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Étude de l'attention portée aux différents liens d'une page de résultats de moteur de recherche et des facteurs influençant les comportements décisionnels des utilisateurs

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HEC MONTRÉAL

Comité d'éthique de la recherche

CERTIFICAT D'APPROBATION ÉTHIQUE

La présente atteste que le projet de recherche décrit ci-dessous a fait l'objet d'une évaluation en matière d'éthique de la recherche avec des êtres humains et qu'il satisfait aux exigences de notre politique en cette matière.

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Résumé

Ce mémoire par article vise à explorer les comportements des utilisateurs dans un contexte de recherche en ligne. Plus particulièrement, cette étude porte sur l'attention et sur la distinction faite par les utilisateurs entre les différents types de liens présents sur une page de résultats de moteur de recherche, tels que les liens annonces, les liens naturels, les liens spéciaux Google. A travers deux études en laboratoire, nous avons étudié les réactions de participants lors de tâches de recherche variées tournant autour du thème de l'assurance automobile. La première étude de nature exploratoire nous a permis une meilleure compréhension du sujet, puis la deuxième étude a servi à approfondir ces premiers résultats. L'analyse démontre que les utilisateurs ont une démarche d'esquive par rapport aux liens commandités, et nous avons également pu montrer l'influence de certains facteurs dans cette approche. Tout d'abord, nous avons observé qu'une bonne connaissance des moteurs de recherche menait à porter une attention plus poussée envers les liens annonces, mais à un choix de clic se portant plus volontiers sur les liens naturels. De même, une bonne connaissance du sujet (i.e., l'assurance automobile), menait à une plus grande attention portée sur les liens naturels. Les deux articles de ce mémoire présentent les résultats de nos deux études et offrent une meilleure compréhension de l'attitude des utilisateurs lors de recherche en ligne, sujet jusqu'alors peu exploré dans la littérature académique.

Mots clés : Moteur de recherche, comportements attentionnels, comportements décisionnels, recherche en ligne, assurance automobile, page de résultats

Méthodes de recherche : Études en laboratoire, oculométrie, analyse statistique, revue de littérature.

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AOI: Area of Interest

SEA: Search Engine Advertising

SE: Standard Error

SEO: Search Engine Optimization

SERP: Search Engine Result Page

UX: User Experience

Avant-propos

Ce mémoire a été rédigé par articles avec autorisation de la direction du programme de la Maîtrise ès sciences en gestion, spécialisation Expérience Utilisateur dans un contexte d'affaires.

Les consentements des coauteurs ont été préalablement demandés afin de les inclure au présent mémoire.

Le comité d'éthique de la recherche de HEC Montréal a approuvé les deux expériences ayant été menées respectivement en janvier et en mai 2022 (certificat d'approbation éthique n°2022-4854).

Le premier article regroupe les résultats de la première phase de l'étude et cherche à explorer les comportements des utilisateurs sur une page de résultats de moteur de recherche lorsque ceux-ci sont à la recherche d'information en ligne. Il a été présenté en juin 2022 à *HCI International* en tant que *Late Breaking Work - Poster*[1].

Le deuxième article a pour objectif d'approfondir la réflexion de la première étude, en proposant notamment une revue de la littérature, ainsi que les résultats de la deuxième expérience qui nous ont permis, par l'utilisation d'outils physiologiques, d'explorer plus en détails les conclusions tirées à la suite de la première phase du projet. Cet article sera soumis au journal *Multimodal Technologies and Interaction* de la revue MDPI.

[1] Puzzangara L., Coursaris C., Léger PM., Sénécal S. (2022) The influence of different types of results displayed on search engine result pages on users' behaviors. In "HCII 2022 - Late Breaking Work - Posters" Springer CCIS volumes of the Proceedings

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Chapitre 1 : Introduction

L'accès à l'information se fait aujourd'hui principalement grâce à Internet, qui représente une source de connaissances presque illimitée. Les moteurs de recherche sont les outils principaux pour accéder à l'information sur le Web et représentent un portail vers toute cette information disponible. En une minute sur Internet, environ 5,9 millions de recherches Google sont effectuées à travers le monde selon une estimation datant d'avril 2022 (Statista, 2022). C'est un chiffre considérable démontrant à quel point les moteurs de recherche, et plus particulièrement Google, se sont inscrits dans nos vies quotidiennes. Effectuer une recherche sur Internet est devenu plus facile et accessible, notamment grâce à de nombreuses innovations et mises à jour ayant eu lieu ces dernières années sur les moteurs de recherche, plus particulièrement sur Google, l'entreprise étant le leader et précurseur sur le marché des moteurs de recherche. L'expérience utilisateur sur ceux-ci est donc devenue unique et supposément plus satisfaisante. Depuis son lancement à la fin des années 90, le moteur de recherche Google a connu de nombreuses évolutions afin de justement offrir une expérience toujours plus agréable et simple d'utilisation. De nouvelles fonctionnalités, designs, types de lien n'ont eu de cesse d'être implémentés par l'entreprise pour aboutir au moteur de recherche que nous connaissons aujourd'hui.

Ce mémoire va se concentrer sur l'étude des types de liens présentés sur une page de recherche Google, et plus précisément sur l'interaction qu'ont les utilisateurs avec ceux-ci. Lorsque nous mentionnons ces différents types de liens, nous faisons référence aux divers formats de liens qui sont disponibles sur les pages de recherche. Cela comprend donc les liens naturels, ou liens organiques, qui sont les liens dits basiques sur Google et représentent les liens issus du référencement naturel des sites Internet. Ils s'opposent par exemple aux liens sponsorisés, ou annonces, dont nous allons également faire beaucoup mention dans ce mémoire. Ces liens, implémentés en 2006 sur Google (Google, s.d.) présentent la particularité d'être référencés généralement en top position sur les pages de recherche, et sont comme leur nom l'indique, commandités et donc payants. D'autres liens seront également mentionnés et étudiés, comme les liens "Résultats Zéro", qui englobent les fonctionnalités Google permettant d'accéder à l'information directement depuis la page de résultat sans avoir ni à cliquer sur un site, ni à faire défiler la page. Les extraits optimisés, définitions, autres questions posées font parties de ces résultats Google qui sont intéressants d'un point de vue de l'expérience utilisateur car très innovants. Ils proposent généralement les réponses aux questions posées sur le moteur de

recherche en rendant visibles des extraits ou définitions tirés des sites web sur la page de recherche. Tous ces liens permettent l'accès direct à l'information, d'une façon qui n'est pas forcément détaillée mais très facile d'accès afin d'obtenir une réponse courte et rapide à une interrogation. Ils ont commencé à être mis en place sur Google au milieu des années 2010 (Google, s.d.) et sont depuis constamment optimisés par l'entreprise. Nous avons enfin d'autres types de liens plus évidents, tels que les cartes et recommandations locales, offrant aux utilisateurs des résultats de recherche dans leur zone géographique et visible sur un plan, ou encore les résultats images, vidéos. En figure 1 ci-dessous, un exemple de page de recherche avec les principaux liens étudiés lors de notre recherche.

Figure 1 : Page de résultats avec exemples de liens étudiés

Ainsi, les moteurs de recherche ont connu une grande évolution, et l'expérience utilisateur devrait s'en trouver grandement améliorée. Cependant, selon une étude publiée en 2022 (ACSI, 2022), le score de satisfaction des utilisateurs avec Google a chuté à 75 points d'index sur 100 aux Etats-Unis cette année, ce qui représente le score le plus bas enregistré ces dernières années. Nous sommes donc à même de nous questionner sur cette chute de la satisfaction, et de façon plus générale, sur comment les utilisateurs interagissent avec les moteurs de recherche, quels sont leurs besoins, attentes et réflexions lors de leurs recherches en ligne.

A l'heure actuelle, les études concernant les moteurs de recherche, et plus précisément comment les utilisateurs interagissent avec ceux-ci, sont peu nombreuses. En effet, nous expliquerons dans le deuxième chapitre de ce mémoire où en est la littérature à propos de la recherche en ligne, et nous verrons que bien qu'un certain nombre d'études aient été faites sur la navigation sur le Web, très peu d'entre elles ont comme sujet d'étude principal les interactions avec les moteurs de recherche et les pages de résultats. Il s'agit cependant d'un thème intéressant et primordial pour les entreprises, qui face à la digitalisation, se voient obligées d'innover en termes de stratégies d'optimisation des moteurs de recherche (Search Engine Optimization, ou SEO) et donc de publicité sur les moteurs de recherche (Search Engine Advertising, ou SEA) également, afin d'avoir une meilleure présence en ligne et une offre toujours plus visible. Le SEA est défini comme le placement de liens annonces parmi les autres liens organiques, pour lesquels les entreprises payent un honoraire aux moteurs de recherche (Ghose & Yang, 2009). Il est donc important sous divers aspects d'apprendre à mieux comprendre l'expérience vécue par les utilisateurs sur les moteurs de recherche, de connaître leurs comportements, et ainsi de développer des stratégies plus efficaces. De plus, les dépenses en publicité sur les moteurs de recherche sont élevées et devraient encore plus augmenter selon les prévisions qui sont faites. En effet, au Canada en 2021, 5 milliards de dollars canadiens ont été dépensés en SEA, et les prévisions affirment que ce chiffre devrait augmenter jusqu'à 8 milliards de dollars d'ici 2025 (eMarketer, 2022), ce qui confirme l'importance d'étudier les comportements des utilisateurs face aux différents types de liens sur les pages de résultats de moteur de recherche.

1.1 Objectifs de l'étude et questions de recherche

Avec ce mémoire, nous avons pour objectif d'apporter plus de lumière sur le sujet des moteurs de recherche, des pages de résultats et surtout des interactions qu'ont les utilisateurs avec ces outils. Nous cherchons ici à mieux comprendre l'attention visuelle et la charge cognitive allouées à une recherche en ligne, et ainsi les comportements décisionnels des utilisateurs lors de la navigation sur les pages de résultats.

Pour atteindre cet objectif, nous avons pensé à plusieurs questions de recherche (RQ). Dans un premier temps, une question d'ordre générale serait la suivante:

RQ1: Dans un contexte de recherche de services en ligne, comment les utilisateurs traitent-ils l'information en fonction du type de liens présentés sur une page de résultats ?

Suite à cette question, d'autres interrogations plus précises seraient alors:

RQ2: Quels comportements récurrents peuvent-être observés chez les utilisateurs lors d'une recherche en ligne à travers l'étude de l'attention portée aux différents types de liens, et comment les utilisateurs les différentient-ils?

RQ3: Quels autres facteurs, de type individuels ou contextuels, sont susceptibles d'influencer le comportement des utilisateurs dans leur décision de navigation ?

Pour répondre à ces questions, nous avons mené deux études en laboratoire, avec un total de 41 participants répartis sur les deux études. Pour chacune des deux études, les participants avaient un ensemble de tâches à effectuer. Il s'agissait de tâches de recherche sur Google avec des scénarios différents, afin que nous puissions évaluer leur expérience à travers l'utilisation de divers outils et mesures qui seront décrits plus tard dans ce mémoire.

1.2 Contributions potentielles

Ce mémoire vise dans un premier temps à combler le manque d'études avec comme sujet les interactions entre utilisateurs et pages de résultats de moteurs de recherche. La littérature est pour le moment assez faible sur le sujet, et le peu d'études qui y sont dédiées sont dépassées. Avec l'évolution constante et rapide de ces outils, il est d'autant plus important d'avoir des

recherches actualisées et prenant en compte les nouvelles fonctionnalités maintenant disponibles sur Google.

Dans un second temps, combler la littérature et apporter plus de lumière sur les comportements utilisateurs lors de recherche en ligne sera automatiquement bénéfique pour les entreprises, les spécialistes du marketing et pour la recherche UX en général, apportant ainsi une dimension managériale à l'étude. Grâce à une meilleure compréhension des utilisateurs, de leurs besoins et de leur façon de gérer l'information lors d'une recherche sur le web, nous aurons une meilleure visibilité quant à comment appréhender les constants changements sur les moteurs de recherche, sur comment mieux mettre en valeur son offre sur Internet et sur comment proposer du contenu répondant aux attentes des utilisateurs. Il est d'autant plus important de connaître l'appréciation des utilisateurs pour les différents liens quand nous voyons à quel point les dépenses SEA sont importantes, comme mentionné précédemment.

1.3 Structure du mémoire

Ce mémoire est présenté sous forme de deux articles. Le premier article est concentré sur la description de notre première étude, qui était à titre exploratoire. Nous y présentons notre méthode, et nos premiers résultats qui ont servi de base à la construction de notre deuxième étude.

Le deuxième article est quant à lui une description de notre étude dans sa globalité. Nous y présentons une revue de la littérature et un résumé de notre première étude, servant de contexte à notre deuxième étude. Les résultats et conclusions du premier article y sont donc détaillés à nouveau. Celle-ci est ensuite décrite en détails: nous présentons notre méthode et nos résultats de façon précise, avant d'arriver à une conclusion et à une discussion générale de nos observations.

1.4 Informations sur l'article 1

Le premier article de ce mémoire a été soumis et présenté à la conférence HCI International 2022 en juin de cette année en tant que Late Breaking Work - Poster[2], sous le titre « The influence of different types of results displayed on search engine result pages on users' behaviors ». Il s'agit d'une description de notre première étude ayant été effectuée à titre exploratoire en janvier 2022, et propose une première approche de l'étude des comportements utilisateurs lors de la navigation sur une page de recherche. L'objectif ici était d'obtenir de premiers résultats et faire des constatations que nous pourrions ensuite approfondir lors d'une deuxième étude en laboratoire. Grâce à un ensemble de tâches de recherche à effectuer sur Google, notre première étude nous a permis de dresser de premières conclusions et de décider des thèmes à explorer lors de la deuxième étude.

1.5 Informations sur l'article 2

Le deuxième article constitue donc la continuité de notre première étude. L'objectif est d'approfondir les résultats de celle-ci en abordant les comportements utilisateurs sous différents angles. Cet article est destiné à être soumis au journal *Multimodal Technologies and Interaction* de la revue MDPI. Nous visons à mieux comprendre comment l'attention est attribuée aux différents liens d'une page de résultats, et comment les utilisateurs prennent la décision de cliquer sur un lien plutôt que sur un autre. Nous allons nous concentrer plus en profondeur sur les motifs récurrents pouvant être observés chez les utilisateurs lors d'une recherche en ligne. Cela comprend l'étude du phénomène d'esquive des publicités, mais également des facteurs influençant l'attention et la prise de décision sur les pages de résultats. La revue de littérature met ici en place un contexte théorique, tandis que la première étude met en place le contexte pratique nous ayant permis de mener à bien cette étude.

1.6 Contributions et responsabilités

[2] Puzzangara L., Coursaris C., Léger PM., Sénécal S. (2022) The influence of different types of results displayed on search engine result pages on users' behaviors. In "HCII 2022 - Late Breaking Work - Posters" Springer CCIS volumes of the Proceedings.

Étapes	Contribution
Définition des requis	Traduire les besoins du partenaire d'expérience en question de recherche et définition de la problématique – 50% • Définition des questions de recherche pour le mémoire • Besoins d'affaires préalablement établis par l'équipe d'opération et le partenaire
Revue de littérature	Définition des échelles et mesures à utiliser lors des études – 60% • Recherche dans la littérature pour certaines échelles, avec aide des codirecteurs • Aide du laboratoire concernant les outils physiologiques et utilisation de ressources déjà établies. Revue de littérature sur l'interaction des utilisateurs sur les pages de résultats – 100%
Design expérimental	Conception du design expérimental et protocoles de test – 50% • Réalisé en grande partie par l'équipe d'opérations. J'y ai spécifié les mesures nécessaires à la recherche et ai participé à l'écriture des scénarios.
Recrutement	Recrutement par le partenaire industriel, effectué en externe.
Collectes des données	Participation active aux activités de collecte – 75% • Prise de notes lors des tests nécessaires dans le cadre du projet (données d'observation) • Présence lors de toute la collecte • Modération à l'occasion
Analyse des données	Analyses statistiques – 75% • Aide de l'équipe et du statisticien de la Chaire pour le traitement des données
Rédaction	Écriture des articles du mémoire – 100% • Rédaction autonome avec corrections et pistes d'amélioration apportées par les coauteurs

Tableau 1 : Contributions et responsabilités dans les activités de recherche.

Chapitre 2: Article 1

The influence of different types of results displayed on search engine result pages on users' behaviors[3]

Laure Puzzangara, Constantinos Coursaris, Pierre-Majorique Léger, Sylvain Sénécal

Abstract

This research focuses on the influence of different types of results displayed on Search Engine Result Pages (SERP) on users' click behavior. The aim is to explore the users' behaviors through the context of online research to better understand the importance of differentiation between types of links and their positioning. A study was conducted to investigate this topic, through which several insights were identified. Firstly, our results suggest that there might be an avoidance pattern toward sponsored links. Secondly, we observed a great appreciation of Position Zero links despite a low click rate. Finally, we noticed that SERPs were not generating a lot of frustration, but that elements surrounding the links (i.e., the description, the title, etc.) could influence the users' appreciation of the websites and their searching behavior. As this study is exploratory, the results call for further research.

Keywords: Click behavior, Sponsored search advertising, Search engine optimization,

2.1 Introduction

Search engines, such as Google, have experienced a major growth in their usage within the last decade. In August 2021, the number of online research made in an online minute was estimated at 5,7 million, only through Google [13]. Search engines are then not only one of the primary sources of online traffic but also a great opportunity for companies and marketers. While using search engines for their research, users are able to choose between different types of links such as organic links, zero-click results (known as Position Zero), maps, or sponsored links [8]. The latest is particularly interesting for companies as they allow them to have their link among the

[3] Puzzangara L., Coursaris C., Léger PM., Sénécal S. (2022) The influence of different types of results displayed on search engine result pages on users' behaviors. In "HCII 2022 - Late Breaking Work - Posters" Springer CCIS volumes of the Proceedings.

first results displayed on a search engine result page (SERP). Worldwide, the amount spent on those sponsored links has grown increasingly since their debut and represented almost $145 billion U.S. of the total internet advertising spending in 2021, the second-largest amount after social media spending [9].

Thus, companies now have various ways of promoting their offers and through SERPs only. However, despite the increasing amount expected to be spent on sponsored links [9], there is very little research about how users process information when encountering sponsored links, and more generally how all different types of search results mentioned influenced their behavior and decision-making process when searching for information.

Through preliminary research and literature review, it has been observed that users' behavior while facing sponsored links can be influenced by some internal factors, such as mood and arousal [14]. Evidence supported that the user's state while surfing on a SERP, as to know their mood and arousal, has an impact on their appreciation of ad snippets. Another focus was put on the importance of keyword popularity on consumer click behavior [10]. The effect of an external factor, keyword popularity, was shown to also have a significant impact on the choice of sponsored links while searching for information online. It was observed that users tend to click more on sponsored links after a search using popular keywords. However, when it comes to the effect of the types of links and their positioning in the users' decision-making process while navigating through SERPs, very little research has been made. There is then a need to better understand the users' searching behavior when facing different types of links and how this can be efficiently put to use when implementing Search engine strategies.

This study aims at answering the following question: In the context of searching for information online, what is the influence on users' click-behavior of the different types of results displayed on the SERPs? Through this question, the research is intended to achieve three objectives. Firstly, to better understand the importance of positioning in SERP and its managerial implications. Secondly, to explore users' behaviors while facing the different types of results such as sponsored links or Zero Position results. Lastly, to identify potential search patterns in the users' behavior, such as a tendency to avoid the paid search links, easier access to Position Zero result, or an intensive search for organic results.

