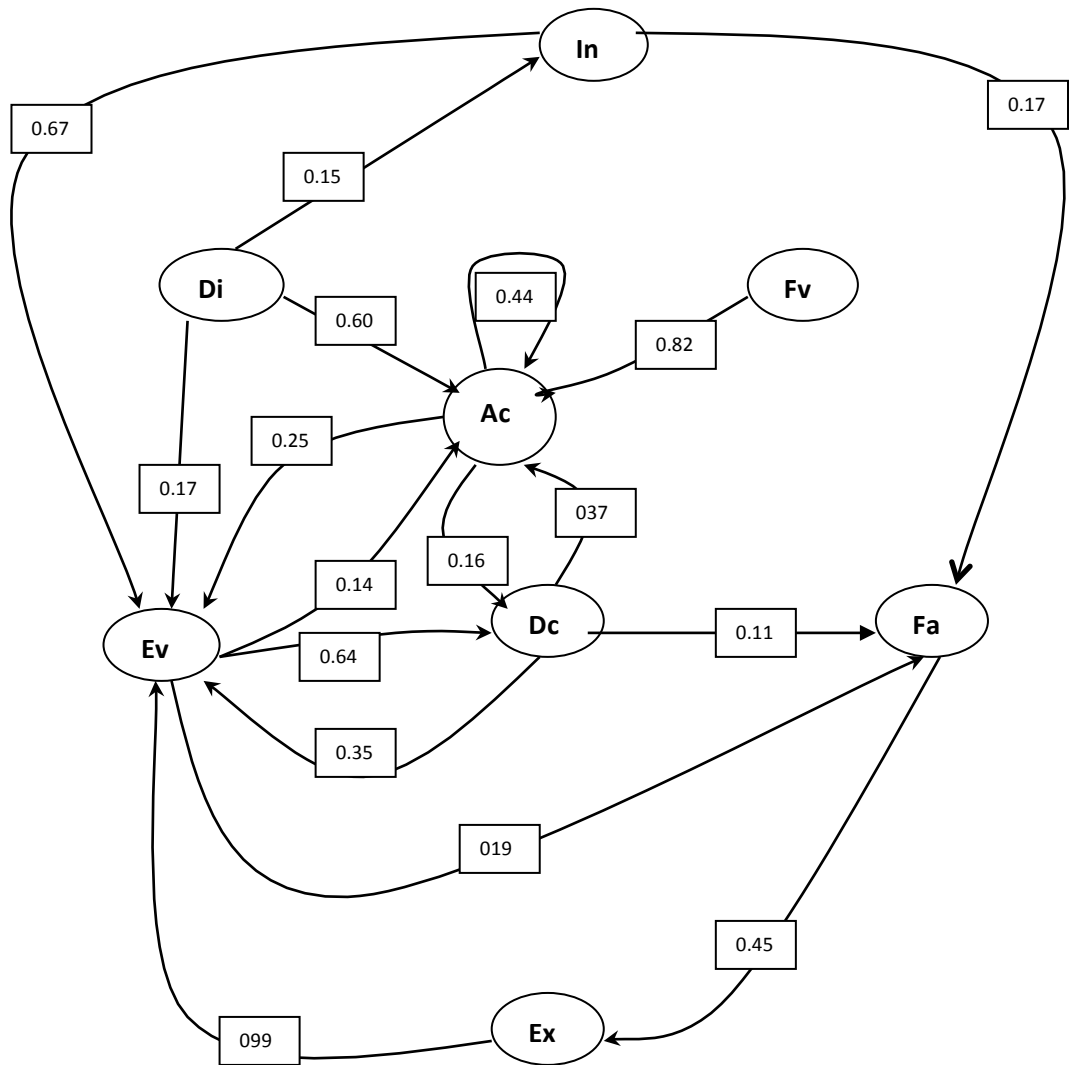
a 30 cells (46,9%) have expected count less than 5.  
The minimum expected count is ,02.

The Chi-square test of 1123.576 with 49 degrees of freedom has a good significance, which gives a strong dependence of the states  $t$  to  $t+1$ . Subsequently, to verify the stability or configuration change, we have fragmented the data according to the range of the operation.



