

# Partners in life and online search: Investigating older couples' collaborative information seeking

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Older adults frequently collaborate with their spouses in daily tasks and problem solving. Despite information seeking being an important aspect of collaboration, the information seeking behaviour of older adults and in particular couples remains under investigated. To address this gap, in this paper we present a qualitative investigation of older adults' collaborative information seeking. Through in-depth interviews and demonstrations of real-life search tasks with eleven older couples, we show that older couples frequently engage in collaborative information seeking in daily tasks, interests, and to satisfy curiosity. Our research suggests that collaborative information seeking is a relationship maintenance behaviour among older couples, and that their long-term relationships may play a key role in how they communicate, make decisions, and develop divide and conquer strategies by taking on various roles during their collaborative information seeking. We also found that older couples construct shared views toward technology adoption and usage despite their individual differences. We include some reflections on the existing collaborative information systems and how they may adapt to fit older couples' collaborative information seeking.

## ACM Reference Format:

Winter Wei, Cosmin Munteanu, and Martin Halvey. 2022. Partners in life and online search: Investigating older couples' collaborative information seeking. In *Proceedings of the 2022 ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR '22)*, March 14–18, 2022, Regensburg, Germany. ACM, New York, NY, USA, 15 pages. <https://doi.org/10.1145/3498366.3505820>

## 1 INTRODUCTION

Older adults have rich and varied information needs ranging from “provisions for elderly living independently” [46] to hobbies [49], being informed of the world around them, learning new things, and spirituality [2]. When challenged with obtaining information on their own, some turn to close families and relatives as an information source or proxy [2, 35, 49], yet getting support from their children and relatives take away their sense of independence [35]. Instead, older adults prefer to collaborate with their spouses for daily tasks and problem solving, and can even be considered “collaborative experts” [43]. The collaboration perspective is worth our research attention as evidence has pointed out that people search online in collaboration frequently [27, 28, 45] including older adults [1, 28, 31]. This suggests a possibility that older adults may collaborate with their spouses in online information seeking, whether for shared information needs or helping each other overcoming challenges presented in online information seeking. However, despite knowing older adults engage in collaborative information seeking (“CIS”) [1], there is very little investigation into how they do so [31], especially with their spouses. Understanding older couples' CIS will inform us of ways to design collaborative information systems that facilitate such activities to fulfill their rich and diverse information needs.

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Manuscript submitted to ACM

To address this research gap, we set out to explore how older couples search online together with the following research questions in mind:

*RQ1: What are the contexts, needs, and behaviour of older couples when they seek information online together?*

*RQ2: How are the age and relationship dimensions reflected in older couples' collaborative information seeking activities from the perspective of information behaviour?*

*RQ3: What are the challenges faced in older couples' collaborative information seeking? And how do they impact the design of a collaborative information system that aims to help older couples search online together?*

To answer these research questions, we conducted in-person and remote semi-structured interviews with eleven couples (22 participants) aged 60 years or older. The interviews consist of open-ended questions about the contexts, motivations, topics, detailed activities, and challenges related to their past collaborative information seeking and a demonstration of real-life CIS tasks (in remote interviews, whenever possible, participants shared their screens over video conference software). The answers to open-ended questions about their multiple and diverse past CIS experiences and demonstrations of the real-life CIS tasks allow us to situate the couples' CIS in their daily lives and grant us a glimpse of how their relationships affect their collaboration. The research data, including interview transcripts and screen recordings, were coded and analyzed using Braun and Clark's six-stage thematic analysis approach [7].

Our findings surface empirical evidence suggesting that older couples' CIS needs range from daily tasks, interests, and to satisfy curiosity. More importantly, older couples' relationships are identified as a key aspect to their CIS behaviour. Not only can older couples' CIS be seen as primarily a relationship maintenance behaviour [12], their relationships are also fundamental in how they collaborate in information seeking. To that end, our study provides preliminary insights to older couples' CIS configurations, strategies and challenges. In addition to reflections on the design of systems that aim to facilitate older couples' CIS, we reflect on how the CIS community would benefit from understanding older couples' CIS from their collaboration expertise, and more broadly, how the relationship perspective can help turn "social ties" to "collaborative ties" [41].