2.2 Method

To address this question, an exploratory study was conducted. Due to the sanitary conditions at the time of the data collection (January 2022), the research was performed online through the Lookback[4] platform [7, 16]. Lookback is a tool designed for usability testing and offers multiple features to conduct research. We mainly used it to instruct the participant and conduct our interviews remotely. A set of six tasks was asked of the participants, revolving around the theme of car insurance. In 2022, 62% of Canadians surveyed had car insurance [1]. Car insurance is also more likely to be shop for and even purchased online, as 19% of the Canadian respondents had stated having bought theirs through the Internet [1]. The objective was to collect data with regards to the searching journey a consumer can have while searching for a specific product or service; from a broader information search to a more precise information search, as consumers go through their decision-making process. The context of car insurance enabled us to design tasks that were the closest to this type of online searching journey and to observe potential variations in the users' behavior through different situations (i.e. searching for specific information, searching for a quotation, etc.).

In this study, Google was the search engine used during the experiment. Indeed, it is by far the most important search engine to consider, with approximately 87% of the U.S market share in 2022 [15]. Thus, it was appropriate to use the search engine the more used to have a better chance of suiting the participants' preferences and habits.

In order to better understand this study, the present Method section will be divided into the following subsections: Firstly, the sample and the participants' profiles will be described; then how the study was led through a Procedure subsection; and finally the different measures used will be presented.

2.2.1 The sample

To participate in this study, twelve participants in total were recruited, composed of seven women and five men, between 18 and 43 years old. The average age was 35 years old. The sample was composed of three participants having completed high school, eight had completed an undergraduate university program and one participant had earned a Master's degree.

[4] Lookback URL: https://www.lookback.com/

There were no exclusion criteria for this study, but the objective was to observe the users' behavior while searching online. Thus, the only condition for their participation was that they would be more likely to search for information by themselves and preferably only online (rather than calling directly their insurance company).

Finally, half of them already had car insurance for their vehicle in Canada, while the remaining six had not.

2.2.2 Procedure

Prior to the start of the experiment, all participants were asked to sign a consent form. Then, a pre-task questionnaire measuring their knowledge about search engines and car insurance was given to the participants to answer.

Six tasks were given to the participants in the same order, following a logic similar to a consumer's online searching journey (getting information from general to more specific, and getting a quotation). We choose not to randomize the order of the tasks to stay consistent with the consumer journey. It is more logical and less confusing for the participants if the tasks follow what they would do when searching for a service on their own. In this way, some of the tasks were only informational tasks, where the participants were asked to find some general or more specific information about car insurance, while some others were transactional, where the participant was asked to get a quote for car insurance. Those tasks were also imagined to evaluate if the participants' searching behavior varied across different tasks. To complete the tasks, the participants were given a two-minute time limit per task and were asked to act as naturally as possible and to conduct their research as they would do if they would do it at home.

For the first task, a short scenario was presented to the participants, asking them to imagine having just bought a new car and being in the very beginning of a car insurance purchase. They then needed to find general information about car insurance. In the second task, the participants were asked to get information about the concept of public liability. The third task was about finding the best prices for young drivers of 25 years old or younger. The fourth task was a transactional one: the participants were asked to get a quote for the insurance provider of their choice. The last two tasks were also informational. The fifth task was seeking information about the impact of COVID-19 on insurance prices and the sixth task was checking if their insurance would cover them if driving a friend's car.

After completing each task, participants were asked to answer a short questionnaire aiming to evaluate their experience through the task (satisfaction and trust in the information obtained, and perceived effort to complete the task). Then some questions were asked verbally by the moderator through a semi-structured interview to get insights into the search they just made. After completing all the tasks, a semi-structured interview was administered. During this last interview, questions about the participants' habits while searching for information online and about car insurance were asked, as were questions about sponsored links too. This aimed specifically to get the participants' opinions about sponsored links and to know if they noticed those links or not.

2.2.3 Measures

During the experiment, the Facereader software by Noldus (Wageningen, Netherlands) was used via Lookback, enabling us to collect the emotional valence and the pain points felt throughout the tasks. The emotional valence, that is, the emotional value felt due to a stimulus, was detected through the software and converted to quantitative data, allowing us to lead statistical tests. Facereader is able to recognize facial expression patterns and classifies them according to six universal emotions[5]: happy, sad, angry, surprised, scared and disgusted. It also recognizes the neutral state and contempt. The emotional valence is then calculated from the emotions' intensity: "happy" being the only positive emotion, the valence is calculated by subtracting the intensity of all negative expressions from the intensity of "happy". "Surprised" is neither positive nor negative, thus, it is not included in the calculation. Pain points, on the other hand, were converted into qualitative data [7, 16]. To identify pain points, the software uses the same face recognition patterns mentioned below, and recorded when participants' had peaks of negative emotions, such as anger or disgust, and for how long they were feeling them. In this way, we were able to go through the recordings and analyze what could cause difficulty when pain points occurred.

As previously mentioned, we also used pre-task and post-task questionnaires. The first questionnaire was focused on measuring the participants' knowledge about search engines and car insurance. For this questionnaire, we used the car insurance literacy scale [6] and the search engine literacy scale [5], through which the participants had to assess their knowledge of both thematics on a 10-point Likert scale. The type of personality of the participants was also

[5] The six universal emotions were described by Ekman in the *Universal facial expressions of emotion* (1970).

assessed through the Abbreviated Barratt Impulsivity Scale [3] in the final questionnaire. This measure consists of thirteen items to rate through a 4-point scale according to their occurrences, 1 being never or rarely and 4 being almost always or always. Finally, the participants were asked to assess their opinion about a few well-known car insurance brands on the Canadian market. We used a 7-point Likert scale to rate 3 affirmations about the brands [11]. We also collected the opinion of each participant after every task and we measured several elements. The first question asked after a task was how satisfied the participant was with their research. We used a CSAT [1] through a 5-point Likert scale, with 1 being "very unsatisfied" and 5 being "very satisfied". The perceived effort (SEQ) [1] to complete the task was also measured through a 7-point Likert scale, with 1 being "very difficult", and 7 being "very easy". Finally, the participants were asked to evaluate the confidence they felt in the information obtained through another 7-point Likert scale [12], with 1 being "very unconfident" to 7 being "very confident".

Data were also collected directly from the observations made during each test. This observational data was gathered while the participants were completing the tasks as an observer was taking notes about everything happening during the experiment. In this way, we were able to get the following elements from the observation: the types of links the participants clicked on, their position within the SERP, how many ads and Position Zero were displayed, the keywords they used, the number of clicks in one research and the number of research for one task. Those items were rigorously listed in an Excel sheet, enabling us to get quantitative data from these elements (number of clicks on a sponsored link for each task, average position of the first click, etc.). All those observations have played a major part in the analysis and will be at the center of the discussion of the results that will follow.

Finally, through the interviews conducted with the participants, we obtained qualitative insights that will serve to better understand the observations we made. The same questions were asked to every participant. As mentioned before, a set of questions was asked after each task to get the participants' impressions of what they just did. Questions such as "Why did you click on that specific link?" or "Why did you continue your research after visiting this website?" were asked. At the end of the experiment, the participants were asked if they noticed the sponsored links, and what they thought about them, and finally some questions were asked to get an idea of their usual searching behavior.

2.2.4 Analysis

As mentioned, we collected numerous data through the observations of the tests. From this observational data, means and sums were calculated for every "item" observed (i.e. the links' position within the SERP, the number of clicks to get a satisfactory answer, etc.). Those were calculated for every participant and then for every task, in order to identify potential patterns. Through those measures, some findings have been brought to light, which were then linked up with the qualitative data obtained via the interviews. This data has been processed using Optimal Workshop[6], which made the analysis easier and enabled us to classify the observations under similar thematics. Optimal Workshop is a collaborative platform offering a suite of tools designed for user research, such as card sorting, tree jacking, etc.

Concerning the pre-task, post-task and final questionnaire, we calculated the means for each item and for the whole questionnaire. To analyze this quantitative data we used statistical tests such as two-tailed Wilcoxon to analyze the data. We also compared the means of the post-task questionnaire (CSAT, SEQ and confidence) for each task, to see if there was any difference between them.

2.3 Results

This exploratory study led us to uncover some interesting findings that can be ordered according to certain themes. The results will be presented through those themes and will aim to achieve the research objectives aforementioned. A detailed analysis was conducted to go through all the data collected. Most of the results presented below were drawn from the observational data (number of clicks, the position of the links, etc.) observed during the tests, from the qualitative data (interviews with the participants and pain points), and from the post-task questionnaires. However, most of the quantitative data extracted from the pre-task and final questionnaires turned out to be insignificant. Using a two-tailed Wilcoxon sum rank test, we wanted to test if the completion time was impacted by car insurance literacy and search engine literacy. We found that for some items of the questionnaire only, the results were statistically significant. However, overall the tests were not significant so we cannot state that

[6] Optimal Workshop URL: https://www.optimalworkshop.com/

car insurance literacy and search engine literacy induce a smaller or longer completion time. We did not find any other significant results in the rest of the questionnaire.

To discuss the results, this section will be divided into three subsections according to the main observations we have made from the analysis. The first main result we obtained was the discovery of a potential pattern of avoidance toward sponsored links. In the next section, we will discuss how the results of our study suggest that the participants tended to avoid sponsored links displayed on the SERPs on purpose.

2.3.1 Avoidance of the sponsored links

With the observations made through the experiment, results suggest that participants might tend to avoid clicking on the paid search links while doing their research online. Indeed, through our observational data, we noted several elements we observed during the tests, such as the position of the first link clicked and the number of sponsored links displayed. Looking at the position of the first link clicked during each task, we observed that on average, participants were likely to click on the 3rd or 4th link displayed on a SERP. We found out that the average position of the links clicked by all participants on the separate tasks ranged from 2,5 to 4,7, with means superior to 4 for the Tasks 1 to 4. Between the 12 participants on the first search result, 2 or 3 sponsored links were displayed on the SERPs on average, always at the top position of the pages. This observation suggests that the participants most likely clicked on the first link they found after the advertising, which was usually an organic link. Two exceptions were noticed: during the first task, the participants were often clicking on the sponsored links, and during the fifth task, where no advertising was ever displayed on the SERPs. However, this observation is nuanced by the click-through rates calculated, as to know, the number of clicks on one link displayed at a specific position. This rate, for the click on the first link displayed on the SERP for every task, is by far the highest (18%). However, this same rate for the third and fourth links displayed are both 8%, equally the second most important rates.

To understand those observations better, we analyzed the data collected from the interviews. Out of 12 participants, nine of them mentioned they noticed the sponsored links. Regarding the appreciation of such links, the opinions were divided. Three participants stated that if companies were paying to put those links forward, that means they are more relevant. However, 5 of them mentioned that those links only aim to sell something but do not necessarily give the

best information or offers. Four other participants did not have an opinion on the sponsored links and said they were not paying attention to the type of link when doing their research.

A certain distrust regarding the sponsored links is observed among some participants. However, it is important to mention that those links still represented an important part of the links clicked during the whole experiment, with 29% of the clicks being paid searches. Organic links are favored with 58% of the total clicks. In the end, those observations suggest that users tend to avoid advertising on purpose.

The second main observation we made from our analysis relates to the use of Position Zero links. The next section will cover our findings concerning those links and their appreciation.

2.3.2 Position Zero links

During this study, we observed that Position Zero links were not often clicked by the participants, but were greatly appreciated. Through the experiment, it was observed that those links did not have the highest click rate, representing 11% of the clicks in our experiment, even though 8 participants clicked on those links at least once. In comparison, 58% of the clicks were organic links, and 29% were sponsored links. However, Position Zero links received great appreciation from the participants who were mentioning how quick and easy it was to get information through them.

With those links, a user can see and read information from the SERP, without having to enter a website. As we were only able to observe where the participants were clicking, we are not able to determine whether participants did or did not use the information displayed. It is possible that, as the information is visible without necessarily having to click, participants have perused those links without us noticing. Once again, this gives another lead to explore using eye tracking to see if the participant read the information without actually clicking on the website giving that information.

Finally, the last main observations we made concern the pain points felt by the participants throughout the online research and how they can be related to their research motives. This last section will discuss what apparently caused frustration during the tasks, and how we can link it to the participants' statements made during the interviews.

2.3.3 Pain points and research motives

As previously mentioned, Noldus Facereader software was used during the experiment to measure the participants' emotional states. From facial recognition, the software identified the emotions felt by the participants during the tasks and recorded when they peaked. The pain points we mention in this section are the translation of negative emotions peaks, in other words, when participants experienced difficulty. Through the experience, three recurring pain points were identified through the Facereader software and were recorded at precise moments of the research. Firstly, pain points were mostly observed while the participants were after clicking on a SERP result, suggesting the pain points are due to the content of the page. This type of pain point constituted 49% of them. Another 33% of the pain points were observed at the very beginning of the tasks when the participants were typing keywords. Only the remaining 18% are actually occurring when navigating on the SERPs.

Looking at the participants' research motives can give insights to understand the reason behind those pain points. Of 12 participants, 9 of them mentioned being interested in quick and easy-to-read content. This would suggest that pain points occurring during the visit to a website might be due to content too dense. It is also worth noticing that participants clicked mostly on insurance companies' websites and that when those links were the ones chosen, the participants rated their experience lower (CSAT, SEQ and confidence in the information were lower) than for other types of websites, such as informational websites or comparators. When asked about their experience, the participants often mentioned being disappointed by the experience on an insurance company's website, the content being difficult to read, the information unclear and the description usually being too attractive compared to the usual content. This can also contribute to explaining the pain points felt while navigating the websites. In the same way, 4 participants mentioned they were trying to use the most precise keywords to get better results. Then, another hypothesis would be that focusing on finding the best keywords, generates pain points. Some participants effectuated multiple research for one task (i.e. they typed new keywords and started the research process again), and were most of the time reformulating their keywords to precise them. Once on a SERP, other elements were mentioned by the participants, especially concerning the reason behind their choices. Of the 12 participants interrogated, 8 of them stated that the positioning of the links encourages them to click, 10 of them also paid attention to the URL of the website and 9 mentioned the description of the website. In this way, we have several elements that can generate pain points, or at least that can influence the users'

click behavior. Once again, further research would be necessary to get a clearer vision of what the participant is paying attention to the most while navigating on a SERP.

2.3.4 Summary of Key Results

To conclude this section, we can summarize our findings as followed:

- Participants may avoid sponsored links on purpose. We noticed a high click rate for the first links appearing after the sponsored ones. Sponsored links are the first ones displayed on the SERPs and are then highly clicked on by the participants, however, we still noticed a certain mistrust toward them through our interviews.
- Position Zero links seem to be greatly appreciated by the participants, however, we did not observe an important click rate compared to organic or sponsored links. As those links do not require any click in order to get information, we might have been unable to observe their use through our tests.
- We observed recurring pain points throughout the research journey, but navigating on the SERP was not what appeared to cause the most difficulty. Our data collected from the interviews enabled us to link those pain points to the users' research motives and expectations when searching online.

In the last section of this paper, those key findings will be discussed as well as the implications of this study, its limits and finally, the following research that can result from this experiment.

2.4 Discussion

This paper aimed at exploring users' behavior while searching online, to get a better understanding of how different types of links may influence the users' click-decision. We identified several leads that align with the idea that types of links and their display on SERPs may influence users in their decision-making process. Firstly, the results of the experience suggest that, as we primarily imagined, there might be a phenomenon of "banner blindness" surrounding the sponsored links displayed on a SERP. This research highlighted that users might tend to avoid sponsored links on purpose as they may not feel very trustful in their pertinence and neutrality. This result would need to be pushed forward to be proven, but this gives a solid hypothesis to explore in a following study, this time using eye tracking to observe

the gaze of the participants when facing sponsored links. Secondly, it would be interesting to lead further research around the Position Zero links that might be used more than what we observed during this experiment but seems to be appreciated by the participants. Finally, pain points were noticed throughout the whole online research process, but in our matter of interest, the links made between the pain points felt on a SERP and the research motives of the users are particularly important. In the end, this experiment contributed to giving more evidence that users' behaviors on a SERP can be influenced by the type of results displayed, specifically when sponsored links come into play.

This study brings new light to previous studies that have been made as it focuses more on how the user acts when facing various types of links and the effect of their display. We mentioned previously some studies made about the effect of mood and arousal [14] or the correlation of the click decision with the keywords used. Another study [4], used eye-tracking research to find factors influencing the viewing behavior on a SERP. Some interesting points were made and significant results were demonstrated about contextual factors and individual factors influencing the behavior on a SERP. It was discovered in that study [4] that the task type (transactional or informational) does not seem to have an impact on users' viewing behavior (contextual factor), but individual factors such as age or literacy in the topic have made participants read the SERPs more carefully. However, this study would come in complement by investigating the effect of the links and display on the users' behavior.

Getting this information about the influence of the display and the different links offered on a SERP would also have managerial implications and would offer room to rethink SEO strategies. Indeed, if our findings regarding the types of links and their use are true, this could lead companies to reconsider their online marketing, especially concerning their involvement in paid search. Paid search and SEO in general represent a cost for companies, it is then interesting to get the users' perception of different types of links in order to better understand the return on investment.

As aforementioned, this study was exploratory, and we, for now, lack empirical pieces of evidence to state that those findings can be generalized. Further research, led with more technical equipment and specifically eye tracking would be needed to confirm these results. As in every study, there is also the possibility that the participants were not acting exactly as they would do naturally, which may skew the data.

With this research, we have solid grounds to continue our exploration in a second study, this time involving the previously mentioned equipment to get more precise results. It will be particularly interesting to better investigate our discoveries by using eye-tracking and physiological sensors and then get a final answer to our research question.

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Chapitre 3: Article 2

How the type of results on search engine result pages influence attention and behaviors[7]

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Abstract

This research investigates how consumers' process different types of results on search engine result pages (SERP). The aim is to identify patterns and factors influencing browsing behavior when users are facing different types of links. We conducted two studies, the first one was exploratory and the second study was more in-depth and took place in a laboratory environment, allowing the use of physiological tools. Especially through the use of eye tracking, we were able to study the attention paid to links. First, we found that sponsored links generated attention but had a low click-through rate, implying advertising avoidance from users. Second, we identified a positive effect on attention toward sponsored results when participants had a good knowledge of search engines and a positive effect on click-decision toward organic links. Third, prior topic knowledge was found to have a negative effect on attention toward organic links.

Keywords: users' behavior, search engine advertising, advertising avoidance, search engine optimization, SERP, attentional behavior.

3.1 Introduction

The World Wide Web has become our modern Encyclopedia, providing users around the world unlimited access to information on any subject. Search engines represent the tools allowing users to retrieve all this information, Google being the most important one on the market, detaining almost 84% of the global market shares in July 2022 (StatCounter, 2022). Google alone generates considerable online traffic through Google Search, counting a total of 89 billion visits in May 2022 (SimilarWeb, 2022) and making search engines an obviously essential part of a web search. The results obtained through search engines are presented on Search Engine

[7] To be submitted to the journal *Multimodal Technologies and Interaction* from MDPI.

Results Pages (SERPs). Their display changed a lot through the last decade, proposing a multitude of types of links, such as sponsored ones, images, videos, Zero-click results, knowledge panels, etc. (SEO PowerSuite, 2021; Appendix 1). One type of result of prime importance for marketers is the sponsored results, for which companies pay to appear in the ads section on Google and thus, to be ranked at the top positions on SERPs. See Figure 2 below, an example of a sponsored result with in red the distinction made on a SERP to show users it is a sponsored link.