Table 3:  
**Conditional probability of the next operation**

			Type of operation (state t+1)								Total
			1 Direct address	2 Action	3 Decision	4 Evaluation	5 Favourite	6 External search	7 Internal search	8 Failure	
Type (state t)	1 Direct address	Count	0	29	2	8	0	0	7	2	48
		%	,0%	60,4%	4,2%	16,7%	,0%	,0%	14,6%	4,2%	100,0%
	2 Action	Count	1	150	55	84	0	20	11	21	342
		%	,3%	43,9%	16,1%	24,6%	,0%	5,8%	3,2%	6,1%	100,0%
	3 Decision	Count	10	74	9	70	1	8	4	22	198
		%	5,1%	37,4%	4,5%	35,4%	,5%	4,0%	2,0%	11,1%	100,0%
	4 Evaluation	Count	1	40	183	0	0	3	2	55	284
		%	,4%	14,1%	64,4%	,0%	,0%	1,1%	,7%	19,4%	100,0%
	5 Favourite	Count	0	9	0	1	0	0	1	0	11
		%	,0%	81,8%	,0%	9,1%	,0%	,0%	9,1%	,0%	100,0%
	6 External search	Count	0	0	1	102	0	0	0	0	103
		%	,0%	,0%	1,0%	99,0%	,0%	,0%	,0%	,0%	100,0%
	7 Internal search	Count	0	3	2	20	0	0	0	5	30
		%	,0%	10,0%	6,7%	66,7%	,0%	,0%	,0%	16,7%	100,0%
	8 Failure	Count	4	36	9	0	1	46	5	0	101
		%	4,0%	35,6%	8,9%	,0%	1,0%	45,5%	5,0%	,0%	100,0%
Total		Count	16	341	261	285	2	77	30	105	1117
		%	1,4%	30,5%	23,4%	25,5%	,2%	6,9%	2,7%	9,4%	100,0%