We should note that we define this demographic group as adults over the age of 60, which in Canada is the threshold for pension eligibility [10]. We use the term "older adult" for this demographic, as the participants in this study and direct surveys [33] indicate this to be the terms most commonly preferred.

## 2 RELATED WORK

To investigate older couples' CIS, we first review older adults' information behaviour and technology adoption to understand their information behaviour and the challenges they face in an increasingly digital age as individuals; then, we give a brief summary of research on older couples' relationships and collaboration before examining existing theories and frameworks about collaborative information seeking. We also highlight what is missing from the literature and how our study addresses the gaps.

### 2.1 Older adults' information behaviour

Older adults have a wide and diverse range of information needs including information pertaining to living independently such as health, social benefit or compensation [11, 46], information to learn about the "outside world", and affective information to stay positive [2, 49]. Their diverse information needs align with what they regard as important factors that contribute to maintaining a positive outlook on life [37, 47].

From an information behaviour perspective, information can be categorized as "everyday information" [38] and information pertaining to "higher things in life" [23]. The notion of "everyday information seeking" [38] goes beyond

the “active seeking of effective information” to maintain the “way of life”. Activities such as “passive monitoring”, “information sharing” [44] and “dressing” (i.e., packaging and presenting information) [18] are also aspects of the “everyday information” activities. The notion of “higher things in life” or information pertaining to “the pleasurable and profound” [23] was drawn from positive psychology to mean “anything that objectively reflects humanity’s possibilities for reaching its full potential.” More concretely, it can include leisure, hobbies, creativity, human development, and meaning or purpose of life, just to name a few. These theoretical grounds help us situate older adults’ information practices in their daily tasks or chores (i.e., to support living independently) and the desire to experience “higher things in life”.

## 2.2 Older adults’ ICT adoption

While older adults’ adoption of Information and Communication Technologies (“ICT”) is not the main purpose of our study, it cannot be decoupled from the investigation of older adults’ CIS. Despite the fact that the gap of older adults’ ICT adoptions have narrowed in recent years [20, 50], this demographic still face challenges to fully access and benefit from technologies facilitating online search [6, 21, 32]. Attitudes including lack of trust and perceiving little value towards new technologies [6, 48], as well as different mental modal [4], are among many factors that prevent older adults from adopting ICT. While some research suggests the the involvement and immediacy of family members can positively influence ICT adoption and use [15, 48], it remains to be seen how being in a long-term relationship affects one’s ICT adoption and online information seeking.

## 2.3 Older couples’ relationships and collaboration

Couples collaborate on household tasks and problem solving daily, and as such the line between collaborating on tasks and maintaining their relationship is blurred. Sharing household tasks and spending time together to be in each other’s presence are the most frequent relationship maintenance behaviours [12]. Given their years of practice, older couples are considered to be “collaborative experts” given how well they know of each others’ strengths and weaknesses, and how effectively they can divide and conquer [43]. The uniqueness of older couples’ relationship and collaboration style are fundamental in understanding their CIS. Additionally, due to the heterogeneous nature of older couples’ relationships [9], for the rest of the paper, we use the term “partner” instead of “spouse” or “husband/wife” to refer to the individuals in a committed and long-term intimate relationship.

## 2.4 Collaborative information seeking

Collaborative information seeking is defined as a type of search where “more than one user shares an information need, and they actively work together to fulfill that need.” [31]. Researchers in CIS have examined its various dimensions, among which demographics [31], configurations (i.e., time and location) [31], communication and awareness [41], as well as roles and strategies [31] emerged as key aspects for our investigation into older couples’ CIS.