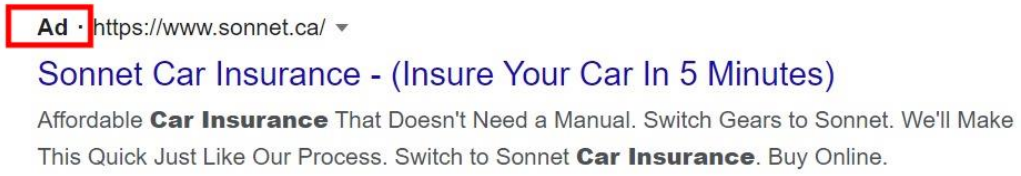


Figure 2: Example of sponsored result

This system is called the pay-per-click as advertisers pay every time the sponsored result is clicked on. In 2022, Search Engine Advertising (SEA) spending in the United States is estimated at 88 billion dollars and is forecasted to reach 123 billion dollars by 2026 (Statista, 2022). It represents for now the most important digital advertising spending (Statista, 2022). Sponsored links are the best way for companies to appear high up in the search results, however, as aforementioned, the search engine environment has become richer, and Google's new features and links are becoming more and more important. For example, "People Also Ask" (PAA) links are shown to appear in 2nd position 58% of the time in the United States in 2020 (Semrush, 2020), becoming another interesting SEO lead for companies.

With the emergence of this classification of links on SERPs, new challenges are being faced by companies and marketers, as they need to better understand Google's algorithm in order to create efficient SEO strategies. More specifically, there is a need to understand how users process the information and make decisions during online searches when they are exposed to different types of links displayed on a page. There have been studies on how consumers process information on SERPs, but those studies are less recent. They do not necessarily include all the new features offered (e.g. People Also Ask, Google definitions, geographical recommendations, Zero-click results) nowadays by search engines as this is a fast-growing environment. For example, Dinet et al. (2010) led research using eye-tracking, to study visual attention on a SERP and influential factors, however, this study does not cover new features displayed on SERPs as it was published before some of them were created. Similarly, Lorigo et al. (2008) led an eye-tracking study, this time focusing on the visual attention to elements of

the SERPs and their results, such as the abstracts and titles associated with the websites. Sponsored results, which were already displayed on SERPs at the time, were furthermore removed from the studied SERPs prior to the experiment. Thus, this study does not consider the diverse result formats that we can now see while navigating the Web. Therefore, there is a more specific need to understand users' behavior with the present SERP format, considering the new types of results that have emerged since previous studies were made.

To fill this gap in the literature, we conducted two laboratory studies where a sample of participants was asked to perform online search tasks for services. We designed those tasks aiming to obtain very natural outcomes from the search engine, so the participants can see SERPs identical to the ones they would see while searching for information at home and so that we can collect data on most search engines' result formats. The objective of the first study was to explore users' behavior while navigating on a SERP in general. The objective of the second study was to further the results of the first one, and thus to better understand how users interact with the different results on a SERP, and what factors can influence their behavior. Hence, this article aims to answer the following questions: Can patterns be observed from the study of the users' attention to the different types of results displayed on the SERPs? And more specifically, can factors influencing the users' click behavior be identified?

Those two studies bring a newer perspective on users' interaction with SERPs. Our results suggest that users adopt different behaviors when facing different types of results. Compared to previous studies (Cho & Cheon, 2004; Réjon-Guardia & Martinez-Lopez, 2014; Kelly et al., 2010), our research considers Google's new result formats, and we obtained significant results, especially regarding the difference in the interaction between organic and sponsored results. When previous studies were focusing more on the global online experience (Hölscher & Strube, 2000; Hsieh-Yee, 2001) or specific SERP's elements (Lorigo et al., 2008), our research focuses on visual attention and interaction with new kinds of results displayed on SERPs.

Through this research, we aim to give companies insights to build efficient SEO strategies. With a better understanding of the SERPs and of how users interact with the different links displayed on them, companies will be able to make better decisions concerning their SEO strategies. This research makes new contributions to the literature on search engines and users' behavior, by establishing comparisons between the way users process different kinds of new results present on SERPs and by trying to understand what can influence it. First, this extends the work of Cho & Cheon (2004) about advertising avoidance on the Internet but by transposing

it to the specific context of SEA. This also extends the work of Li (2019) who studied this topic in the Chinese context. Secondly, our research complements the work done about factors influencing users' behavior online, by considering factors identified by Lewandowski and Kammerer (2021) and again by applying it to the study of users' behavior on SERPs. We decided to focus our research on the study of knowledge factors on users' viewing and click behavior, and found significant results on how literacy in search engines and in the research topic can affect navigation on a SERP, thus extending prior research done on those topics ((Hölscher & Strube, 2000; Allen, 1991; Hsieh-Yee, 2001). We also followed other leads in our study of influential factors, such as the effect of task types or of participants' impulsiveness, but no significant results were found regarding those. In the end, this study will bring new light on users' online behavior and enable marketers to better know their digital audience when it comes to search engines, specifically in the way they avoid sponsored results.

This article will be organized as follow: we will first go over the background of this study, with the presentation of our review of the literature and a reminder of the procedures and findings of our first exploratory study. Then, the hypotheses for the second study will be stated and the details and results of it will be presented. Finally, we will conclude this paper with a general discussion covering all our findings and go over the limits of our research, as well as the resulting managerial implications.

3.2 Literature Review

Our research aims to study the attention paid to different types of results displayed on a SERP. In this section, we review two topics related to users' behavior while navigating on a SERP: advertising avoidance and the factors influencing information processing on SERPs. Our research was made through Google Scholar. Search terms used to search on advertising avoidance included: "advertising avoidance", "advertising avoidance on the Internet", "Search Engine avoidance", "Banner blindness", "Banner blindness SERP". To research on the factors influencing users' behavior, we used keywords such as followed: "Online search behavior", "Online search behavior SERP", "factors influencing web search behavior", "eye tracking search engine result pages".

3.2.1 Avoidance of sponsored content

One of the main interests of our study is the attention paid to the sponsored content displayed at the top position of SERPs and more particularly, the potential avoidance of the said results. To review this topic, we researched advertising avoidance in general, through traditional and new media, and narrowed this down to SEA.

First, advertising avoidance can be defined as "all actions by media users that differentially reduce their exposure to media content" (Speck & Elliott, 1997). This can be translated into many different behaviors, such as scrolling down to pass the ad, pressing a skip button while watching a video, or switching the channel during a commercial break. The topic of advertising avoidance has been largely studied in the past decades through various media channels. Advertising avoidance in traditional media has been studied by Speck and Elliott (1997), who explored more particularly the predictors of such behavior through print (magazines and newspapers) and broadcast (television and radio) media. In this study, various variables were used to explain advertising avoidance through traditional media. Among those, the demographic variables of age and income were found to be the strongest predictors of advertising avoidance across all media studied, but that other predictors were also significant, especially ad perception, and would vary from one media to another (Speck & Elliott, 1997).

Ad perception or attitude toward advertising related to one's beliefs and appreciation of the sponsored content was also considered in other studies as a predictor of advertising avoidance (Rojas-Méndez et al., 2009; Kelly et al., 2021). A comparative study across media (Kim & Seo, 2017) tested advertising avoidance using a belief-attitude-behavior hierarchy. This study sought to explore the difference between advertising avoidance across media and to establish a comparison between traditional media (here, television, represented through commercial breaks) and new media (Internet, represented through advertising on YouTube videos) while considering the relationships between the constructs aforementioned. Results show that certain beliefs about advertising directly influence attitudes toward advertising and avoidance and that Internet advertising has a higher rate of avoidance than television advertising. Those advertising beliefs were measured using the 21 items from Pollay and Mittal's measure (1993), classifying them into seven factors: product information, hedonic/pleasure, social role and image, good for the economy, materialism, falsity and value corruption. Those seven factors were all related to advertising avoidance, three of them being negatively related (materialism, falsity, and value corruption). Product information's positive effect was also shown to be

significant for attitude toward advertising, and materialism and falsity were shown to be negatively related to attitude.

Regarding advertising on the Internet, many studies have been made more recently trying to explain avoidance behaviors from users. Cho and Cheon (2004) led research where advertising avoidance could be explained by three constructs: Perceived goal impediment, perceived ad clutter on the Internet, and prior negative experience. The three constructs were shown to be significant predictors of advertising avoidance online. Thus, prior (negative) experience, or more specifically dissatisfaction and perceived lack of utility (Cho and Cheon, 2004) regarding previous experience with advertising, will lead users to avoid the source of those negative perceptions, then avoid advertising. Goal impediment, or the perceived disruption to achieving one goal online, is also shown to cause ad avoidance. Finally, perceived ad clutter, or the perceived abundance of sponsored content displayed on the Internet, was proved to induce irritation among users and then lead them to avoid advertising. Those two last constructs are quite interesting as they introduce the concepts of disruptiveness and intrusiveness to the exploration of advertising avoidance.

Through a literature review, Réjon-Guardia and Martinez-Lopez (2014) explored the concept of intrusiveness in online advertising and its relationship with avoidance behaviors. They concluded that the overload of advertising present on the Internet (or the ad clutter) will cause significant irritation due to the perception of their space being invaded by unwanted advertising. Advertising avoidance is then described as "one of the most significant defense mechanisms used to cope with the disturbing perception of clutter" (Réjon-Guardia & Martinez-Lopez, 2014, p.581).

Other research focused on advertising avoidance and disruption through specific sources on the Internet. Advertising avoidance among teenagers on social networking sites has been studied (Kelly et al., 2010) and comes to nuance the findings previously mentioned. For example, in this specific context, the experiment showed little support for Cho and Cheon's (2004) model about advertising avoidance related to ad clutter disruption, but more support for other constructs such as relevance and credibility. This means that advertising avoidance antecedents might be influenced by the channel through which the advertising is displayed, which seems coherent regarding the number of different forms advertising can now adopt on the Internet.

Other studies about advertising avoidance online exist in the literature, but those studies mainly use Cho and Cheon's (2004) constructs and give some variability and precision to the model, and/or adapt it to specific contexts or geographic areas (Kelly et al., 2021; Seyedghorban et al., 2016; etc.). However, as this study is now out-of-date, we do not know if the results would still be accurate considering how search engines and SERPs evolved and the new features that are now being displayed on them.

Our study focuses on the advertising displayed on SERPs. On this matter, however, very few studies have been made to explore related avoidance behaviors. One research was led on SEA avoidance in the Chinese context (Li, 2019), also through the three constructs defined by Cho and Cheon (2004) (prior negative experience, perceived ad clutter and perceived goal impediment) in addition to two user characteristics, monthly income, and advertising location awareness. The experiment supported the hypotheses related to the effects of those variables on SEA avoidance, stating that prior negative experience, perceived ad clutter and perceived goal impediment would have a positive effect on SEA advertising avoidance. Monthly income was also shown to attenuate the impact of perceived advertising clutter and to intensify the impact of prior negative experience, and location awareness was proved to intensify the effect of perceived advertising clutter.

As we aim to study the attention paid to the sponsored links on top positions of the SERPs, we review the phenomenon called "banner blindness". Banner blindness was first reported in the literature in 1998 and refers to a specific phenomenon occurring during online search when the user will consciously on unconsciously ignore a visually appealing element on a webpage, called the banner (Benway, 1998). The "banner" refers to the specific element of the webpage, conventionally an advertising banner, that was designed to be seen by the user. This first study about banner blindness showed that this phenomenon was indeed occurring often during online searches, even though it was not universal (some users would see the banner). Banner blindness could then be considered as one type of advertising avoidance.

From a strictly visual standpoint, Banner Blindness is found to be in some sort of grey zone as it does not seem to be systematically observed (Hervert et al., 2011). This study used eye-tracking to intend proving the existence of the banner blindness phenomenon. Some other studies, on the other hand, seem to support this phenomenon or are at the very least bringing nuance to its existence (Drèze & Hussherr, 2003; Resnick & Albert, 2014). The results are divided concerning Banner Blindness: Drèze & Hussherr (2003) found out that not every

participant was subject to the phenomenon, but that it was still commonly observed. Banner Blindness might also be dependent on the ad location and the user's goal (Resnick & Albert, 2014). The literature is then divided on the occurrence of such phenomenon (Pagendarm, 2001) as it is not always observed, and on what influences it.

In the context of our study, the "why" of this phenomenon is not our main interest, and we should first focus on the "what if" this is existent when it comes to SERPs. Indeed, instead of being blind to a banner ad, the phenomenon could also be observed on SERPs through the sponsored links displayed on top of them. The users could then obliterate the whole section of sponsored links on top of a result page and skip directly to the organic links. Text advertising has been found to be as subject to blindness as banner advertising (Owens et al., 2011), which is interesting as sponsored links could technically be considered text advertising. The study of such blindness on SERPs has also been done through desktop and mobile devices using eye tracking and came in contradiction with previous findings as it stated that users were mostly seeing sponsored links (Djamasbi et al., 2013), meaning that they spent enough time looking at the area for it not be considered as banner blindness. Once again, studies are not necessarily agreeing on the matter. Furthermore, most of those studies are aging we do not know if they are taking new formats of results on SERPs into consideration. New research on the topic might be needed to better understand the attention and potential avoidance of advertising on SERPs, with their new features.

3.2.2. Factors influencing users' behavior online

In this section, we will review the literature surrounding the factors that may have an influence on users' behavior or attention while using search engines and navigating through SERPs. A possible classification of those factors was identified by Lazonder and Rouet (2008) who suggested that factors (or variables) could be ordered under three different groups: contextual factors, resource factors and individual factors. Contextual variables include all elements that are specific to the situation and that are independent of the online search (e.g., the place, the devices, etc.). Resource factors are defined as all the information and resources that are available and accessible for online searches, such as for example access devices, interfaces, and basically, everything that is designed for and on the Web in general. Finally, individual variables encompass factors inherent to the users, such as their skills, and knowledge. (Lazonder & Rouet, 2008).

1. Contextual factors

First, we review the literature regarding contextual factors. Among those, the potential effect of task types on searching behavior is a topic of interest for our research. Indeed, to study users' click behavior related to different kinds of links on a SERP, we can easily imagine that the type of task performed online may have an impact on the decision leading the user to choose one link over another. Web search intention can be categorized into three classes representing the three possible different kinds of queries: navigational, transactional, and informational (Broder, 2002). A navigational query would be described as the intention to directly reach a specific website the user would have in mind. A transactional query is defined as the intention to "reach a site where further interaction will happen" (Broder, 2002, p.6) the interaction being a transaction on the website. Thus, this so-called transaction can take various forms, such as online shopping, downloading a file, etc. Finally, an informational query represents the purpose of finding information potentially available online, with no further intention to interact in any other kind of way than reading. The main difference between transactional and informational queries is that, for informational queries, an interaction can occur but is not predicted when formulated on the search engine. A transactional query aims directly to achieve a transaction (e.g: typing "AdBlock download" would be transactional). In other words, this means that when searching online, users always have one of those three goals in mind.

Using this model, many studies about the influence of those types of tasks on search behavior were made but led to different results. In a study using eye tracking (Schultz, 2019) task types were shown to have a significant influence on click and conversion metrics related to search engine advertising. Many other studies also demonstrated similar results (Lorigo et al., 2006; Şendurur & Yildirim, 2015; Hienert et al., 2018). The main idea that can be extracted from those studies is that task types influence various constructs related to search behavior such as clicking strategy, browsing style, formulations of queries, task completion and completion time. Other studies are dedicated to the topic; if many agreed on the influence of task types on users' behavior, others discovered contradictory findings (Lewandowski & Kammerer, 2020). In a literature review dedicated to factors influencing users' behavior on SERPs (Lewandowski & Kammerer, 2020) the effect of task types has been found to be quite unclear. The article reviewed 41 studies about factors influencing users' behavior using eye tracking, among which few studied the effect of task types. Within the reviewed literature, Lewandowski and Kammerer (2020) found no systematic proof that task types have an influence on search

behavior as some studies disagreed on that matter. As an explanation for this variability, the researchers suggested that "effects of task types might be heavily influenced by the concrete topics, by participants' familiarity with these topics, and last but not least by the concrete individual search results provided by the search engine" (Lewandowski & Kammerer, 2020). Thus, the effect of task types, even though it has been studied heavily through the literature, is still somehow uncertain and cannot be systematically observed.

2. Individual factors

We then reviewed the literature related to individual factors. We first found studies about the effect of age and gender on users' behavior while searching online. The influence of gender on online general behavior was demonstrated among children and young teenagers (elementary school to eighth grade) and it was shown that boys tend to be more active while searching online (jumping from one page to another, clicking on more hyperlinks, entering more queries, etc.) than girls who are more likely to browse and scan one document entirely (Large et al., 2002; Roy & Chi, 2003). The literature lacks proof that gender is also a factor influencing online behavior among adults, however, a few studies focused on the influence of age on online research behavior, inducing a knowledge and skills gap between generations. It was found that in most cases, younger users performed better than older users, are able to find more easily correct answers and use more efficient strategies to solve their problems (Strong et al., 2006; Meyer et al., 1997; Chevalier et al., 2015). The influence of age on users' online behavior is mostly related to a difference in skills and Web knowledge between generations as younger users tend to be more familiar with the online environment, and then show better browsing strategies than older users.

Hence, age induces more difficulty while searching online and a lack of knowledge of search engines and computers in general, or even of the concerned domain of study (Chevalier et al., 2015; Strong et al., 2006). It is indeed suggested that the difference between age groups' performance may be due to better knowledge from younger users. From a broader perspective, this can raise the question: Do knowledge of the topic and search engine knowledge impact users' behavior while searching online? In a study published in 1991, Allen demonstrated that topic knowledge would influence searching behavior when it comes to search vocabulary (Allen, 1991). Thus, high-knowledge users would use more search expressions and then "innovate" in their formulations (e.g., by using a different vocabulary than the one in the task description) than low-knowledge users. In the same literature review as the one mentioned

before (Lewandowski & Kammerer, 2020), the authors report that using eye-tracking, it was shown that the higher the level of knowledge is, the higher the time of fixation on a link before clicking is, thus the more careful the users are during the reading.

Regarding the Internet, computer and search engine knowledge, other studies have been made to understand the effect of those constructs on search behavior. In one first study (Hölscher & Strube, 2000), two experiments were conducted to understand the relationship between Web expertise and Web search. Among those experiments, the second one aimed to compare the performance of expert Internet users and novice searchers, in a rather tricky context hence controlling for the ease of the searches. Results showed that novice users were prone to have more difficulty formulating efficient queries, meanwhile, expert users still had problems but offered overall better performance. In line with this finding, other studies suggested that Web expertise would have similar effects on search behavior (Hsieh-Yee, 2001). In addition to the difference concerning syntax used by expert and novice users, White & Morris (2007) proved that the use of an advanced syntax would result in a significant difference in performance, translated into constructs such as result-click, post-query navigation, and search success. Results suggest that Web expertise induces better-querying strategies, which increases search success. However, the present state of literature concerning the effects of both web knowledge and topic knowledge on search behavior is again aging and can have varied through the years as Web search using search engines is a fast-growing environment.