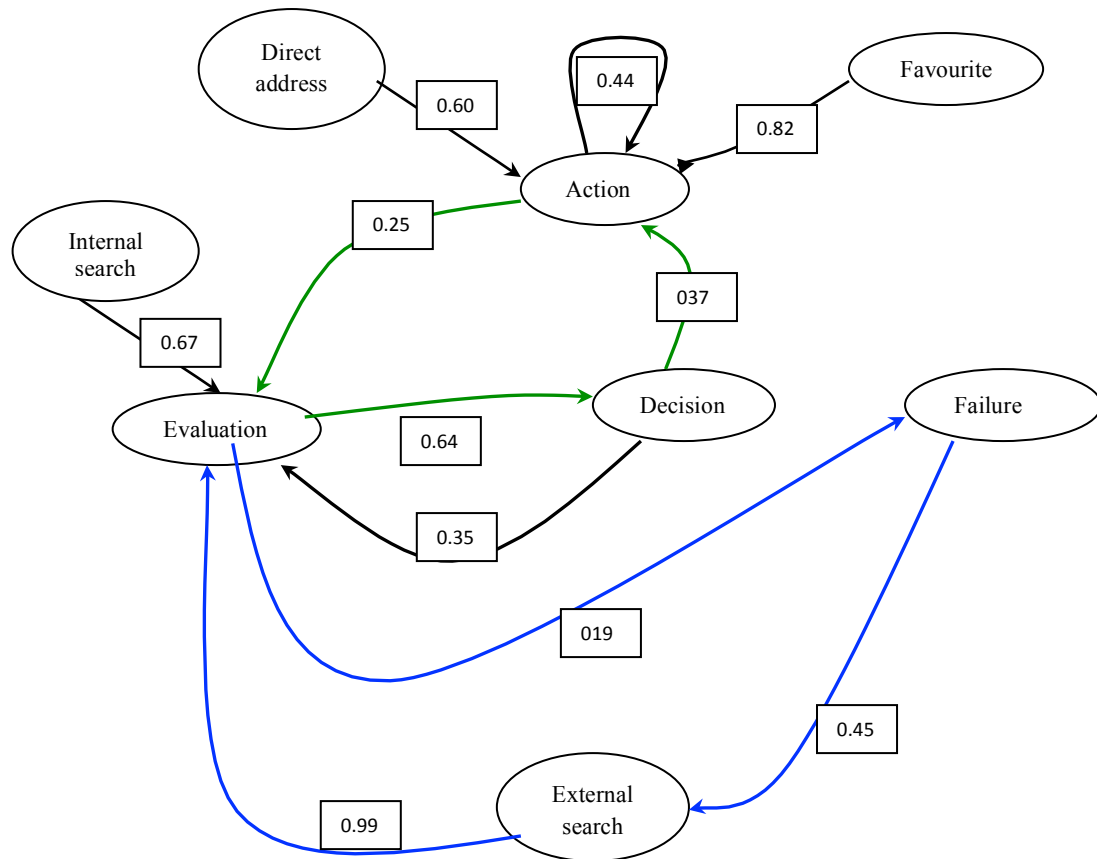


In : Internal search	Ex : External search
Ev : Evaluation	Ac : Action
Di : Direct address	Dc : Decision
Fa : Failure	Fv : Favourite

**Figure 1. General operations transactions**

The elimination of low probability connections in the above graphical representation leads to the result in Figure 2. In turn, the figure reveals a particularly remarkable structure. Two major flow cycles animate the whole process. The first and main cycle consist of 'Action' ⇒ 'Evaluation' ⇒ 'Decision', associated with the progressive evolution toward the final result. It is formed by two variations, one on the way to a

iteration of 'Action' ( $p=0.44$ ). In this case, it clearly corresponds to the logical completion of forms, which, in turn, correspond to a trivial result. A second variation is formed by the return of 'Decision' to an 'Evaluation' ( $p=0.35$ ). In this case usually corresponds to an adjustment involving a search.



**Figure 2. Relevant process transitions**

A second cycle consists of 'Evaluation'  $\Rightarrow$  'Failure'  $\Rightarrow$  'External search' in relation to Failure. The nature of the External search suggests that this cycle corresponds to the search for a new method for information search, i.e. a new heuristic. In the two cycles there is a common element, a pivot: the 'Evaluation'. In reality, what lies before us, is a process of two cycles of learning popularized by Argyris (Argyris, 1976; Argyris & Schön, 1974).

Their analysis allows us to prove the existence of three types of operations that may trigger the initial process: 'Direct address', 'Favorites' and 'External search'. This

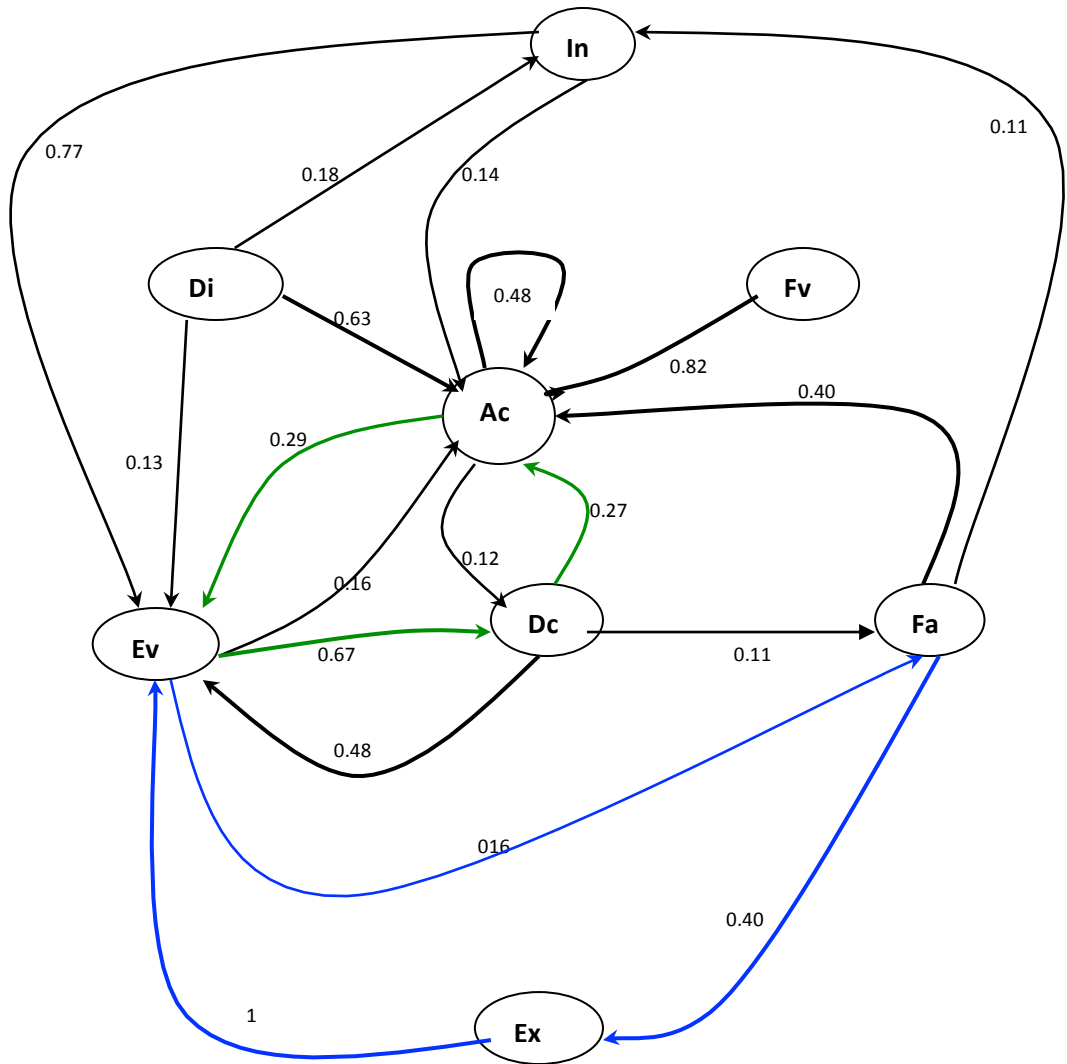
suggests two ways to start the search: either there is a clear idea of how to start searching information or whether goes directly to an 'External search'.