**Demographics.** While older adults reported engaging in CIS [1, 27], their CIS motivation and behaviour have not been investigated in depth. In fact, Morris and Teevan pointed out the gap of “search needs and practices” in certain demographic groups including older adults in their summary of the CIS landscape [31]. By investigating older adults’ unique collaborative information seeking practices, our study fills an important demographic gap in the CIS field today.

**CIS configurations.** We use the term “CIS configuration” to denote how collaborators configure themselves spatially and across time to collaborate (note in some literature it is referred to as the “time and space dimensions” of CIS [31]). Spatially, CIS can be co-located or remote [31, 45]. Across time, CIS can be synchronous or asynchronous. While some

collaborative information systems are designed to mediate co-located and synchronous search [1, 16, 30], others attempt to accommodate various configurations across time and space [29, 36, 40]. Our study provides some preliminary insights into how older couples configure their CIS across time and space depending on the stage of the search and what to optimize for in 4.2.2.

**Roles and strategies in CIS.** Similar to how people collaborate in general, in CIS, collaborators may take on various roles. These roles may be symmetric or asymmetric [31]. When collaboration is asymmetric, meaning collaborators fulfill different roles due to domain expertise, technical proficiency or other factors, “divide and conquer” becomes a common strategy where tasks are divided and assigned among roles [31]. In co-located search situations, one may take on the “driver” role (i.e., controlling the input device) while other(s) take on the “observer(s)” role [1]. Alternatively, one may assume the “miner” role (i.e., exploring a certain topic in depth) and the other the “prospector” role (i.e., widening the breadth of the search) [16]. The divide and conquer strategy can also be applied in asynchronous search situations. To accommodate flexible divide and conquer strategies, some systems provide means to automatically assign roles and tasks or leave the decisions to the users [29]. Our study provides insights into the types of roles older couples assume during their CIS divide and conquer strategies that are grounded in their relationships in 4.2.2.

**Communication and awareness.** Regardless of the CIS configuration, successful collaboration depends on effective communication and collaborators being aware of all aspects related to the CIS task [41], including collaborating on how to find information and sharing what was found [31]. Some systems attempt to enhance communication and raise awareness with many features such as a messaging interfaces, a search history panel, and user activities and status [29, 40], while other systems enable voting and surfacing user’ preferences [19] to assist in decision-making. It is interesting to note that most systems assume the users have no prior knowledge of their collaborators, which explains why communication and awareness raising features are designed to be as explicit as possible. However, in the case of older couples who already know each other very well, we should reflect on how the design of such a system can take this into account.

## 2.5 Summary of research gaps

In summary, our study addresses two main research gaps, namely the demographic and the relationship lenses in CIS. Addressing the demographic gap currently existing in CIS by studying older couples will help us construct a more holistic view of older adults’ information practices and inform the design of systems that facilitate older adults’ CIS. This is particularly important given the barriers to the adoption of technology (such as online search) specific to this demographic. Addressing the knowledge gaps specific to the relationship lens in CIS will help contribute to the development of CIS theories, especially in understanding the motivation in everyday life and social contexts [41, 44] which may in turn contribute to the investigation of CIS manifested in their various dimensions.

## 3 METHODS

The primary researcher conducted one pilot study and eleven in-person and remote (due to the limitation imposed by COVID-19) semi-structured and open-ended interviews with couples aged 60 years or older. Each interview was conducted with both partners in the couple so that they could both contribute to the conversation.

### 3.1 Participants

The recruiting criteria for the study was couples who are both over 60 years of age and find themselves regularly searching online together or discussing what they have found online. Participants were recruited through multiple