We also considered studying the role of personality on search behavior. More specifically, we what personality traits would be more likely to influence attention paid to SERPs and their links. We thought that considering the way users interact with a SERP, “Impulsiveness” would be an interesting axis to study the effect of personality on web search behavior. Impulsiveness is defined as “a personality trait characterized by the urge to act spontaneously, without reflecting on an action and its consequences” (Coutlee et al., 2014, p.1). In the context of online research, impulsiveness would be represented by clicking links without reading the description or the title, electing a link within a very short amount of time, etc. The effect of impulsiveness in an online context has been mostly studied regarding the online shopping environment. For example, Zhang et al. (2018) found that impulsiveness had a relationship with the utilitarian or hedonic value of the research in an online purchase decision. However, no study has been made on the specific topic of how impulsiveness influences users’ behavior on a SERP.

In summary, this literature review highlighted some elements that remained to be studied about SERPs and users' behavior. First, we researched advertising avoidance through traditional media and the Internet and concluded that SEA avoidance could be studied more in-depth in order to obtain more definitive answers on whether or not this is a pattern observed on SERPs and if banner blindness is occurring. Users' behavior can also be influenced by multiple factors, such as task types or knowledge gaps, but the literature remains divided. In this way, topic and web knowledge are interesting leads for our study, just as task types and the effect of users' personalities to try to get a better understanding of how users interact with a result page.

3.3 Study 1

Based on the literature and lack of research on how consumers process today's SERPs that include various formats, a first exploratory study was performed. The first study aimed to better understand the users' click behavior through SERPs. As this was an exploratory study, no formal hypotheses were initially formulated, and this first study mainly led to a clearer vision of the users' behaviors and click decisions. The study was designed to identify potential patterns within the users' behavior in the context of searching for information online, and in this way formulate hypotheses for the second study. The context of the study was car insurance, as this is a topic that allowed us to design informational, navigational and transactional tasks, and it is one kind of insurance most likely to be taken online in the US in 2022 (Statista, 2022), representing 26% of the respondents. See an example of a typical SERP for this topic in Appendix 2.

3.3.1. Method

This study was approved by our institution Ethics Committee and obtained a certificate of ethics approval (n°2022-4854). The study was conducted in French.

1. The sample

The sample was composed of seven women and five men, so a total of twelve participants. The average age of our sample was 35 years old, and all participants were aged between 18 and 43 years old.

2. Procedure

Due to the sanitary situation at the time of this first study, the data collection had to be conducted entirely online, using the platform Lookback[8]. The various tools specifically designed to conduct research offered by the platform enabled us to instruct the participants about the different tasks and lead our interviews.

The participants were given a set of six tasks to complete. After each of them, they had to answer three questions to rate their experience. Those questions aimed to measure their satisfaction regarding the search they just made, the perceived effort to complete the task and their confidence in the information obtained. Once those questions were answered, the moderator conducted a quick interview to clarify certain actions taken through the task. At the end of the study, the participants had to answer final questions about their experience through a semi-structured interview.

The six tasks were always given in the same order to the participants. They followed a usual consumer's search journey, as to know, starting from searching for general information about the product or service and then narrowing down to find some more precise information and/or to get a quote. We then had a combination of informational and transactional tasks, allowing us to potentially get different results according to the type of task. For this research, only the fourth task was transactional. The participants also had to complete each task within a two-minute time limit but were free to end it sooner if they felt like they obtained a satisfactory answer.

Short scenarios were given to the participants prior to the start of each task to give some context to their research. See in Appendix 3 the scenarios used for those tasks. The first task was to imagine having just bought a car and searching for general information about insurance. The second task given was to get information about public liability related to car insurance. For the third task, the participants had to search for the best prices for drivers 25 years old or younger. During the fourth task, it was asked to simulate getting a quote for one car insurance on the market (transactional task). The fifth one was getting information about potential price cuts due to COVID-19 and finally, the sixth task was to get information about the coverage of driving someone else's car.

[8] Lookback URL: https://www.lookback.com/

3. Measures

Most of the data were collected directly through the observations of the experiment. An observer would take notes during the tests to get elements about what was happening on the participants' screens, which were validated during the analysis by watching the recordings. The following elements were taken from observations during each task: the types of links and websites participants would click on, their position on the result page, the number of sponsored links and Position Zero displayed, the keywords used to search for the information asked, the number of clicks for one research and the number of research for one task (i.e., we considered research as new research when the participant was modifying the keywords to obtain the information asked for a task, and a new click when the participant was coming back to the SERP to click on another link). This observational data gave us quantitative results to work with as it enabled the calculation of click-through rates, averages or the total numbers of clicks.

Satisfaction about the research, perceived effort to complete the task and confidence in the information obtained was measured after each task. We used respectively the CSAT scale (Albert & Tullis, 2013) through a 5-point Likert scale (1 being "very unsatisfied", 5 being "very satisfied"), SEQ (Albert & Tullis, 2013) through a 7-point Likert scale (1 being "very difficult", and 7 being "very easy") and another 7-point Likert scale (Langlois et al, 2020) (1 being "very unconfident" to 7 being "very confident").

Qualitative data were obtained through semi-structured interviews. The participants were all asked questions about their research, the links they clicked, and by the end of the experiment, whether they had seen the sponsored links. Some questions were also asked about their online searching habits.

Finally, the emotional valence was measured using Facereader software (Noldus, Wageningen, Netherlands). The software calculates the valence by subtracting the positive emotions to the most negative emotion of all negative emotions, using facial recognition to identify those among the participants and translating them into values ranging from -1 to +1 (unpleasant to pleasant) (Hölfing et al., 2020). Facereader uses the Facial Action Coding System (FACS) (Ekman and Friensen, 1980) to analyze the users' facial expressions and determine their emotions. From this data, pain points were identified as where the participants were feeling peaks of negative emotions. Looking then at when those pain points were felt, we were able to

determine what could be causing them during the task which gave qualitative data. All measures used in Study 1 are reported in Table 2.

Construct	Measure
Valence	Facial recognition Facereader (Noldus, Wageningen, Netherlands)
Peaks of negative emotions	Facial recognition and analysis of peaks of negative emotions, hence when negative valence was observed (tenth percentile of negative valence) (Giroux-Huppé et al., 2019) Facereader (Noldus, Wageningen, Netherlands)
Satisfaction	Self-reported CSAT (Albert & Tullis, 2013) 5-point Likert scale
Effort perceived	Self-reported SEQ (Albert & Tullis, 2013) 7-point Likert scale
Confidence in the information obtained	Self-reported Confidence (Langlois et al, 2020) 7-point Likert scale
Number of clicks	Observations from the tests
Position of the links clicked	Observations from the tests
Number of clicks on specific links	Observations from the tests
Number and types of results displayed on the SERPs (sponsored, organic, maps, PAA, other Google's featured links)	Observations from the tests

Table 2: Measures used in Study 1

3.3.2. Results

This section is divided into three subsections, representing our main findings and identified patterns from this first study.

1. Purposeful avoidance of sponsored links

Through the analysis of the data collected, we found that the participants might be purposely avoiding clicking on sponsored links while navigating on a SERP. First, we found out that on average, a SERP displaying sponsored links was showing them by blocks of 2 to 3 links, always at the top position of the page. Looking at our observational data and particularly at the average position of the first click for the first search performed, we noticed that the participants were most likely to click on the 3rd or 4th link displayed on the SERP. The average position of the first links clicked on the tasks was ranging from 2.5 to 4.7, so generally the links displayed

after the sponsored ones. The click-through rate for a specific position (the number of clicks on this specific position divided by the total number of clicks) proves however that sponsored links remain the most clicked type of links: The first link displayed on a SERP (i.e. a sponsored link) has the highest rate (18%) through all the tasks. The third and fourth links have equal rates of 8% and are then the second most clicked positions. See a descriptive summary of those results related to the click data in Table 3.

	Task 1	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**	**All tasks**
Average number of clicks	2.5	1.8	1.9	1.8	1.8	1.5	1.875
Average number of sponsored links displayed	3.75	2.75	4	3.67	0	1.5	2.6
Average position of links clicked	4.1	4.7	4.4	4.0	3.0	2.5	3.8
Click-through rate link at 1st position (in %)							18.03
Click-through rate link at 2nd position (in%)							6.03
Click-through rate link at 3rd position (in%)							8.02
Click-through rate link at 4th position (in %)							8.01

Table 3: Descriptive summary of the results related to click data (n=12)

With the interviews, we can get a better understanding of those previous results. Nine out of the 12 participants noticed the sponsored links when asked about them. However, opinions were very divided about them: 3 participants mentioned they would be more relevant as companies are paying to get to the top positions, but on the other hand, 5 participants mentioned they were reluctant to click on those links for this exact same reason. We can then observe a certain distrust towards sponsored links, however, they still represent an important part of the total clicks during the whole experiment (28%), as a comparison, organic links represent a major part of the total clicks with 58%. Besides that, no sponsored result was ever displayed during Task 5, no major difference was observed between tasks here.

2. Position Zero links

Our second findings are related to the use and appreciation of Position Zero links. Through our experiment, we noticed that Position Zero links have a low click-through rate compared to the other kind of links: they represent 11% of the clicks throughout the whole experiment. They however received great appreciation during the interviews when participants were asked about them. Considering the way they are used (i.e., information being accessible without necessarily having to click on the associated link) it is possible that our experiment does not efficiently prove their use by the participants. As we only noted when participants were clicking the links, we should consider the possibility that participants were reading the information and then accessing the information without us noticing it because it would have not been considered a proper click. This would have to be explored with eye-tracking technology to determine whether participants are accessing the information.

3. Peak of negative emotion

We then identified three main sources of negative emotions. The most important one being the arrival on a website, as to know when the participant was leaving the SERP (i.e., the participant click on a link displayed on the SERP and goes to a website), suggesting that the negative emotions felt were due to the content of the said webpage. Those peaks of negative emotion represented 49% of the peaks identified during the whole experiment. Then, another recurring type of peak of negative emotion was occurring when participants were typing keywords (33%), which only leave a remaining 18% for the actual navigation on the SERP (see the details in Table 4). From those results, we can then observe that navigating on a SERP may not be the primary source of frustration when searching for information online. However, the SERP can be linked to the pain point felt afterwards: in the case of negative emotions felt upon arrival on a webpage, we can hypothesize that the content of the page does not match the expectations of the users, thus that what they have seen beforehand was too attractive for the actual content. Obviously, peaks of negative emotions felt on the webpage can also be due to the content of the page being too dense, inaccurate or the interface not meeting the users' expectations. See a summary of those results in Table 4. Regarding those observations as well, no major differences were observed between tasks.

	PEAKS OF NEGATIVE EMOTION CATEGORIES		
	Destination Website	**SERP**	**Search query**
Task 1	8	3	3
Task 2	7	2	4
Task 3	5	4	3
Task 4	4	1	2
Task 5	4	3	5
Task 6	10	1	8
All Tasks	38	14	25
Average per categories in %	49.4	18.2	32.5

Table 4: Summary of results related to pain points

3.3.4 Discussion

The results suggest that users may be purposefully avoiding the sponsored links displayed at the top of SERP. The feeling of distrust surrounding the sponsored links, and the likelihood that users choose the first organic link over top position sponsored links reinforce the idea that users may be automatically skipping the sponsored section. The banner blindness phenomenon does not seem to occur in this context, as participants apparently remember seeing the sponsored results. Second, Zero Position links might be more used than what we measured with the experiment. We lack information about what participants read and use without clicking on a link, implying that we are missing the actual use of Zero Position links as those do not require any click to get information. Finally, we found out that the navigation on the SERP was not the most frustrating part of the information searching process, however, SERPs' elements could induce frustration during navigating a webpage.

With a second study done in a laboratory environment, we were able to explore further the leads found through the literature and the results obtained with this first study. The use of physiological tools enabled further exploration of the observations made. As an example, the use of eye tracking enabled the observation of the banner blindness phenomenon related to

sponsored links. We were also able to determine the visual attention paid to the different kinds of links.

3.4 Study 2

3.4.1. Hypotheses development

Advertising avoidance on SERPs has not been studied in depth for now, and as advertising was shown to be avoided on other channels, we could easily imagine this pattern can be valid for SERPs as well. Associated with this idea, we conducted research on the banner blindness phenomenon, which refers to a phenomenon observed online where users are obliterating an element of a webpage, usually a banner advertising, and thus process the related information very briefly to automatically skip the banner (Benway, 1998). This phenomenon could be applied to SERPs with the upper section dedicated to sponsored links, meaning that users would automatically skip this portion of the SERP to go directly to the organic results and thus allocate very little visual attention to the section. Those findings are coherent with the results of our exploratory study, where we found that sponsored links, despite having a pretty high click-through rate, were still less clicked on than the first organic links coming after them. Participants of the study also mentioned not really trusting sponsored links, which can lead us to think that advertising avoidance is also occurring on SERPs. This can then lead us to the first hypothesis:

H1: Users adopt a pattern of advertising avoidance with sponsored links displayed on a SERP while searching for information online.

With this hypothesis, we aim to explore how users process sponsored results and how they allocate their visual attention while also considering their click behavior. This hypothesis will be supported if we notice some attention on the advertising section of the SERP, in addition to the clicks being mostly effectuated on other results.

We then focused our research on factors that could potentially influence users' online behaviors when facing different kinds of results on a SERP. Through the literature, we found a classification of those factors that helped us frame our reflection on the topic: we then observe contextual factors, resource factors and individual factors (Lazonder & Rouet, 2008). We centered our research around contextual and individual factors and discovered that search

behaviors could be influenced by a multitude of factors from both categories and that some leads have not been explored yet. In this way, we decided to focus our efforts on the following influencing factors: prior topic knowledge, search engine knowledge, impulsiveness and task types. Through the literature, we learnt that prior topic knowledge and search engine knowledge induced better performance and strategies while searching the web (Strong et al., 2006; Chevalier et al., 2015). In the context of our study, good prior topic and search engine knowledge could be associated with higher visual attention allocated to SERPs' results as they should be more aware of the online environment (search engine display and types of results, vocabulary associated with the topic), and thus influence the way users decide on which result they will be clicking (the click decision). A better knowledge of the search engine environment could also induce a better knowledge of the implications of the sponsored content (hence, the pay-per-click system and the non-organic referencing it implies) thus, be more cautious when processing them. We also want to extend previous work done using eye-tracking as reported in Lewandowski & Kammerer's (2021) literature review, stating that the higher the knowledge is, the higher the fixation time is allocated on a link. We then have the following hypotheses:

H2: Prior search engine knowledge has a positive effect on users' visual attention allocated to SERPs' results, hence more time allocated to process the results, which will influence their click decision toward one kind of result.

H3: Prior topic knowledge has a positive effect on users' visual attention allocated to SERPs' results, hence more time allocated to process the results, which will influence their click decision toward one kind of result.

With those hypotheses, we imply that the more knowledge (topic or search engine) participants have, the more careful and attentive they will be while navigating on a SERP and that this will reflect on their choice of results.

We have seen that impulsiveness in the context of online navigation can be characterized as clicking without reading the abstract, or not paying attention to what kind of result or website we click on. In this way, we can hypothesize that being impulsive will reduce visual attention to results and thus influence click decisions. Thus, we have:

H4: Impulsiveness has a negative effect on users' visual attention allocated to SERPs' results, hence less time allocated to process the results, which will influence their click decision toward one kind of result.

3.4.2. Method

Similarly to Study 1, this study was approved by our Ethics Committee under the same certificate of ethics approval (n°2022-4854). Study 2 was also conducted in French.

1. The sample

A total of 29 participants were recruited for Study 2. The sample was composed of 17 women and 12 men, aged between 21 to 45 years old, 31 years old on average. For this sample, 16 of the 29 participants had car insurance among the brands present in the local market.

As this study also used physiological measurement tools, participants were asked if they were wearing glasses or contact lenses to read on a computer, if they were epileptic, and if they had any dermal allergies or eye sensibility. Those questions were asked to exclude people that had such issues as they are incompatible with the tools to be used during the experiment (eye-tracking and measure of the electrodermal activity).

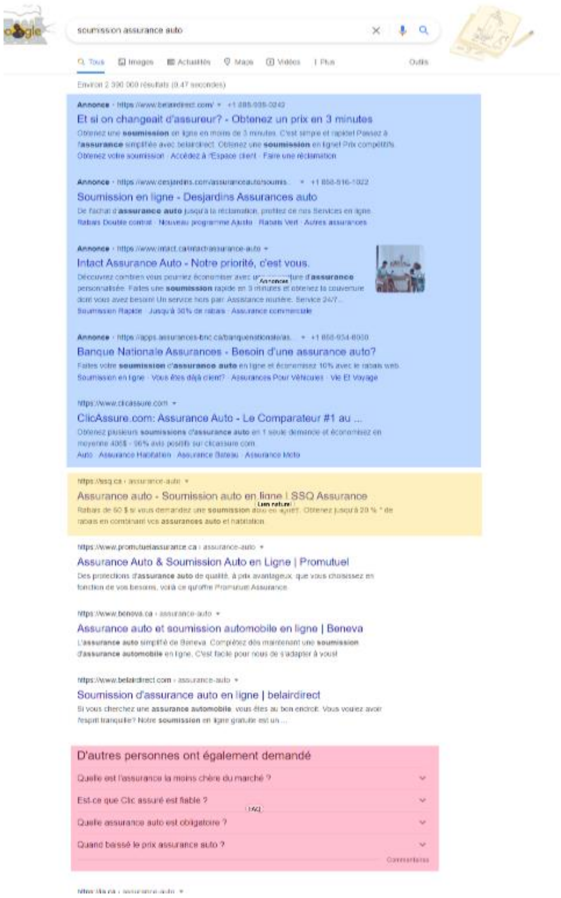
2. Procedure

Prior to the start of the experiment, the participants had to sign a consent form informing them about the modalities of the test and about the physiological measures that were going to be recorded. Then, the experiment started with the calibration of all the tools.

The participants started by answering a questionnaire about their knowledge of two topics: car insurance and search engines. After this pre-task questionnaire, a set of six tasks was given to be completed. Similarly to study 1, short scenarios were given prior to the start of each task in order for the participants to fully integrate the research they will have to do. Same as for the first study, we chose not to randomize the order of the tasks proposed and to stay consistent with the consumer's search logic (i.e., starting by searching for general information and narrowing down the research to end on the search for a quotation). For this study, only the third task was informational whereas tasks 2, 4 and 5 were transactional. Before starting to describe the tasks, it is important to know that SERPs varied from one search to another. Even when using the same keywords, SERPs can look differently and display different links or rank them differently (Levenets, n.d). Many elements, such as live updates of the search engine, location, or previously visited websites influence how Google is going to rank the links on a SERP. In

this way, we designed Tasks 1 and 2 differently in order to get more control over this variability. Study 2 used the same time limit to complete one task as Study 1.