#### *4.2 The operations transition - An sectioned analysis*

The next step that arises is to know whether the process is stable over time or is taking other configurations. We will explore this issue by producing other matrices of transitions to two new situations: (1) Over the first ten operations, which will select the most common operations; (2) On the operations from the eleventh operation, that reflect the prolonged tasks.

##### *4.2.1 Operations transitions - the first ten operations*

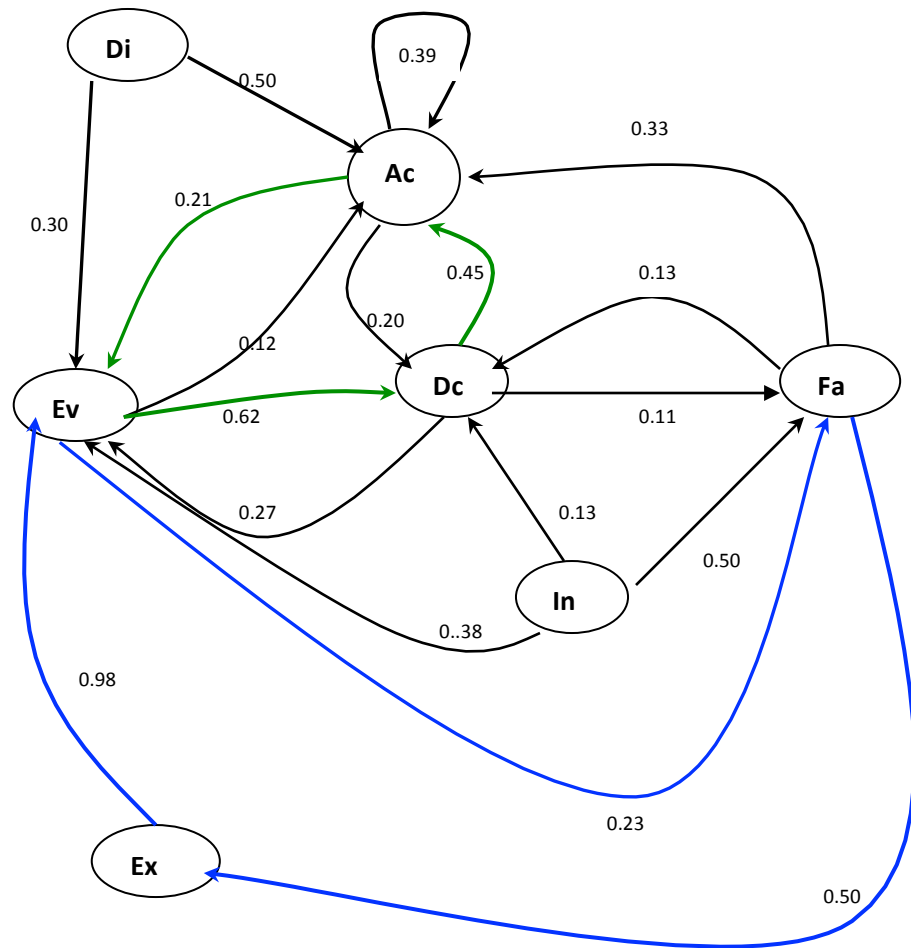
The first ten operations transitions are represented on Figure 3. As we can see, the two cycles identified above are strongly evident. The cycle represented in green, consisting of 'Action' ⇒ 'Evaluation' ⇒ 'Decision' and the second cycle, represented in blue, consists of 'Evaluation' ⇒ 'Failure' ⇒ 'External search'.