Participant	Age	Education	Profession	Retirement	Device usage
P1A	-	Master degree or higher	Geologist	Retired	Laptop
P1B	69	College	School counsellor	Retired	Laptop, mobile phone
P2A	61	High school	Seamstress	Retired	Desktop
P2B	64	College	Software developer	Retired	Laptop, mobile phone, tablet
P3A	58	Master degree or higher	Research scientiest	Employed	Laptop, mobile phone, tablet
P3B	57	College	Homemaker	-	Laptop, mobile phone
P4A	70	Master degree or higher	Architect	Retired	Desktop, mobile phone
P4B	68	College	Art appraiser	Retired	Desktop, mobile phone
P5A	69	College	Librarian, special school teacher	Retired	Laptop, mobile phone
P5B	64	College	High school teacher	Retired	Laptop, mobile phone
P6A	63	College	Software consultant	Self-employed	Laptop, mobile phone
P6B	61	College	Homemaker, helping P6A with his business	-	Desktop, mobile phone
P7A	-	College	Mechanical engineer consultant	Self-employed	Laptop, mobile phone
P7B	69	College	Health information professional	Retired	Laptop, mobile phone
P8A	82	High school or lower	-	Retired	Shares a desktop
P8B	75	High school or lower	Cook, homemaker	Retired	Shares a desktop
P9A	66	High school	Homemaker, part-time gig worker	Self-employed	Laptop, mobile phone
P9B	60	College	Hospitality	Employed	Mobile phone
P10A	75	Master degree or higher	Government researcher	Retired	Desktop or laptop, mobile phone, shares a tablet
P10B	75	College	Teacher	Retired	Desktop or laptop, mobile phone, shares a tablet
P11A	79	Master degree or higher	Law firm partner	Retired	Laptop, mobile phone, shares a tablet
P11B	75	College	Publicist	Retired	Laptop, mobile phone, shares a tablet

Table 1. Demographics and device usage of participants.

channels including mailing lists, online recruiting platforms and flyers posted to community bulletin boards. Those who picked up the recruitment flyers did not manifest any technical difficulties in connecting with us digitally and setting up the video call sessions. Recruitment continued until saturation was reached in terms of new insights gained from the sessions.

Eleven couples participated in the study. All but one couple were over 60 years old, two participants did not disclose their ages but self-declared eligible. We included the data from the couple under 60 as the Continuity Theory of normal aging [3] indicates that couples in their late 50s will likely behave and interact with each other in similar ways as they age. Indeed our data suggests this couple's CIS behaviour does not differ substantially from others. Participants are representative of this age group in the large metropolitan area where we are based, with adults over 60 being frequent users of online digital technologies [39]. The participants' demographic information and device usage are summarized in Table 1.

All couples are in committed and long-term relationships. Most couples ( $n = 8$ ) have been lifelong partners, the rest have had previous marriages but have been partners with each other for 7, 10, and 18 years respectively. Of the eleven couples, one was a same-sex marriage, one was a heterosexual common-law relationship, and the rest were heterosexual marriages.

Since there are two participants in each interview, we refer to each couple with a number (e.g., "P1" denotes the couple). One partner is referred to as "A" (e.g., "P1A"), and the other is referred to as "B". Note that this labeling scheme does not carry meaning with regards to the study findings.

### 3.2 Procedure

The interview sessions were 60-90 minutes long, with the couple participating together, and both partners in the couple contributing to the discussion. Each session was divided into two parts. During the first half of the session, to collect richer background information, we asked the participants to answer questions about the contexts, motivations, topics, detailed activities, and challenges related to their past CIS experiences. We also asked participants to show us using web cameras if possible or describe to us where their devices were situated and how they physically engaged in collaborative search. We encouraged and guided participants to come up with a large diverse set of examples of CIS to gain a more complete picture of how their CIS is situated. The interview questions were semi-structured and open-ended. In the

second half of the interview, whenever feasible, participants were asked to demonstrate real-life collaborative search tasks. The tasks were open-ended and centred on the couples' interests, with the researcher engaging in conversation with the couple on both the search process and on the subject topic of their search during the execution of the task. If time allowed, we encouraged participants to demonstrate more than one tasks.