Task 1 consisted of a basic research task where participants were simply told that they were researching car insurance. Task 1 was more specific as this task was not interactive. To get more control and in order to get precise eye-tracking data, the participants were given a short scenario just like for the other tasks, however, they were then seeing a screenshot from a Google search, and could not interact with the SERP. They were not told that the page was a real Google page to get their most natural reaction possible (i.e., scroll down the page, take some time to examine the links, etc.). The purpose to show a screenshot instead of a real Google page was to control the links displayed so every participant would see the same ones, without taking the variable elements impacting the Google algorithm, and so to get accurate eye-tracking data that can be analyzed in-depth and compared accurately. We determined Areas Of Interest (AOIs) on the screenshot where we wanted to analyze the attention of the participants. Those AOIs basically were all the different types of links displayed on a SERP. We then had the following AOIs: the top section sponsored results, the first organic result following them (only the first one), the PAA result, the map, and one link's extensions. See Figure 3 to view the screenshot used annotated with all the AOIs studied. For Task 2, participants were asked to search for a car insurance quotation in the city. However, on this task only, we tried having more control over the SERP's variability by imposing some keywords to use, which were "soumission assurance auto Montréal". For the three following tasks, participants were free to choose the keywords to use. For task 3, participants were instructed to find the best prices for drivers 25 years of age or younger. For task 4, we asked the participants to do an insurance claim. Finally, task 5 was about getting a quotation from a specific company (Desjardins). In Appendix 4, see the details of those scenarios.


soumission assurance auto
Et si on changeait d'assureur? - Obtenez un prix en 3 minutes
Soumission en ligne - Desjardins Assurances auto
Intact Assurance Auto - Notre priorité, c'est vous.
Banque Nationale Assurances - Besoin d'une assurance auto?
ClicAssure.com: Assurance Auto - Le Comparateur #1 au ...
Assurance auto - Soumission auto en ligne | SSQ Assurance
Assurance Auto & Soumission Auto en Ligne | Promutuel
Assurance auto et soumission automobile en ligne | Beneva
Soumission d'assurance auto en ligne | belairdirect
D'autres personnes ont également demandé
Quelle est l'assurance la moins chère du marché ?
Est-ce que Clic assuré est fiable ?
Quelle assurance auto est obligatoire ?
Quand baissé le prix assurance auto ?

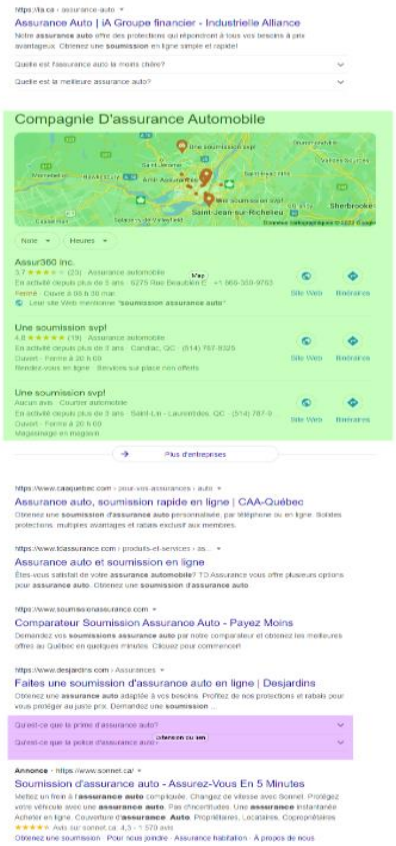


Figure 3: Screenshot used in Study 2 for task 1

Note: the different AOIs are shown through the blocks of colors. In blue, the sponsored links; in yellow, organic link ; in red, People Also Ask ; in green, the map ; in purple, a link's extension.

The rest of the experiment was very much similar to Study 1. After each task, the participants had to answer three questions about their satisfaction, their perceived effort and their confidence in the results related to their research during the tasks (Albert & Tullis, 2013; Langlois et al, 2020). After answering those questions, a moderator was also asking the participants verbally about their experience and their choice of results through a semi-structured interview.

After completing every task, hence at the very end of the test, the participants and the moderator were discussing some topics in another semi-structured interview. The moderator was asking questions related to their knowledge about the sponsored links: if they were noticed and appreciated; and also about their regular habits when it comes to searching for information online (if they tend to search on a laptop, smartphone, alone or with a partner). Finally, the participants had to answer the last questionnaire, aiming to measure their impulsiveness and their attitude toward various brands available in the car insurance market. At the end of the

experiment, the measuring tools were removed, and the participant received their compensation.

3. Measures and instruments

Most of the measures used in Study 2 are the same as the ones used in Study 1. In this way, the same observational data were obtained from taking notes during the experiment as well as qualitative data obtained from semi-structured interviews. Emotional valence and pain points were identified in this study too, using the same Facereader software (Noldus, Wageningen, Netherlands).

The pre-task questionnaire was a self-reported assessment of personal knowledge about car insurance and search engines. Those were measured through two 10-point Likert scales, respectively a car insurance literacy scale (Flynn & Goldsmith, 1999) and a search engine literacy scale (Dou et al., 2010). In the post-task questionnaire, the participants were asked to assess their personality, and more precisely their impulsivity through the Abbreviated Barratt Impulsivity Scale (ABIS) (Coutlee et al., 2014; Baylé et al., 2000) which is a self-reported assessment constituted of 13 items to rate from 1 to 4, 1 being "never or rarely" and 4 being "almost always or always". It was used to operationalize the impulsiveness concept. This scale implies that the answers to the questions (the items) be ordered according to three dimensions of Impulsiveness that are to be analyzed separately (Coutlee et al., 2014). Those dimensions are attentional impulsiveness, which corresponds to inconsistency in controlling thoughts and attention and is characterized by a lack of focus; motor impulsiveness, which represents intuitive decision-making, spontaneous acts and a tendency to emotional reactions; and non-planning impulsiveness which is characterized by a lack of planning and a tendency for foregoing premeditations (Coutlee et al., 2014).

As the second study was led in a lab environment, we were able to use physiological tools. First, we used eye-tracking measures to capture and operationalize the participants' visual attention during the experiment. We used Tobii (Stockholm, Sweden) equipment and associated software Tobii Pro Lab to analyze the data. Oculometry was used for task 1, by analyzing the visualization of the AOIs mentioned before. We measured the electrodermal activity (EDA) of the participants as well using Biopac software (Goleta, USA). The electrodermal activity was used to measure the level of arousal attained by the participant (Dawson et al., 2007), which is calculated by capturing the electric conduction on the palm of

the hand through sweat. The software Observer XT (Noldus, Wageningen, Netherlands) was used to synchronize the measures mentioned above (Léger et al., 2014). We used several metrics extracted from the eye-tracking data to model attention and cognitive loads associated, such as fixations, glances, and visits, according to each AOI. A fixation is by definition a period where the eyes are relatively still so detailed information about what is being looked at can be obtained and is composed of a sequence of gaze points (Tobii Pro AB, 2022). Hence, it is a common indicator of cognitive processing, inducing that the longer the fixation, the higher the attention load (Joseph & Murugesh, 2020; Zagermann et al., 2016). The average duration of a fixation usually ranges between 200 to 300 milliseconds (Zagermann et al., 2016). Whole fixations will also be mentioned in our analysis and designate the interval when all the gaze points composing a fixation are located within the time of interest, i.e., the time allocated to an AOI (Tobii Pro AB, 2022). A saccade is one kind of eye movement "used to move the fovea rapidly from one point to another" and is basically a rapid scan of the page (Tobii Pro AB, 2022). It starts decelerating when the eye finds the focus location, or the AOI (Tobii Pro AB, 2022). A glance is "the time between the start of the saccade leading into the AOI until the end of the last fixation on the AOI" (Tobii Pro AB, 2022) and then records attention from the moment the participant starts recognizing the AOI to the moment they stop putting attention to it. It differs from a visit as this last metric records visual attention from the start of the first fixation on AOI to the end of the last one (Tobii Pro AB, 2022).

Several statistical tests were used to lead the analysis and ensure the results' validity. The analyses were led either by statistical analysis software STATA[9] or SPSS[10]. We led linear regressions using the Ordinary Least Squares (OLS) method with repeated measures due to the non-independence of the observations. The independent variables were observed multiple times among one participant, hence the use of this method. This concerns regressions made in Tables 12-14-15-16 (regressions between eye-tracking data and car insurance knowledge, search engine knowledge and impulsiveness). We normalized the independent variables using logarithms as their distributions were not normal before leading the regressions. All normalized variables will be annotated with "l" or "log" before their names in our tables. The constant variables related to those regressions will be presented in our tables for accuracy purposes. We also led logistic regressions, which can be seen in Tables 13 and 18, to analyze the effects of our independent variables on the click decision. We operationalized click-decision by coding

[9] https://www.stata.com/

[10] https://www.ibm.com/spss

the links' presence per task (1 at least one link of the kind appeared, 0 otherwise) and coding if participants clicked on those (1 if participants clicked on the links at least once during the task, 0 otherwise). Those codifications only concerned tasks 2 to 5. Tasks were also used in those logistic regressions as control variables, in order to detect a potential effect on the results. Hence, tasks 2 to 5 were used to analyze click-decision, controlling for task 2 (meaning that comparisons were made between task 2 and the rest of the tasks). Advertising avoidance was operationalized using a combination of visual attention metrics (i.e. the eye-tracking data), observations from the tests and the aforementioned codifications. We established that advertising avoidance would be supported if some visual attention would be observed on the sponsored section (very little meaning we are facing a banner blindness phenomenon, and a lot meaning participants are actually intending to process the information) but if the clicks were mostly concentrated on other types of results, therefore why we need a combination of metrics to interpret our results. The regressions also excluded any other type of links other than organic and sponsored: they had insufficient occurrences; thus we were unable to perform tests using those variables. All measures used in study 2 are summarized in Table 5.

Construct	Measurement
Visual attention	Eye-tracking (Tobii, Stockholm, Sweden) • Time per AOI • Fixations per AOI • Glances per AOI • Visits per AOI
Knowledge about search engine	Self-reported Search engine literacy scale (Dou et al., 2010) 10-point Likert scale
Knowledge about car insurance (prior topic knowledge)	Self-reported Car insurance literacy scale (Flynn & Goldsmith, 1999) 10-point Likert scale
Impulsiveness	Self-reported ABIS (Coutlee et al., 2014; Baylé et al., 2000) 4-point Likert scale
Advertising avoidance: Total number of clicks	Observations from the tests
Advertising avoidance: Position of the links clicked	Observations from the tests
Advertising avoidance: Number of clicks on specific links	Observations from the tests

Advertising avoidance: Number and types of results displayed on the SERPs (sponsored, organic, maps, PAA, other Google's featured links)	Observations from the tests
Advertising avoidance: Click-through rates (number of clicks on specific results divided by the total number of clicks)	Observations from the tests

Table 5: Measures used in study 2

3.4.3 Results

To open this results section, we can start by presenting the descriptive statistics of the measures used in this study. Firstly, the participants had to fill out questions about their knowledge of car insurance, of search engines and about their level of impulsiveness for us to obtain the desired data to test our hypotheses. See in Table 6 the descriptive statistics of the answer to this questionnaire. The impulsiveness scale was divided into three dimensions as described in the Method section.

	IMPULSIVENESS			PRIOR TOPIC KNOWLEDGE	SEARCH ENGINE KNOWLEDGE
	Attentional	Motor	Non Planning	Car insurance knowledge	Search engine knowledge
Mean	1.86	2.13	1.91	3.48	5.33
Minimum	1.00	1.25	1.00	1.00	3.33
Maximum	3.00	4.00	3.50	6.22	6.83
Standard deviation	0.46	0.68	0.58	1.33	0.98
Skewness	0.09	0.88	0.64	0.18	-0.20
Kurtosis	2.58	3.37	3.43	2.12	2.13
N	145.00	145.00	145.00	145.00	145.00

Table 6: Descriptive statistics for the impulsiveness, prior topic knowledge and search engine knowledge measures.

We also used the presence of each type of link to help us operationalize the click decision. In Table 7, see the presence of the different results from Task 2 to Task 5 and the clicks effectuated on those types of results. We excluded Task 1 as it was not an interactive task and the presence of results was controlled. Table 7 also helps us to visualize why we excluded most types of results from our analysis, as their presence was infrequent, and they accounted for a very little number of clicks overall.

	PRESENCE OF THE DIFFERENT RESULTS					
	Sponsored	**Organic**	**Map**	**PAA**	**Link's extension**	**Definition**
Mean	0.98	0.97	0.15	0.39	0.58	0.14
Minimum	0	0	0	0	0	0
Maximum	1	1	1	1	1	1
Standard deviation	0.13	0.18	0.36	0.49	0.50	0.35
Skewness	-7.42	-5.10	2.00	0.46	-0.31	2.10
Kurtosis	56.02	27.04	5.00	1.21	1.10	5.41
N	116	116	116	116	116	116

CLICK ON RESULTS					
Sponsored	**Organic**	**Map**	**PAA**	**Link's extension**	**Definiton**
0.44	0.58	0.02	0.03	0	0.05
0	0	0	0	0	0
1	1	1	1	0	1
0.50	0.50	0.13	0.18	0	0.22
0.24	-0.31	7.42	5.10		4.05
1.06	1.10	56.02	27.04		17.39
116	116	116	116	116	116

Table 7: Descriptive statistics of the presence and clicks related to each type of result

Finally, see in Table 8 a summary of the descriptive statistics of the visual attention metrics. Most of our analyses were led with all the metrics extracted from Tobii in order to remain as precise as possible, however, this summary presents the main metrics used to draw conclusions from our results. This only concerns Task 1 and as we did not use the observations on every type of result, we are only presenting the descriptive statistics for sponsored and organic results. The descriptive statistics of the observational data will be presented in the next sections.

	Sponsored			Organic		
Variable	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
Time_to_first_fixation	28	547.00	850.58	26	9725.19	7287.51
Number_of_fixations	28	51.46	34.07	26	16.88	12.51
Total_durationtion_of_fixations	28	12975.07	8105.27	26	4558.69	3329.41
Average_duration_of_fixations	28	259.64	46.19	26	291.65	82.48
Total_duration_of_Glances	28	15215.36	9770.86	26	5191.00	3785.85
log_time to first fixation	16	6.27	1.20	26	8.91	0.77
log_total_fixation_duration	28	9.25	0.73	26	8.10	0.91
log_avg_fixation_duration	28	5.55	0.17	26	5.64	0.25
log_total_glance_duration	28	9.39	0.75	26	8.22	0.92
pct_time_fixation	27	0.60	0.40	25	0.21	0.19
pct_time_glance	27	0.70	0.45	25	0.24	0.21
log_pct_time_fixation	27	-0.72	0.68	25	-2.03	1.09
log_pct_time_glance	27	-0.57	0.69	25	-1.90	1.09

Table 8: Summary of descriptive statistics of the visual attention metrics

1. Advertising avoidance

With H1, we hypothesized that users adopt a pattern of advertising avoidance toward sponsored links displayed on a SERP. This takes into consideration various dimensions: first, users might be blind to the top sections of sponsored links on SERPs (i.e., the banner blindness phenomenon as previously mentioned), and/or users are more generally avoiding those links to prefer organic links or other types of results displayed on a page. We know that for our first study that most users were aware of the presence of advertising on SERPs. For Study 2, we can establish the same conclusion: on 29 participants, 23 answered they noticed the sponsored links when asked about them. This brings us more control over our following result as this suggests that participants that clicked on them were doing it knowing it was paid advertising.

Now looking specifically at the results of Task 1 (i.e. the non-interactive task allowing the use of eye-tracking), we obtain interesting information about advertising avoidance. First, we extracted a heatmap from the software Tobii ProLab, which is a visualization of the overall fixations of all participants on a screenshot (Tobii Pro AB, 2014). The colors present on the heatmap determine the number of fixations: red indicates a high concentration of fixations on the area, while green indicates a lower level of fixations. See in Figure 4 the heatmap extracted from Tobii for task 1 representing the fixations for all participants.

Figure 4: Heatmap from Task 1, all participants

We can clearly see that there is an important concentration of fixations located on the upper section of the SERP, thus on the sponsored links. In other words, this means that sponsored links generated attention. Some areas reach an orange, almost red color meaning that the participants spent a lot of time looking at those links, which indicates a somehow important cognitive processing going on, hence banner blindness is not occurring. The first organic link is however the one that seems to gather the most fixations. Looking at the data extracted from Tobii, we observed that the AOI related to sponsored links cumulated an average of 51 fixations and that every participant saw it. In comparison, the first organic link was seen by 26 participants and cumulated an average of 17 fixations over the area (the associated AOI corresponded only to the first link, which explains the difference with the number of fixations on the sponsored links as there were four of them). With the total duration of glances, we are able to measure the overall time spent paying attention to the AOIs as the glance includes the short moment before a fixation (i.e. a brief moment before the starting reading and processing the information) to the end of the last fixation (i.e. the end of the cognitive processing related to the studied AOI): this time is on average 15.2 seconds for sponsored links, and 5.2 seconds

for the first natural link, scores once again to consider according to the number of links to examine in one AOI. Another metric that is interesting is the time to first fixation for the organic link: we can see that on average it is of 9 seconds, meaning participants would spend 9 seconds looking elsewhere before looking at the organic link. In this way, we can interpret those results as an important cognitive process going on when participants look at the sponsored results. See Table 9 for a summary of the descriptive statistics related to the aforementioned AOIs. The following table is presented in milliseconds.

	Sponsored			Organic		
Variable	**N**	**Mean**	**Std Dev**	**N**	**Mean**	**Std Dev**
Time_to_first_fixation	28	547.00	850.58	26	9725.19	7287.51
Number_of_fixations	28	51.46	34.07	26	16.88	12.51
Total_durationtion_of_fixations	28	12975.07	8105.27	26	4558.69	3329.41
Average_duration_of_fixations	28	259.64	46.19	26	291.65	82.48
Total_duration_of_Glances	28	15215.36	9770.86	26	5191.00	3785.85

Table 9: Descriptive statistics, AOIs and Eye-tracking (in milliseconds)
*One participant excluded from the results due to technical issues with their data.

We also made regressions to statistically compare the difference in visual attention between sponsored links and the first organic link. Through those regressions, we obtained significant differences between the eye-tracking data of both types of links: variables "number of fixations", "total duration of fixation", "total glance duration", "time/fixation" and "time/glance"[11] are all statistically higher for sponsored links than for the organic link, meaning that overall, participants spend more time processing the sponsored section than the first organic link. Details of those regressions are in Table 10.

AOI	**_AOI**	**Estimate**	**StdErr**	**DF**	**tValue**	**Probt**	**Adjustment**	**Adjp**	**DV**	**Method**
Sponsored	Organic	1.16	0.2	60	5.64	<.0001	Holm	<.0001	Number_of_fixations	Neg. binomial[1]. regression with random intercept
Sponsored	Organic	1.16	0.23	60	5.01	<.0001	Holm	<.0001	log_total_duration of fixation	Linear regression with random intercept
Sponsored	Organic	1.18	0.23	60	5.07	<.0001	Holm	<.0001	log_total_glance duration	Linear regression with random intercept
Sponsored	Organic	1.31	0.24	57	5.39	<.0001	Holm	<.0001	log_pct_time/fixation	Linear regression with random intercept
Sponsored	Organic	1.34	0.24	57	5.49	<.0001	Holm	<.0001	log_pct_time/glance	Linear regression with random intercept

[11] respectively, those variables correspond to the total number of fixations or glances, divided by the task duration, hence they are presented in percentages of the task duration.

Table 10: Comparative regressions between sponsored links and first organic link.

1. Parametric test of overdispersion (alpha) significantly different from 0, which justifies the use of a negative binomial model over a Poisson regression model.

Now, looking at the observations made during the experience, we have the number of clicks made on each of the displayed links during Task 1. From those observations, we noticed that the most clicked-on link was the first organic link after the sponsored ones with 13 clicks among all participants (as a reminder, during this task only, participants could only click on one link). The overall number of clicks on sponsored links reached 10, making the first organic link participants' first choice. Table 11 sums up the observations made throughout the experience.