**Figure 3. The transitions for the first ten operations**

*4.2.2 Operations transitions - after the first ten operations*

The examination of the operations in longer periods also reveals the same structure. As can be seen in the figure 4, the overall structure is the same and remained unchanged throughout the process, however there are some variations in transition probabilities.



**Figure 4. The transitions for the tenth operation**

At a more detailed level of analysis, we can observe the same dynamics on the task environment where information search is performed, which means that searching is an accumulation of methods used, the combination of methods, the adaptation to situations, and strongly dependent on the skills of the user.

The general structure emerges as a double-loop learning process in accordance with the Argyris approach. The basic structure is the choice of a search method, following an 'Action' ⇒ 'Evaluation' ⇒ 'Decision'. According to the result, a new cycle is initiated until the achievement of a successful outcome; otherwise it is taken a decision to seek a new method.

It should be noted that the method chosen has a very important initial role. It can be divided into two families: a direct search as the use of a referenced page (favorite) or by accessing a search on a search engine. Therefore, to improve the customers' information search, it is necessary to extend the repository of direct search methods so that people can use other starting points and can improve the effectiveness of the search.

## **5 Conclusion**

The purpose of this study was to reexamine the process of information search on the Internet environment. Employing an exploratory descriptive method, the so-called naturalistic method, we managed to better understand how the virtually unlimited number of information is handled by consumers.

In this research, we explore the advantages that a naturalistic approach can add to the study of the information search. What interested us was accessing a fundamentally new approach to searching information as a phenomenon and explaining how different ways of information searching at a microscopic level affect the search process. To achieve this goal, we made use of a naturalistic methodology, and this approach has contributed to a new perspective of knowledge on how decisions are made.

We noticed that the process of information search on the Internet shows a particularly admirable main structure of a process, animated by two major cycles of operations flows: an initial fundamental cycle, composed by the operations 'Action' ⇒ 'Evaluation' ⇒ 'Decision' associated with the progressive development of the process towards the final result, and a second cycle, represented by 'Evaluation' ⇒ 'Failure' ⇒ 'External search', associated with failure. The nature of 'External search' in this cycle seems to match the research of a new heuristic for the search process. This result is consistent with the model of double-loop learning process enunciated by Argyris.

For enterprises, extending the repertoire of methods for consumers must be a goal because it is observed in the study that consumers' repertoires are composed of very few methods. The knowledge of a large number of methods will lead to an improvement in the process of information search by customers. Lastly, facilitating the choice of the method used by customers in accordance with the purpose of the search and skill level of the customer is equally an objective that enterprises should try to achieve.

This study is marked by its exploratory nature, which forces certain limits. One of the limitations is the weakness of the sample size, mainly because it is performed with a reduced effective, not statistically representative. This weakness limits the possibility of generalizing the results. However, the group of participants and the quasi-experimentation are adapted to the exploratory nature of the research. The research allows us, in fact, to study the process of information searching by consumers in their natural environment. New researches with more diversified and more representative samples should lead to more accurate results.

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