Due to COVID-19 restrictions, which came into effect after two in-person interviews, the remaining nine interviews were all conducted remotely over video conference software. Participants joined from their device at home. In the remote interviews, we asked participants to share their screens when demonstrating how they search for a topic together online. Two couples were not able to share their screens. In such cases, we prompted them to reflect on the specific CIS activities, by asking them to think aloud and to discuss with each other during the tasks. Overall, nine couples (two in-person and seven remote) demonstrated at least one real-life CIS task, among which six couples demonstrated tasks that are within their future plans or ongoing tasks, whereas the other three demonstrated tasks they recently completed.

The two in-person sessions were audio-recorded along with screen shots of their search sessions. The remaining sessions were remote on video conference calls, which were video recorded including the screen sharing of the demonstrations. All the audio recordings were transcribed by the primary researcher.

Given that the focus on our research is on collaborative online search activities, we do not consider that the use of remote video conference software created any biases in the selection or inclusion of participants. We did not observe any significant technical proficiency differences between the couples who attended in person and those who participated remotely.

### 3.3 Data collection and analysis

The primary researcher transcribed the audio recordings of the interviews and took notes of both the screen shots and participants' non-verbal interactions as observed from video recordings. The transcriptions and notes were analyzed using inductive thematic analysis to form the themes described by Braun and Clark [7] using their six-stage analytic approach. The primary researcher carried out the coding process and the initial thematic analysis. During the coding process, the groups and themes were reached from the initial coding and constantly checked against the raw transcript data to not only ensure they fit in the overall narrative of the themes, but also interpreted in the context of the conversation—this is particularly important as both partners in a couple contribute to the conversation, one person's quote can be in response to what their partner said. The secondary researcher checked for internal consistency of the thematic analysis. Subsequent refinements and corrections of the thematic analysis are carried out by the primary researcher. Intercoder reliability is not used as there is an expectation the coding process will be necessarily subjective in such inductive thematic analysis [34]. Out of more than 900 low-level codes and 70 intermediate-level codes (i.e., code groups) we reached three main themes, each with a number of sub-themes.

## 4 ANALYSIS

In this section, we describe and discuss the main themes reached in our analysis. First, we look at older couples' CIS in terms of everyday information and relationship maintenance (4.1). Then, we discuss older couples' CIS through the lens of their relationship (4.2), including how CIS reflects their collaboration in general and specific CIS configurations and strategies. Lastly, we discuss older adults' adoption of ICT as individuals and as a couple (4.3).

#### 4.1 Searching online together for everyday information and relationship maintenance

Couples search online with their partners to fulfill a variety of needs, from everyday tasks, common interests, satisfying curiosity, and sharing the experience of searching together. Older couples' CIS can be seen as an everyday information activity and a relationship maintenance behaviour [12].

*4.1.1 Searching together for daily tasks, interests and curiosity.* Daily tasks including grocery shopping and household purchase or repairing are the most common topics that couples searched for collaboratively. CIS for daily tasks are usually planned or part of a couple's routine. This observation is consistent with couples' relationship maintenance behaviour [12]. In terms of searching for topics of interest, while couples search for common interests together, they also pay attention and share search results of interests that are not shared. Lastly, couples' CIS can also be motivated by curiosity, which prompts couples to collaboratively find answers or solve problems by searching online together. This can be as simple as looking up someone on TV, or as complex as tracking down the location and information about an unknown painting. Couples' curiosity do not always send them down a collaborative path, as sometimes couples search together to settle a debate, to *"use the internet to prove who's right and who's wrong."* (P10B). Couples' CIS motivated by curiosity are usually spontaneous.

*4.1.2 Searching online together is to maintain relationship.* The role couples' relationships plays is even bigger when the process of searching together becomes the end goal itself, as it allows couples to spend time with their partners and be in each other's presence, and therefore a shared life experience that brings pleasure in itself. All couples shared examples of searching together side by side, discussing, making decisions, or having a good time looking at what they found. When couples' CIS is motivated by interests or curiosity, discussing what was found, sharing their opinions and feelings are not only common among the couples, but also the goal for some, as P6B concluded, *"I think the point of doing it together is so we can talk about it."*

While our study aims to uncover how older couples search online together, instances of "searching offline together" came up frequently in the interviews. While in some situations "searching online together" is a step in the information seeking process to complete a task, in other cases, an online search might be prompted by offline activities such as seeing a poster on the street, hearing something on the news, or talking with families and friends. Another aspect of "not searching online together" is being "offline together", where couples recount physical activities they engage in as a couple. These findings signal that older couples do not view their CIS activities as isolated instances, but integral parts to their relationships and lives together.