TASK 1		
Links positions	**Number of clicks**	**Click-through rate (%)**
1 (sponsored)	2	7
2 (sponsored)	6	21
3(sponsored)	2	7
4 (sponsored)	0	0
5 (organic)	13	45
All sponsored	10	34.48
TASK 2-5		
Types of results	**Number of clicks**	**Click-through rate (%)**
Sponsored results	62	38.27
Organic results	87	53.7

Table 11: Descriptive statistics of observational data

From Table 11, we also noticed that the observations for the rest of the set of tasks are similar and that organic links are favored by participants. It is to be noted that Task 5 gathered an important number of clicks on sponsored results, higher than on organic results, but this was the only task where this observation was made. Hence, this task considerably increased the overall number of clicks on sponsored results without being the general tendency on the overall experience. Those observations will be further discussed in one of the next sections, where we will focus on the influence of task types on users' behavior. From those tests, we can then conclude that sponsored links definitely generate visual attention, despite having a lower click-through rate compared to organic links. In other words, participants did pay attention to the sponsored results but did not favor them in their click-decision. Hence, by being mentally aware

of the presence of advertising and deciding to choose another link, participants were indeed avoiding clicking on a sponsored link. **Thus, H1 is supported.**

2. Topic and search engine knowledge

Through H2 and H3, we hypothesized that prior topic knowledge and search engine knowledge would have a positive effect on visual attention while searching on a SERP. This means that having good prior topic knowledge would make participants more aware of their research and thus, increase the attention paid to SERPs' results, hence more time processing those displayed results. Similarly, a good knowledge of search engines would increase visual attention: an experienced user would have a greater awareness of the displayed results and thus take more time to process the information to be sure to make the "right" choice. To intent to answer those hypotheses, we led linear regressions between the eye-tracking data extracted from Task 1, and the results of the knowledge assessments completed by the participants prior to the start of the experiment. The attentional variables from Tobii were used as dependent variables meanwhile the questionnaire answers were used as the independent variables.

Looking at the effect of both kinds of knowledge on the visual attention paid to sponsored links, we obtained only one significant result from the regressions between sponsored links and car insurance knowledge, a positive effect with Time to first fixation (coef.=0.57, SE=0.43 & p-value=0.2). However, we found more significant results from the regressions led with search engine knowledge. It is the case for some variables extracted from Tobii, such as Total duration fixation (coef.=0.26, SE=0.15 & p-value=0.1), the number of fixations (coef.=0.29, SE=0.14 & p-value=0.05), number of whole fixations (coef.=0.28, SE=0.13 & p-value=0.05), total duration of visit, etc. (the summary of the important results of the regression are in Table 12).

	lTotalDurationFixations		lNumberFixations		lTimetoFirstFixation		lNumberWholeFixations	
	reg1		reg4		reg5		reg11	
	b/se/p		b/se/p		b/se/p		b/se/p	
Car insurance knowledge[1]	-0.03		-0.04		**0.57**	*	-0.05	
	0.09		0.09		**0.43**		0.09	
	0.77		0.64		**0.20**		0.61	
Search engine knowledge[1]	**0.26**	**	**0.29**	**	-0.38		**0.28**	**
	0.15		**0.14**		0.60		**0.13**	
	0.10		**0.05**		0.53		**0.05**	
constant variable	8.00	****	2.41	***	3.61		2.41	***
	0.84		0.78		3.08		0.76	
	0		0		0		0	
N	29		29		29		29	
N_clust	29		29		29		29	
df_m	2		2		2		2	
F	1.49		2.21		0.87		2.22	
R²	0.10		0.13		0.05		0.13	
R²_a	0.04		0.06		-0.02		0.06	
p	0.24		0.13		0.43		0.13	

	lTotalDurationWholeFixation		lDurationFirstVisit		lDurationFirstGlance	
	reg7		reg20		reg26	
	b/se/p		b/se/p		b/se/p	
Car insurance knowledge[1]	-0.03		0.09		0.10	
	0.09		0.18		0.18	
	0.75		0.60		0.59	
Search engine knowledge[1]	**0.25**	*	**-0.38**	**	**-0.38**	**
	0.15		**0.18**		**0.18**	
	0.10		**0.05**		**0.05**	
constant variable	8.02	****	8.43	****	8.45	****
	0.82		0.87		0.87	
	0		0		0	
N	29		29		29	
N_clust	29		29		29	
df_m	2		2		2	
F	1.41		2.21		2.26	
R²	0.10		0.11		0.11	
R²_a	0.03		0.04		0.04	
p	0.26		0.13		0.12	

Table 12: Summary of the linear regressions knowledge/sponsored links
1. Unilateral level of significance. p-values are associated to different levels of significance: * p-value< 0.20, ** p-value< 0.1, *** p-value< 0.02, **** p-value < 0.002.

For almost all significant relationships found, the coefficient is positive, with the exception of the duration of first visit (coef.=-0.38, SE=0.18 & p-value=0.05) and Duration of first glance (coef.=-0.38, SE=0.18 & p-value=0.05). However, in the context of visual attention, those variables are less interesting than the fixations ones, which imply a cognitive process when observed. Thus, when for example the total duration fixation is increasing, this means that participants are overall spending more time processing the AOI. With positive coefficients, we are able to say that when significant, the tests suggest a positive relationship between dependant

and independent variables, hence that as search engine knowledge increases, attention to sponsored links increases as well. However, not all variables from eye-tracking seem affected by search engine knowledge. Moreover, it almost does not affect at all attention on an organic link.

We also led logistic regressions between the clicks that were made during the rest of the tasks and with the answers to the knowledge assessments, controlling for the apparition of the results. Those regressions extend the observations previously made as we discovered a negative relationship between search engine knowledge and clicking on sponsored links (coef.=-0.70, SE=0.35 & p-value=0.05) but a positive relationship with organic links (coef.=0.9, SE=0.35 & p-value=0.01). Moreover, this last relationship has a higher significance level (p-value inferior to 0.02). See the details of these regressions in Table 13.This suggests that a good knowledge of search engines would induce a higher probability of clicking on organic links, but a lower probability of clicking on sponsored links. It has then an influence on click-decision.

	Click sponsored result		**Click organic result**	
	b/se/p		b/se/p	
Car insurance knowledge[1]	0.24		-0.01	
	0.23		0.25	
	0.30		0.98	
Search Engine knowledge[1]	**-0.70**	**	**0.90**	***
	0.35		**0.35**	
	0.05		**0.01**	
constant variable	4.48		-8.04	
	2.62		3.12	
	0.09		0.01	
N	116		116	
N_clust	29		29	
df_m	12		12	
k	15		15	
k_eq	1		1	
k_eq_model	1		1	
k_dv	1		1	
R^2_p	0.29		0.33	
p	0		0	

Table 13: Summary of logistic regressions led between knowledge and clicks

1. Unilateral level of significance. p-values are associated with different levels of significance: * p-value< 0.20, ** p-value< 0.1, *** p-value< 0.02, **** p-value < 0.002

Thus, **H2 is supported**, as search engine knowledge does have a positive effect on attention but only on sponsored links, and a positive effect on click-decision but only for organic links. This result is somehow aligned with the information we found on the matter in the literature. By suggesting that the more advanced the users are, the more they pay attention to sponsored

links, our results come in complement the previous studies and may suggest that users that know search engines very well are also well aware of the "paid" aspect of sponsored links and would be then more careful before clicking, or before skipping them accordingly to our findings.

Regarding our results about prior topic knowledge (car insurance knowledge in our context), we found opposite results, as to know: no significant relationship was found between car insurance knowledge and attention to sponsored links, but we got significant results for attention to the first organic link. This time, however, all significant coefficients were negative, and we found correlations with almost all variables from Tobii. The summary of those regressions will be in Table 14.

	lTotalDurationFixation		AverageDurationFixations		lNumberFixations		lTotalDurationWholeFixation		AverageDurationWholeFixation	
	reg1		reg2		reg4		reg7		reg8	
	b/se/p		b/se/p		b/se/p		b/se/p		b/se/p	
Car insurance knowledge[1]	**-0.78**	**	**-37.13**	**	**-0.31**	**	**-0.77**	**	**-40.17**	**
	0.37		**17.07**		**0.15**		**0.37**		**17.68**	
	0.04		**0.04**		**0.05**		**0.04**		**0.03**	
Search Engine knowledge[1]	0.17		1.16		0.15		0.15		3.13	
	0.72		27.55		0.25		0.71		28.30	
	0.82		0.97		0.55		0.83		0.91	
constant variable	9.09	**	384.33	***	2.56	**	9.08	**	388.22	***
	4.05		155.04		1.45		4.03		156.50	
	0.03		0.02		0.09		0.03		0.02	
N	29		29		29		29		29	
N_clust	29		29		29		29		29	
df_m	2		2		2		2		2	
F	2.31		2.38		2.23		2.29		2.60	
R^2	0.15		0.17		0.12		0.15		0.19	
R^2_a	0.08		0.11		0.05		0.08		0.13	
p	0.12		0.11		0.13		0.12		0.09	

Table 14: Summary of the linear regressions knowledge/organic link

1. Unilateral level of significance. p-values are associated with different levels of significance: * p-value< 0.20, ** p-value< 0.1, *** p-value< 0.02, **** p-value < 0.002

Focusing again on some of the fixation variables, those corresponding to cognitive processing, we see that as the coefficients are negative, the effect of prior topic knowledge on the way users process the first organic result is negative. For example, this means that as prior topic knowledge increases, the number of fixations on the first organic result (coef.=-0.31, SE=0.15 & p-value=0.05) will decrease. In other words, the more participants know about the topic, the less attention they will allocate to the first organic result. This goes the same for every other metric we calculated.

We led similar logistic regressions to study click-decision related to car insurance knowledge, however, we did not find any significant result this time, hence it seems that car insurance knowledge does not influence click-decision on either sponsored or organic links (see in above Table 13). Contrary to our interpretation of the previous findings, the present results related to car insurance knowledge suggest that the higher the knowledge about car insurance is, the lower the attention to the first organic link is. Thus, **H3 is rejected** as we found a negative effect on one specific type of result displayed on SERPs. Despite having a negative effect on the first organic link, we cannot extend this observation to other types of results, nor draw any conclusion on whether it affects SEA avoidance. This result could suggest that participants with high knowledge of car insurance and of the market would be less likely to spend a lot of time reading and processing the information displayed by the first organic link, however, we are not able to say that it has an impact on click-decision.

3. Impulsiveness

We led similar linear regressions as in the previous section, with eye-tracking data (fixations, glances, visits, all per AOIs) as dependent variables and the impulsiveness scale (ABIS) results as independent variables, testing for both organic and sponsored links. First looking at results for sponsored links, we found a few significant relationships between some of the dimensions of the ABIS scale and some dimensions of visual attention. Motor impulsiveness for example has a negative effect on two variables related to Fixations (Minimum duration fixation, coef.=-0.44, SE=0,21 & p-value=0.04 and Time to first fixation, coef.=-2.02, SE=0.98 & p-value=0.05), but a positive effect on Duration of first whole fixation (coef.=0.23, SE=0.13 & p-value=0.09). Non-planning impulsiveness was found to have a positive effect on Maximum duration of whole fixation (coef.=248.999, SE=133.76 & p-value=0.073). Finally, Attentional impulsiveness is negatively related to Number of Fixations (coef=-0.344, SE=0.26 & p-value=0.191). Thus, it is complicated to draw any conclusion from those results as they are somehow contradictory and scattered. We again focused on the fixation variables, however, we found other significant relationships with other types of variables, either positive or negative, but similarly difficult to interpret. See the summary of the results in Table 15 below.

	lMinimum Duration Fixations		lNumber Fixations		lTimeto First Fixation		Maximum Duration Whole Fixation		lMinimum Duration Fixations		lDuration FirstWhole Fixation	
	reg3		reg4		reg5		reg10		reg3		reg13	
	b/se/p		b/se/p		b/se/p		b/se/p		b/se/p		b/se/p	
Attentional impulsiveness[1]	0.06		**-0.34**	*	1.35		9.97		0.06		-0.12	
	0.29		**0.26**		1.06		106.02		0.29		0.21	
	0.83		**0.19**		0.21		0.93		0.83		0.58	
Motor impulsiveness[1]	**-0.44**	**	-0.03		**-2.02**	**	-139.59		**-0.44**	**	**0.23**	**
	0.21		0.24		**0.98**		127.13		**0.21**		**0.13**	
	0.04		0.91		**0.05**		0.28		**0.04**		**0.09**	
Non Planning impulsiveness[1]	-0.09		0.24		0.78		**249.00**	**	-0.09		-0.19	
	0.24		0.30		1.42		**133.76**		0.24		0.18	
	0.70		0.43		0.59		**0.07**		0.70		0.30	
constant variable	5.24	****	4.03	****	3.86	*	623.91	***	5.24	****	5.36	****
	0.67		0.73		2.73		245.73		0.67		0.53	
	0.00		0.00		0.17		0.02		0		0	
N	29	29	29	29	29	29	29	29	29	29	29	
N_clust	29	29	29	29	29	29	29	29	29	29	29	
df_m	3	3	3	3	3	3	3	3	3	3	3	
F	1.56		0.85		2.07		1.20		1.56		1.07	
R^2	0.22		0.05		0.15		0.11		0.22		0.09	
R^2_a	0.13		-0.06		0.05		0.00		0.13		-0.02	
p	0.22		0.48		0.13		0.33		0.22		0.38	

Table 15: Summary of the linear regressions impulsiveness/sponsored links
1. Unilateral level of significance. p-values are associated with different levels of significance: * p-value< 0.20, ** p-value< 0.1, *** p-value< 0.02, **** p-value < 0.002

No significant results were found looking at the logistic regressions between click-decision and impulsiveness (similar to the ones used in the previous sections). Regarding the results with organic links, we found multiple significant effects with variables of attention to them. Attentional impulsiveness seems to have effects on almost every attention variable. Most of them are positive, the stronger ones being with Average duration of fixations (coef.= 162.78, SE=46.04 & p-value=0.00) and Average duration of whole fixation (coef.= 163.60, SE=46.56 & p-value=0.00). However, on the average duration of fixations, we also notice that Motor impulsiveness has a negative effect (respectively, coef.=-47.73, SE=27.41 & p-value=0.09), but has a positive effect on Number of Fixations (coef.=0.50, SE=0.27 & p-value=0.07) or on Number of whole Fixations (coef.=0.47, SE=0.26 & p-value=0.08). We found other negative effects of Non-planning impulsiveness on Number of fixations (coef.=-0.95, SE=0.36 & p-value=0.01), Number of whole fixations (coef.=-0.92, SE=0.34 & p-value=0.01). See this summary in Table 16. Just as for sponsored links, we did not find any significant relationship through our logistic regressions to analyze click-decision.

	Average_duration_of_fixations		Average_duration_of_whole_fixation		lNumberFixations		lNumberWholeFixations	
	reg2		reg8		reg4		reg11	
	b/se/p		b/se/p		b/se/p		b/se/p	
Attentional impulsiveness[1]	**162.78**	***	**163.60**	***	0.70		0.72	
	46.03		**46.56**		0.57		0.55	
	0.00		**0.00**		0.23		0.20	
Motor impulsiveness[1]	**-47.73**	*	-45.32		**0.50**	*	**0.47**	*
	27.41		28.52		**0.27**		**0.26**	
	0.09		0.12		**0.07**		**0.08**	
Non Planning impulsiveness[1]	25.82		24.35		**-0.95**	**	**-0.92**	**
	35.69		38.49		**0.35**		**0.34**	
	0.48		0.53		**0.01**		**0.01**	
constant variable	11.94		11.87		1.77		1.67	
	103.90		107.14		1.25		1.20	
	0.91		0.91		0.17		0.17	
N	29		29		29		29	
N_clust	29		29		29		29	
df_m	3		3		3		3	
F	4.72		4.52		3.62		3.81	
R^2	0.42		0.40		0.21		0.21	
R^2_a	0.35		0.33		0.11		0.12	
p	0.01		0.01		0.03		0.02	

Table 16: Summary of the linear regressions impulsiveness/organic links
1. Unilateral level of significance. p-values are associated with different levels of significance: * p-value< 0.20, ** p-value< 0.1, *** p-value< 0.02, **** p-value < 0.002

In this way, it is difficult to draw clear conclusions on the effect of impulsiveness on attention and click-behavior on SERPs. The results we obtained are very divided, however, it still seems like attentional impulsiveness has an overall positive effect on the visual attention paid to organic links, hence more time allocated visually processing organic links, but not on click-decision. Those mixed results make interpretation complicated and it is not really possible to know if impulsiveness as a whole influences users' behavior on a SERP. Thus, **H4 is rejected**.

4. Task Types

As introduced by Broder (2002), we witness three types of tasks when browsing the Web: informational, transactional, and navigational. In Study 2, we designed only one informational task (Task 3) and three transactional tasks (2-4-5). Task 5 had one specificity: participants had to ask for a quote for one particular car insurance.

First, we are going to look at the observational data from the notes taken during the experiment. Just like for Task 1, Tasks 2 to 4 also count a higher number of clicks on organic links compared to sponsored links. The click-through rate for organic links during those tasks revolves around 60% while sponsored links range between 22 to 34%. We observed however a significant

difference when it comes to task 5: during this task, participants mainly clicked on sponsored links, which reached a click-through rate of 80%. See the details in Table 17.

T2			T3			T4			T5		
		Click through rate			Click through rate			Click through rate			Click through rate
Clicks on sponsored links	13	31%	Clicks on sponsored links	15	34%	Clicks on sponsored links	10	22%	Clicks on sponsored links	24	80%
Clicks on organic links	26	62%	Clicks on organic links	27	61%	Clicks on organic links	26	57%	Clicks on organic links	8	27%
Total number of clicks		42	Total number of clicks		44	Total number of clicks		46	Total number of clicks		30

Table 17: Descriptive statistics of clicks for tasks 2 to 5

We also led similar logistics regressions as previously mentioned to test for significant relationships between tasks and clicks, and it does seem like Task 5 is the only one that shows a difference. The regressions are controlled for Task 2, meaning that the comparisons were obtained comparing each task with Task 2. We obtained a positive relationship between Task 5 and a click on a sponsored link (coef.=2.64, SE=0.65 and p-value=0.00), and a negative one between Task 5 and a click on an organic link (coef.=-2.79, SE=0.85 and p-value=0.00), both compared to Task 2. Thus, the difference regarding task 5 is empirically proven, and those results mean that there is a higher probability of clicking on a sponsored link during Task 5 compared to clicking on one during Task 2, and on the contrary, a lower probability of clicking on an organic link during Task 5 compared to the probability of clicking on one during Task 2. The present results are shown in Table 18.

		Click Sponsored result		**Click Organic result**	
		b/se/p		b/se/p	
main					
Task 2					
Task 3[2]	Coef,	0.42		0.20	
	(s,e,)	0.72		0.90	
	p-value	0.56		0.82	
Task 4[2]		-1.01		1.35	
		1.18		1.29	
		0.39		0.29	
Task 5[2]		**2.63**	****	**-2.79**	***
		0.65		**0.85**	
		0.00		**0.00**	
N		116		116	
N_clust		29		29	
df_m		12		12	
k		15		15	
k_eq		1		1	
k_eq_model		1		1	
k_dv		1		1	
R^2_p		0.29		0.33	
p		0		0	

Table 18: Summary of logistic regressions comparing click-decision according to the tasks
2. Bilateral level of significance. p-values are associated to different levels of significance: * p-value< 0.10, ** p-value< 0.05, *** p-value< 0.01, **** p-value < 0.001.

We can yet say that the use of sponsored links has been shown to be favoured when participants were asked for a specific brand to search for. This is however not proof of task types influencing behavior, but more of the research motive influencing advertising behavior. This result might suggest that participants may be more inclined to choose sponsored links when the brand is well known, or simply when asked for something very specific.

To sum up all of our results, see in Table 19 below a summary of our tests and results for every hypothesis, and whether we supported them or not.

HYPOTHESES	TEST	RESULTS	SUPPORT
H1 (advertising avoidance)	• Analysis of the visual attention to sponsored results. • Comparison with visual attention to organic results • Comparison of the click-decision between sponsored and organic results, with regards to their respective visual attention allocated	• Visual attention to sponsored results more important than for organic results, inducing more cognitive processing • Click-decision in favor of organic links	**SUPPORTED**
H2 (Search engine knowledge)	• Statistical tests to establish relationships between search engine knowledge and visual attention and click-decision	• Positive effect on visual attention to sponsored links • Positive effect on click-decision toward organic links	**SUPPORTED**
H3 (Prior topic knowledge)	• Statistical tests to establish relationships between prior topic knowledge and visual attention and click-decision	• Negative effect on visual attention to organic results	**REJECTED**
H4 (Impulsiveness)	• Statistical tests to establish relationships between impulsiveness and visual attention and click-decision	• Some effects discovered but too scattered to be interpreted	**REJECTED**

Table 19: Summary of results and support for hypotheses

3.4.4 Discussion

Study 2 aimed at furthering the results of Study 1. Through Study 2, we identified several patterns in user behavior in the context of navigating SERPs. Our first hypothesis was that a pattern of advertising avoidance was observed while searching on a SERP. This first hypothesis was supported because we noticed that sponsored links on SERPs were generating a lot of visual attention and cognitive processing but were not the participants' favored links. Instead,

participants were mainly choosing the first organic link coming right after the top sections displaying SEA. We also observed that the only exception observed for this behavior was when a company brand was explicitly required to complete the task, if so, the participants were most likely to click on a sponsored link from that brand. Our second and third hypotheses were related to the influence of knowledge on attention and click-decision. We found out that search engine knowledge seemed to positively influence visual attention on sponsored links and positively influence click-decision towards organic links, hence it seems like search engine knowledge favors advertising avoidance. Similarly, we found that prior topic knowledge was positively related to attention on the first organic link, but no effect was found concerning click decision. In this way, we decided to partially support H2 and H3 as it seems that both kinds of knowledge influence users' behavior online, but to a certain extent only. Those results are aligned with previous findings as our literature review led us to understand that expert users are more conscious of their online behavior and the way they browse (Hsieh-Yee, 2001; White & Morris, 2007) and that users with a good topic knowledge were performing better and using better query formulations to obtain information online (Allen, 1991; Lewandowski & Kammerer, 2021). Our fourth hypothesis was about the influence of impulsiveness on users' online behavior. This hypothesis was partially rejected because even though we found some relationships through our statistical tests, the results were too divided to make draw conclusions and interpretations.

3.5 General Discussion

To get a better view of what was found throughout this research, here is a summary of the key results obtained after Study 1 and Study 2. Firstly, we obtained significative results concerning the way users are processing sponsored links: our results suggest that participants were purposely avoiding clicking on sponsored results at the top section of the SERPs as those sections were generating a lot of visual attention but a low click-through rate. Secondly, we got evidence about the influence of individual factors on users' viewing behavior while navigating on a SERP. We found support for our hypothesis stating that search engine knowledge was influencing users' viewing behavior while navigating a SERP and rejected the one about prior topic knowledge (even though we found an effect, this one was negative as opposed to what was stated in our hypothesis). Impulsiveness was not successfully proven to have an influence on users' behavior, nor do task types which were the contextual factors we chose to study.

Finally, our results suggest that Google's special features, such as PAA, are appreciated by participants but have a low click-through rate.

Our objective was to explore users' behavior in the context of online search, specifically when facing various types of results on a SERP. With our two studies, we have shown that sponsored results are not processed the same as other results. We first demonstrated that similarly to other kinds of media displaying sponsored content and advertising (Speck & Elliott, 1997; Cho & Cheon, 2004), SEA was subject to avoidance. Users during our experience manifested high visual attention and cognitive load while navigating through the top sections of the SERPs, but organic results were however mostly chosen by the participants. Advertising avoidance was defined by Speck and Elliott (1997) as actions taken to reduce exposure to sponsored content, thus by cognitively recognizing the presence of sponsored links and choosing deliberately the link after those, participants were avoiding SEA. Additionally, choosing an organic link displayed right after the sponsored content represents the said "action taken" to avoid advertising. With this finding, we then align with prior research studying advertising avoidance on the Internet (Cho & Cheon, 2004; Réjon-Guardia & Martinez-Lopez, 2014; Kelly & Kerr, 2010) but with a focus on search engines and SEA, replicating the results of Li (2019) who led a similar study in the Chinese context. We showed evidence that in our Western context, users were equally avoiding sponsored results by preferring others, specifically, the first organic result displayed, thus extending the work previously made and initiating research on Google and new SERPs.

In addition to those findings, we found that search engine knowledge was a predictor of SEA avoidance. Search engine knowledge was demonstrated to have a positive effect on visual attention on sponsored results, but influences click-decision towards organic results. In other words, users with good knowledge of search engines spend more time processing sponsored results, but would rather click on an organic link, implying that high-knowledge web users would be more likely to avoid sponsored links while navigating on a SERP. This finding then further prior work done on search engine knowledge as a factor influencing online behavior: the literature shows that web knowledge has an influence on users' performance to complete online tasks, and on their browsing strategies (Hölscher & Strube, 2000; Hsieh-Yee, 2001), however, no work has been done proving that it would influence SEA avoidance. Our study then provides new insights into how search engine knowledge influences users' online behavior while processing information on SERPs.

Our study also confirmed that prior topic knowledge had an effect on online behavior. Previous studies established that, just like search engine or web knowledge, having good prior topic knowledge had a positive influence on users' performance and querying strategies used to retrieve information online (Allen, 1991; Lewandowski & Kammerer, 2020), leading also to a more careful reading of the links (Lewandowski & Kammerer, 2020). Our research demonstrated that with good prior topic knowledge, participants were less likely to spend time looking at the first organic link. Although we did not find evidence that topic knowledge would influence click-decision, it does seem like it has an influence on viewing behavior regarding what kind of result is being processed by users.

Impulsiveness was believed to have a negative relationship with users' attention, as being impulsive would technically mean paying less attention to the information displayed. Our results were however not sufficient to draw clear conclusions on the topic, thus we partially rejected this hypothesis. As a contextual factor, we wanted to explore the role of task types in our experiment, as it is still a matter of debate in the literature (Lewandowski & Kammerer, 2021). However, we rejected our hypothesis as we did not get significant results, which may partly be due to our study design and will be explained later.

In the end, this study brings new findings to the aging literature on the matter. Search engines, and thus, SERPs are now part of our daily lives and represent our main access to information. They represent opportunities for companies to promote their offers, and simply make them accessible to everyone. Getting a better understanding of how and why users make certain choices or act a certain way online, can only be beneficial for companies, UX designers and marketers. Our study allows companies to understand the users' patterns when they process the information on a search engine, and to comprehend how they differentiate sponsored results from others. This represents important findings as the information process on SERPs has not been studied recently and thus, considering SERPs new types of results. By knowing users are avoiding sponsored results and why they do it, companies are gaining tools to build more efficient online strategies. Our result concerning search engine knowledge as a predictor of SEA avoidance may be particularly interesting as this would suggest that habituation and familiarity make users more aware and more likely to avoid certain content, then giving companies matter to reflect on how to promote their offer efficiently online. A lot remains to be explored when it comes to search engines, however, this study constitutes one foundation for search engine research, and we hope that more is going to complement it.

Our research presents some limits and recognizing them could help other researchers to approach the topic differently. This study remained broad and did not focus on one particular type of result. By not focusing on certain types of results, we concealed research on a few of them. This is mainly the case for Google's special features (Zero click results, People Also Ask, etc.). We found some interesting leads in Study 1, stating that those links may generate attention despite not being much clicked-on (as they often do not require any click to be used). Those links unfortunately did not appear so much throughout the second study, and the screenshot used in Task 1 was only displaying one of those links almost at the very bottom of the SERP, so the participants often did not even scroll to this point. Those links represent a high potential for companies if proven to be effective and appreciated by users, and are also a remarkable display of the advanced UX design that Google developed for its search engine. They are relatively absent in the literature, probably due to being relatively new within the Web's environment. Those features then constitute an interesting lead fo further studies, which should control more for their presence in order to get sufficient data. This goes the same for how we design tasks. Most of the tasks of Study 2 were transactional, so it considerably reduced our chances to see differences between task types. We still managed to get one interesting insight from the study of tasks, being that participants were most likely to choose a sponsored result when asked to search for a specific brand. This opens new possibilities for research to get more insights into the influence of queries and research motives impacting users' decisions on SERPs.

Conclusion

This study has opened doors to more research on users' behavior on SERPs, on visual and cognitive processing, and on click-decision which are important topics that deserve to be further explored. We discovered that, when using Google and searching for a service online, users tend to actively avoid SEA and that they would rather click on organic results. We also found that search engine knowledge was a predictor of SEA avoidance, influencing positively visual attention on sponsored results and click decision towards organic results. Prior topic knowledge was also found to have an effect on visual attention as we found that it influences negatively attention to organic links. Finally, we did not find evidence that task types and impulsiveness would influence users' viewing and decision behaviors. Our study presented certain limitations that could help future researchers to design new studies to continue exploring this topic. We hope that this study will inspire future research to go through the vast

topic of search engines, SERPs, and users' behavior toward the different kinds of links that are presented on them.

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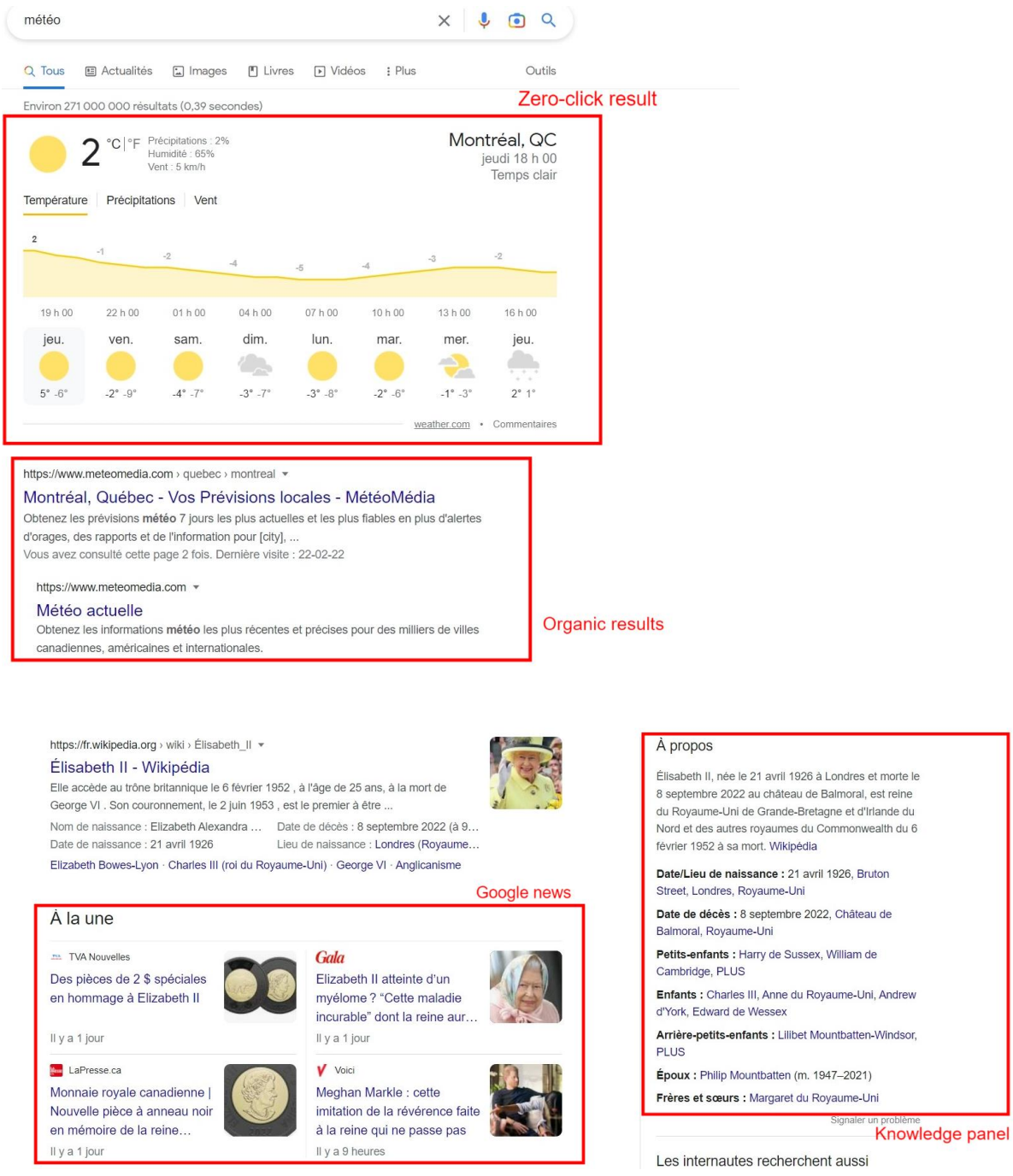
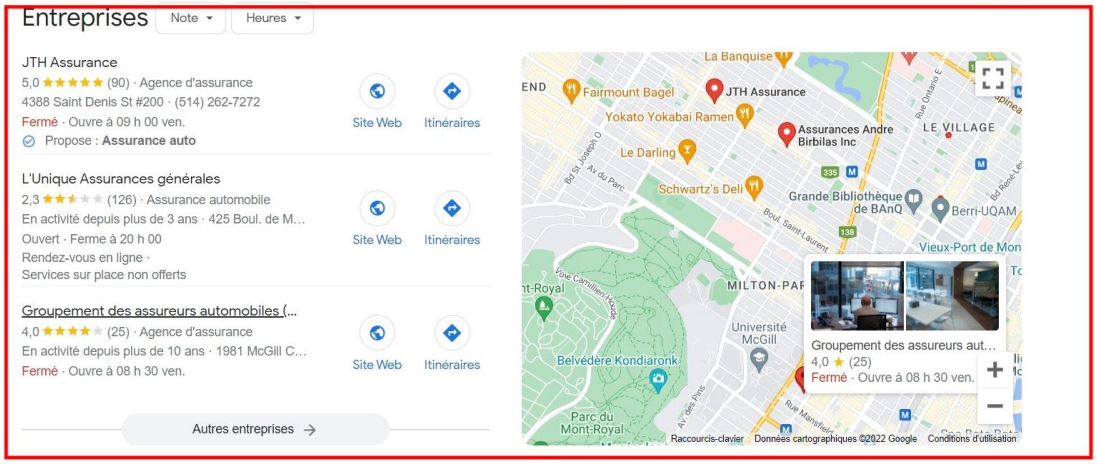
3.7 Appendices

Appendix 1: Visual of different kinds of links on Google



Sponsored results

Maps



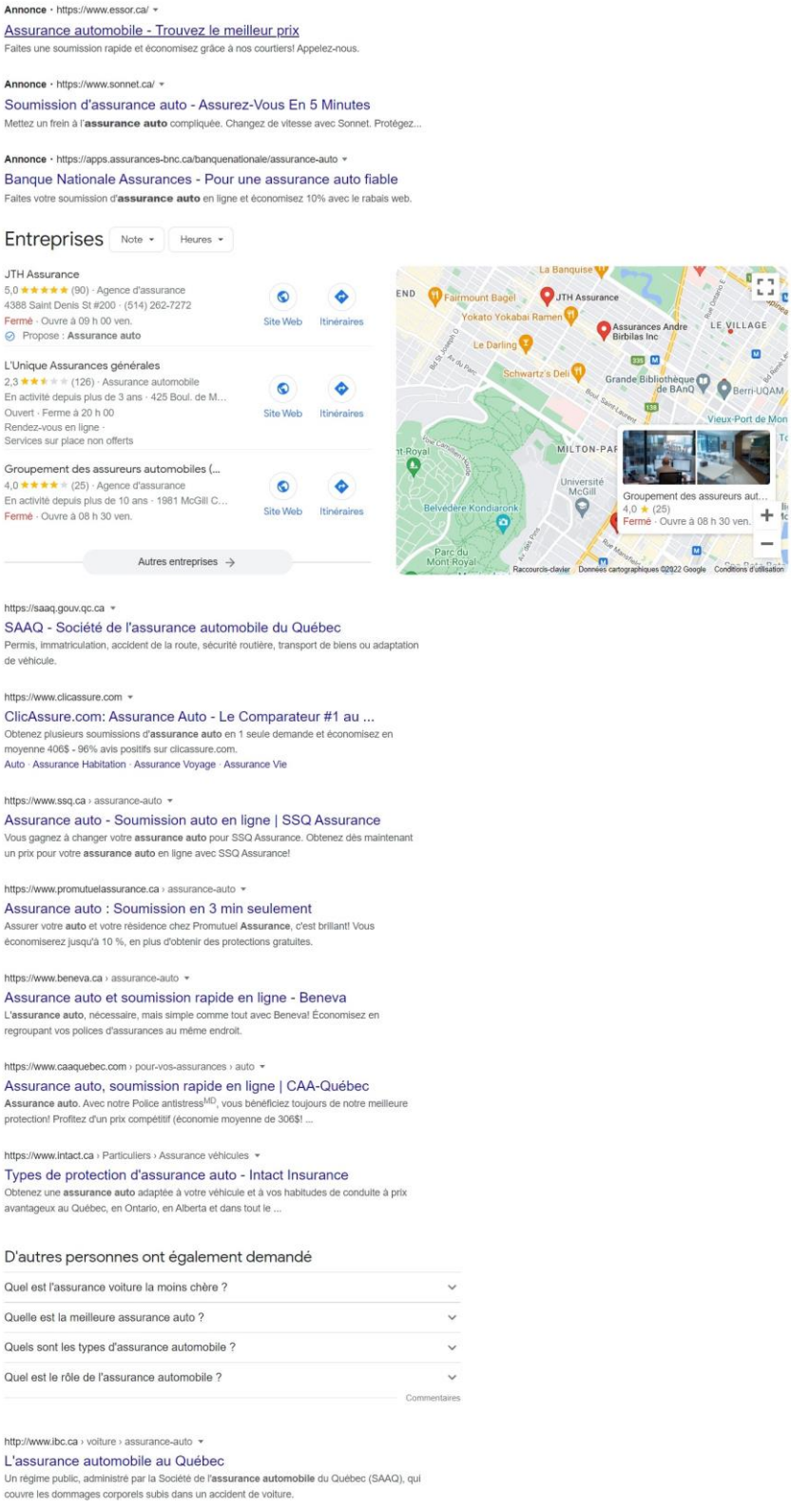
https://www.intact.ca › Particuliers › Assurance véhicules

Types de protection d'assurance auto - Intact Insurance

Obtenez une **assurance auto** adaptée à votre véhicule et à vos habitudes de conduite à prix avantageux au Québec, en Ontario, en Alberta et dans tout le ...