#### 4.2 Collaborative information seeking as lifelong partners and collaborators

Collaborative information seeking can be seen as a collaborative activity that requires information seeking or an information seeking activity that requires collaboration [41]. For older couples who are primarily partners in life who collaborate daily, the lines seem to be blurred. Our study surfaced a glimpse of how older couples combine collaboration and information seeking. The findings seem to suggest that the ways older couples collaborate in information seeking are primarily shaped and manifested by their lifelong relationship.

##### *4.2.1 Older couples' CIS as collaboration activities.*

Older couples have had a lifetime of practicing how to collaborate with each other day in and day out. As P5B emphasized, *"We've done this many many many times before for many many many years."* Our study surfaced a few common characteristics of their collaboration when information seeking is required.

One fundamental characteristic is that couples develop a decision-making framework over time for them to reach a decision efficiently. P4A referred to this as the “*global decision of how decisions should be made*”. This framework is built upon how couples set expectations, reach alignment, and handle disagreements by having ongoing discussions. While alignments and communications are important to reach a decisions that satisfy both partners, not every decision needs equal involvement and agreement from both. In fact, some decisions are driven by one partner more because one has more vested interests, more knowledge in an area, or more expertise in certain tasks. In these situations, couples “*both lead and follow, depending on the circumstance.*” (P4B)

As part of the framework, couples tend to have ongoing discussions before, during, and after the information seeking process to set expectations and be aligned. P7 starts their holiday gifts purchase for their children by discussing what their children like and how much they want to spend, whereas P2 discusses different options throughout the search process. However, not everything needs to be explicitly discussed. Indeed, as long-term partners, couples have learnt what matters to each other and will take the knowledge of each others’ interests, preferences and needs into account when searching. When P9B searches for a new car which P9A will be the main user, he made sure to “*look at safety features, [and that] air conditioning works...Also gotta make sure she looks good behind the wheel.*”

Disagreement handling is also an important aspect of couples’ collaboration. Agree to disagree (“*We don’t have to agree on everything.*” - P1A) and working things out until an agreement is reached (“*we cooperate so we end up with something we both enjoy.*” - P11B) are two common ways couples handle disagreements. Additionally, couples challenge each other during their collaboration to maintain the balance between achieving mutually beneficial goals and maintaining individual preferences, working styles, and opinions. Showing competitiveness (“*See how much quicker I know how to go in here and put in a name, and he doesn’t do that. So I do all of that.*” - P1B) and playing devil’s advocate (“*He does most of the searches and I do most of the criticism.*” - P11B) are two main ways couples challenge each other. Over the course of their long-term relationship, couples seem to learn to adapt to the tension and differences. For example, P10B helps P10A search for crossword puzzle answers, according to her, “*It used to drive me crazy. But now when he asks me, I don’t mind as much.*”

**4.2.2 Older couples’ CIS as information seeking activities.** As discussed in 2.4, previous research has established some theoretical grounds regarding CIS configurations (i.e., the “time and space” dimensions) and strategies [31]. Similarly, we found both co-located and asynchronous search to be common when older couples search together, but may be performed at different stages of the search. Sometimes both are involved during a lengthy or more complex search task. As they search, divide and conquer by taking on roles that highlight one’s advantage is a common tactic employed by couples in their CIS. This CIS tactic is a reflection of their general collaboration styles and characteristics discussed in 4.2.1.