People Also Ask

Appendix 2: Typical SERP Study 1



Appendix 3: Tasks scenarios Study 1

INSTRUCTIONS GÉNÉRALES

Aujourd'hui, nous vous demanderons d'effectuer plusieurs courtes tâches de recherche d'information sur le sujet de l'assurance automobile. Pour chacune des tâches, nous vous demanderons d'agir de la façon la plus naturelle possible, comme vous le feriez si vous étiez réellement dans la situation présentée.

SCÉNARIO 1 : MAGASINAGE D'UNE ASSURANCE AUTO

Imaginez la situation suivante:
Ça y est, c'est décidé! Vous achetez enfin votre première voiture.
Cependant, vous n'êtes pas encore prêts à acheter une assurance auto.
Il reste 3 minutes à votre pause déjeuner. Effectuez une recherche pour vous informer sur les compagnies d'assurance automobile qui existent au Québec.
Cliquez sur le lien bleu pour accéder à Google et commencer votre recherche.
Lorsque vous jugez avoir obtenu une réponse satisfaisante (assez claire pour pouvoir en discuter avec un.e ami.e), mentionnez à la modératrice que vous avez terminé la tâche.

SCÉNARIO 2 : RESPONSABILITÉ CIVILE

Vous savez que vous aurez besoin d'une assurance automobile pour votre voiture. Mais avant de commencer à magasiner, vous souhaitez mieux comprendre le concept de responsabilité civile dans le contexte de ce type spécifique d'assurances.
Faites votre recherche à l'aide de Google.
Lorsque vous aurez trouvé une réponse satisfaisante*, mentionnez à la modératrice que vous avez terminé la tâche.

SCÉNARIO 3 : RECHERCHE DU MEILLEUR PRIX

Vous avez 24 ans, vous habitez à Montréal et vous avez une voiture. Vous avez entendu dire que certaines compagnies d'assurances automobile offraient des rabais spécifiques pour les jeunes.
Vous avez quelques minutes libres avant le début de votre prochaine réunion en ligne. Vous décidez de chercher quelles compagnies d'assurance automobile offrent les meilleurs prix et rabais pour les moins de 25 ans, toujours à partir de Google.
Mentionnez à la modératrice lorsque vous aurez trouvé une réponse qui vous satisfait.

SCÉNARIO 4 : ACHAT D'UNE ASSURANCE AUTO

Vous êtes maintenant prêt à procéder à l'achat d'une assurance auto. À partir de Google, cherchez à obtenir une soumission en ligne auprès de la compagnie d'assurance de votre choix.
Mentionnez à la modératrice lorsque vous aurez terminé la tâche.

SCÉNARIO 5 : IMPACT DE LA COVID

Au vu de la situation sanitaire, vous avez entendu que votre prime d'assurance auto pourrait être réduite, puisque vous vous en servez moins avec le télétravail. Vous vous interrogez donc sur l'impact de la COVID-19 sur la prime d'assurance auto. Informez-vous sur le sujet à l'aide de Google.
Mentionnez à la modératrice lorsque vous aurez trouvé une réponse qui vous satisfait.

Appendix 4: Tasks scenarios Study 2

INSTRUCTIONS GÉNÉRALES

Aujourd'hui, nous vous demanderons d'effectuer plusieurs courtes tâches de recherche d'information sur le sujet de l'assurance automobile. Pour chacune des tâches, nous vous demanderons d'agir de la façon la plus naturelle possible, comme vous le feriez si vous étiez réellement dans la situation présentée.

SCÉNARIO 1 : ACHAT ASSURANCE AUTO

Vous souhaitez procéder à l'achat d'une assurance auto. Vous allez donc sur une page de recherche Google et entrer les mots clés soumission assurance auto.
Une page de résultats s'affichera devant vous. Choisissez le lien qui vous permettra d'obtenir une soumission en ligne auprès de la compagnie d'assurance de votre choix.
Mentionnez à la modératrice lorsque vous êtes prêt à commencer.

SCÉNARIO 2 : SOUMISSION AUTO À MONTRÉAL

Vous habitez à Montréal et vous souhaitez faire une soumission d'assurance auto avec une compagnie d'assurance proche de vous.
À partir de la page Google qui s'affiche devant vous, entrez les mots clés soumission assurance auto Montréal.
Puis, faites votre recherche de soumission comme vous le feriez normalement.
Mentionnez à la modératrice lorsque vous aurez terminé la tâche.

SCÉNARIO 3 : RECHERCHE DU MEILLEUR PRIX

Vous avez 24 ans, vous habitez à Montréal et vous avez une voiture. Vous avez entendu dire que certaines compagnies d'assurances automobile offraient des rabais spécifiques pour les jeunes.
Vous avez quelques minutes libres avant le début de votre prochaine réunion en ligne. Vous décidez de chercher quelles compagnies d'assurance automobile offrent les meilleurs prix et rabais pour les moins de 25 ans, à partir d'une page de recherche Google.
Utilisez les mots clés de votre choix.
Mentionnez à la modératrice lorsque vous aurez trouvé une réponse qui vous satisfait.

SCÉNARIO 4 : RÉCLAMATION AUTO

Vous avez eu un accrochage sans gravité avec votre voiture. En arrivant à la maison, vous cherchez plus d'information sur la façon de faire une réclamation d'assurance automobile.
Faites votre recherche à partir d'une page Google avec les mots clés de votre choix.
Mentionnez à la modératrice lorsque vous aurez trouvé une réponse qui vous satisfait.

SCÉNARIO 5 : SOUMISSION AUTO DESJARDINS

Auprès de votre entourage, vous avez entendu parler des assurances auto de Desjardins. Vous allez faire une soumission chez Desjardins pour pouvoir comparer les prix.
À partir d'une page Google, utilisez les mots clés de votre choix pour faire une soumission d'assurance automobile chez Desjardins.
Mentionnez à la modératrice lorsque vous aurez terminé la tâche.

Chapitre 4 : Conclusion

Ce mémoire vise à explorer les comportements des utilisateurs dans un contexte de recherche en ligne, et plus particulièrement les comportements attentionnels et décisionnels des utilisateurs lors de l'utilisation des moteurs de recherche. Nous nous sommes penchés sur l'étude de l'attention portée aux différents types de liens proposés sur Google afin d'identifier de potentiels phénomènes récurrents lors de la navigation sur les moteurs de recherche, ainsi que des facteurs pouvant influencer les réactions des utilisateurs. De l'ensemble de cette étude, nous avons pu obtenir d'intéressants résultats pouvant servir d'exemple et de base à de futures recherches centrées sur les moteurs de recherche et sur le SEO.

Pour mener à bien cette recherche, deux études ont été effectuées, en ligne et en laboratoire. Un total de 41 participants répartis sur ces deux collectes se sont vu compléter diverses tâches de recherche sur Google tournant autour du thème de l'assurance automobile. Grâce à un certain nombre de questionnaires et d'outils physiologiques (oculométrie, reconnaissance d'émotions faciales), nous avons pu nous rapprocher de nos objectifs et répondre à nos questions de recherche, éléments qui seront rappelés dans les prochaines sections de ce chapitre.

4.1 Rappel des questions de recherche et des objectifs

Nos deux études avaient des objectifs similaires, mais correspondaient à des phases de recherche et de réflexion différentes. Ainsi, la première étude, à but exploratoire, cherchait à répondre à la question suivante:

RQ1: Dans un contexte de recherche en ligne, comment les utilisateurs traitent-ils l'information en fonction du type de liens présentés sur une page de résultats ?

L'objectif était d'initier la recherche sur le sujet des types de liens et des comportements des utilisateurs. Nous voulions obtenir de premières informations sur les processus décisionnels des utilisateurs face à différents liens, et essayer de faire quelques constatations sur de possibles comportements récurrents lors de la navigation.

La deuxième étude visait à approfondir les résultats obtenus lors de la première phase, ainsi, nous avions plusieurs questions de recherche en tête pour cette collecte:

RQ2: Quels comportements récurrents peuvent-être observés chez les utilisateurs lors d'une recherche en ligne à travers l'étude de l'attention portée aux différents types de liens, et comment les utilisateurs les différentient-ils?

RQ3: Quels autres facteurs, de type individuels ou contextuels, sont susceptibles d'influencer le comportement des utilisateurs dans leur décision de navigation?

Ici, l'objectif était de recentrer la recherche après les premiers résultats obtenus grâce à la première étude, en nous concentrant sur quelques éléments jugés intéressants pour continuer d'explorer le sujet.

4.2 Résumé des résultats

A travers notre première étude, nous avons pu observer en surface comment les utilisateurs se comportaient lorsqu'une tâche de recherche leur était présentée. Nous avons ainsi pu constater que les utilisateurs semblaient interagir différemment en fonction du type de liens qu'ils pouvaient voir à l'écran. Nous avons par exemple remarqué que les utilisateurs semblaient esquiver les résultats annonces en haut des pages de résultats, et qu'ils pourraient potentiellement les occulter pour se rendre directement sur la section présentant les résultats naturels. Notre deuxième étude a cependant infirmé cette idée comme nous avons vu grâce à l'oculométrie que les participants passaient du temps à étudier la section annonce. Notre étude a tout de fois confirmée que les participants évitaient les résultats commandités. La première étude a également révélé que les participants semblaient apprécier les formats spéciaux offerts par Google sur les pages de résultats, ainsi que les liens naturels, jugeant ceux-ci plus "neutres" que les résultats annonces qui eux généraient de la méfiance chez les utilisateurs. Ainsi, pour répondre à notre **première question de recherche**, ils sembleraient que les utilisateurs fassent bel et bien une distinction entre les types de liens, et qu'ils ne les apprécient pas ni ne les utilisent pas de la même manière.

Comme mentionné, nous avons remarqué que les utilisateurs évitaient consciemment les liens annonces en leur allouant un temps de réflexion important, mais en choisissant généralement le premier lien naturel venant après eux. Cette tendance à cliquer sur le premier lien naturel malgré un certain temps passé à traiter l'information présentée par les liens annonces s'inscrit donc comme comportement récurrent observé, pour répondre à notre **deuxième question de recherche**. Les liens annonces subissent un traitement différent des autres liens, surtout si on

les compare aux liens naturels: les liens annonces génèrent beaucoup d'attention visuelle mais sont moins cliqués, alors que les liens naturels au contraire génèrent moins d'attention mais sont favorisés. Ainsi, les utilisateurs se comportent différemment selon les liens qui leurs sont présentés et établissent une réelle différence entre liens naturels et liens annonces.

Enfin, nous avons pu observer l'influence de certains facteurs individuels dans le comportement des utilisateurs lors de leur navigation sur une page de résultats afin de répondre à notre **troisième question de recherche**. Nous avons tout particulièrement pu constater l'effet de la connaissance des moteurs de recherche sur le comportement vis-à-vis des résultats commandités. Nous avons en effet découvert qu'une bonne connaissance des moteurs de recherche impliquait plus de temps passé à observer les liens annonces, mais une plus grande probabilité de cliquer sur un lien naturel. Cela rejoint ainsi notre précédente observation que nous pouvons compléter en ajoutant que la connaissance des moteurs de recherche semble alimenter l'esquive des liens commandités. Nous pouvons interpréter ce résultat en suggérant que plus les utilisateurs sont au courant des principes et du fonctionnement des moteurs de recherche, mieux ils connaissent les implications liées aux liens annonces et plus ils auront ainsi tendance à les éviter. Cela vient compléter notre réponse à **RQ2** en apportant plus de précisions sur la manière dont les utilisateurs différencient les types de résultats. Pour revenir à l'étude des facteurs influençant les comportements en ligne, nous avons également constaté l'effet de la connaissance du sujet de recherche sur la façon de traiter visuellement l'information d'un lien de page de recherche. Une bonne connaissance du sujet de recherche s'est révélée influencé négativement l'attention visuelle portée aux liens naturels, ainsi plus un participant est à l'aise avec le thème sur lequel la recherche est effectuée, moins l'attention allouée aux liens naturels sera importante. Nous n'avons pas obtenu d'autres résultats significatifs pour les facteurs d'influence, ainsi nous pouvons répondre à **RQ3** en disant que les connaissances des moteurs de recherche et du sujet de recherche jouent toutes deux un rôle dans la façon qu'ont les utilisateurs de traiter l'information dans un contexte de recherche en ligne.

4.3 Contributions du mémoire

Dans un premier temps, ce mémoire constitue une approche actualisée de la recherche sur les pages de résultats et moteur de recherche. En effet, jusqu'à présent, les études sur le sujet sont pour la plupart dépassées et au vu de l'évolution rapide des moteurs de recherche et de

l'expérience y étant proposée, la littérature devient rapidement obsolète. De plus, de manière plus générale, très peu d'études ont été faites sur les sujets, que ce soit sur les moteurs de recherche ou bien plus particulièrement sur les pages de résultats et les liens y étant présentés. En suivant les codes de recherches similaires, nous avons apporté une nouvelle perspective sur l'étude des comportements utilisateurs dans un contexte de recherche en ligne. Nous avons appliqué les principes trouvés dans la littérature à propos d'autres sujets liés, comme l'esquive de la publicité ou les facteurs influençant l'attention lors de la navigation, et les avons appliqués spécialement à l'étude des pages de résultats et de leurs liens. Nous avons donc esquissé une première voie vers l'étude de ces outils maintenant devenus indispensables aux utilisateurs, et avons montré que les pistes de recherche étaient multiples.

D'un point de vue managérial, l'étude des moteurs de recherche et des pages de résultats est tout aussi importante. Comme mentionné, les moteurs de recherche sont aujourd'hui des outils indispensables à l'accès à l'information et représentent également une opportunité marketing immense pour les entreprises. Mieux comprendre sa cible et savoir adapter ses stratégies est l'objectif de toute bonne campagne, et la présence en ligne n'y fait pas exception, surtout considérant les montants dépensés par les entreprises dans la publicité sur moteur de recherche (Statista, 2022). Ainsi, il est important pour les compagnies de mieux comprendre les comportements des utilisateurs lors de l'utilisation des moteurs de recherche et de la navigation sur les pages de résultats afin de pouvoir mieux construire leurs stratégies SEO. En démontrant par exemple que les utilisateurs avaient tendance à esquiver les liens annonces et quels facteurs influençaient ce comportement, les entreprises et spécialistes du marketing pourraient être amenés à reconsidérer leurs stratégies et à les adapter à l'évolution des moteurs de recherche. En effet, en comprenant que plus la connaissance des moteurs de recherche augmente, plus les utilisateurs semblent "méfiants" des liens annonces, de nouvelles perspectives s'offrent aux marketeurs, qui pourraient alors venir considérer d'autres moyen de promouvoir leur offre sur le Web, par exemple via les liens naturels ou encore les nouveaux liens proposés par Google.

Nos résultats permettent également de mieux comprendre le niveau de complexité de l'expérience utilisateur offerte par Google à travers son moteur de recherche. Avec des utilisateurs de plus en plus familiers avec leur technologie, et donc comme démontré de plus en plus de réticence à utiliser les liens sponsorisés, la création des nouveaux types de liens, comme les Résultats Zéro et autres liens spéciaux sur Google prennent beaucoup plus de sens. Ces liens permettent en effet un accès facilité à l'information et ont l'air apprécié par les utilisateurs, comme nous avons pu le constater à travers notre première étude. Plus de recherche

serait à faire sur ces nouveaux liens offerts par Google pour en apprécier davantage la qualité, mais ceux-ci représentent tout de même une belle avancée pour le UX et pour les entreprises qui pourraient en profiter.

4.4 Limites et pistes de recherche

Ce mémoire présente tout de même certaines limites qu'il est important de noter, mais qui pourront servir à de futurs chercheurs pour mener à bien de nouvelles études sur le sujet. Tout d'abord, certaines des pistes relevées lors de la première étude n'ont pas pu être approfondies avec la deuxième étude. En effet, nous avions soulevé lors de la première étude l'intérêt et l'appréciation des utilisateurs pour les liens Google proposant l'information directement sur la page de résultat (Résultats Zéro, People Also Ask, etc.) malgré un taux de clic assez faible. Cependant, dû au manque d'occurrence de ces types de liens lors de la deuxième étude, nous n'avons pas pu obtenir plus amples informations à ce sujet, et n'avons pas pu démontrer que ces liens généraient plus ou moins d'attention comparativement aux autres types de liens. Cette limite provient très probablement du design de notre deuxième étude et des tâches qui y étaient proposées, celles-ci ne favorisant pas forcément l'apparition de tels liens sur les pages de résultats. La littérature concernant ces nouveaux types de liens est actuellement presque inexistante, de nombreuses pistes de recherche pourrait donc être abordées sur le sujet et présenteraient de potentielles contributions très intéressantes pour l'industrie.

De même, le design de notre étude demeure assez général, et certains thèmes n'ont pas pu être abordés avec précision. C'est le cas par exemple de l'étude de l'influence du type de tâche ou de l'influence de l'impulsivité. Pour les tâches par exemple, la deuxième étude ne présentait pas assez de différence entre types de tâches pour qu'une réelle distinction soit permise. Bien que nous ayons tout de même obtenu un résultat intéressant, pour réellement étudier l'influence de différentes tâches de recherche dans le comportement utilisateur, un design plus complet et plus concentré sur cet objectif serait nécessaire. Pour ce qui est de l'impulsivité, la piste de recherche était intéressante et nous pouvions en effet nous demander suite à l'étude 1 si les participants cliquaient de façon impulsive sur certains liens. Cependant, il est possible que l'échelle utilisée n'ait pas été favorable à l'observation d'un tel comportement, et encore une fois un design d'étude revisité et plus concentré sur le sujet pourrait mettre au clair les résultats obtenus, ceux-ci étant plutôt confus.

Enfin, l'étude 1 avait également soulevé des pistes intéressantes concernant les points de frictions rencontrés lors de la navigation. A des fins de simplification, nous n'avons pas choisi de poursuivre plus la recherche à ce sujet. Cependant, via les entretiens avec les participants, des points intéressants ont été soulevés, notamment concernant le décalage entre la description d'un lien sur la page de recherche et le véritable contenu du site web créant de la frustration. Ces pistes mériteraient d'être explorées de façon plus approfondie afin d'en apprendre davantage sur les motifs de clics des participants, et d'offrir une expérience plus satisfaisante lors de la navigation.

4.5 Conclusion

Pour conclure, notre étude a soulevé des points importants pour la recherche et l'industrie, et offre des pistes de recherche multiples. Nous avons découvert notamment que, de même qu'à travers d'autres types de média et sur Internet (Speck & Elliott, 1997 ; Cho & Cheon, 2004 ; Kelly et al., 2010), les utilisateurs semblent éviter les liens commandités sur les moteurs de recherche. Pour expliquer ce phénomène, nous avons identifié la connaissance des moteurs de recherche comme facteur d'influence, une bonne connaissance induisant plus d'attention sur les liens annonces mais une plus grande probabilité de cliquer sur un lien naturel. Une bonne connaissance du sujet de recherche s'avère également avoir un effet sur l'attention visuelle des participants, mais cette fois négatif et envers les résultats naturels. Finalement, les autres pistes de recherche n'ont pas abouti, montrant quelques limites à notre étude mais offrant ainsi de nouvelles opportunités de recherche. Le thème des moteurs de recherche et de la navigation en ligne est non seulement important pour les utilisateurs mais présente également une certaine multi-dimensialité et peut donc être exploré de multiples façons. Nous espérons donc que ce mémoire et ces recherches inspireront de futurs chercheurs à poursuivre les études sur le sujet et à suivre les pistes soulevées par cet écrit.

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