Having their own devices allows participants to search asynchronously at times that are convenient to them, even the majority of the CIS activities happen in participants’ homes. Asynchronous search takes places most commonly during the beginning of the search phase, when each partner will conduct their own search to come up with a shortlist of options for the couple to choose from. With some degree of coordination, couples will either look for the same aspect of the information for comparison, or complementary aspects of the information to piece results together. Combined with our observations in 4.2.1 that sharing what was found and discussing options are usually necessary steps to couples’ decision-making, we find that participants devise various ways to track and share what they found. In addition to common ways such as bookmarking, emailing found links, and using the built-in “favorite” functionality on the websites, some go to great lengths to keep track of what was found, even when it introduces a substantial amount of



additional work such as keeping many tabs open, leaving items in the shopping cart, and writing down the items to be tracked, or a combination of the above. Participants using these methods despite the inconvenience highlights the importance of the sharing aspect of couples' CIS.

In co-located search situations, some like to sit side by side throughout the search process for closer alignment or enjoying each other's company, others prefer to sit down together to discuss or make decisions after each has conducted their own search asynchronously. Agreeing with past research [1], we found in co-located searches, one partner usually takes on the "driver" role—most commonly the one more comfortable with online search or more invested in the topic being searched. This pattern reflects couples' decision-making framework discussed in 4.2.1 where the partner with more vested interest, knowledge, or more "savvy" with online search techniques tend to drive the decision more.

More broadly, couples divide and conquer in CIS tasks by taking on different roles that more or less reflect how they collaborate in general. One such divide and conquer strategy is by domestic ownership. Most prominently, the homemaker of the couple usually takes on most of the preliminary search stage to gather viable options. The other partner is then involved when the shortlist is available to be looked at, discussed and decided upon. Partners may each have their own "territories", and so another common way to collaborate is for each to take ownership of what they are interested in or care about the most. Domain expertise (*"He will come up with a question about an artist, and what I'll come up with is how is the best way to approach finding out the information that he wants, or the reference that he's looking for."* - P4B), search proficiency (*"She has a real knack for what to put in the search bar"* - P3A), personal interests (*"I look for a lot of recipes online—a real passion I have. I will be guided by what he suggested."* - P7B), and personalities (*"He has much more patience than I do, so he does most of the work."* - P11B) also seem to be common ways partners assign roles to divide and conquer.

Outside the roles mentioned above, we found partners may also take on a "helper" role that does not call for proficiency or expertise, but can help achieve a better result or make a decision more efficiently. A helper's task can be to unblock a partner when they runs into a bottleneck in a search task, searching for information to answer questions their partner has, help make a call when the decision does not necessarily concern one (*"She was there for the last 5% [of the search]. I'll ask, do you like the look of this?"* - P11A), and provide moral support (*"They just kind of want more verification and support from the other one and no consultation kind of purposes."* - P6A)

### 4.3 Adoption of ICT as individuals and as a couple

While the purpose of this study was not to investigate older adults' adoption of or attitude toward technology, we cannot decouple these fundamental aspects of older couples' CIS and reflect on our observation here. Our study suggests that while as individuals, older adults may have various dispositions towards new technology and often carefully weigh the familiarity and efficiency factors of technologies, the older couples' relationship may play a role in the ICT adoption of individuals.

**4.3.1 Adoption of ICT as individuals.** While all participants manifested proficiency with computers and searching online, their perceptions and attitudes towards ICT in general vary. Consistent with past research [32], attitudes and factors that seem to hinder ICT adoption include not seeing its value, lack of trust, seeing ICT as a distraction from real life interactions. Particularly relevant to CIS, challenges due to poor online searching experience were mentioned frequently. On the other hand, seeing technology as an enhancement to life, a sense of accomplishment when learning to use new technology, and support from close family members are all factors that encourage ICT adoption.

When discussing tools that facilitate online search, all participants display much deliberation towards technologies new and old. For example, most participants compared information seeking using the library versus online (many of them still use the library regularly). Participants acknowledged the convenience of online search, but prefer the familiarity, reliability and credibility of the library space and physical books. This comparison suggests the decision of using the traditional media or new technologies that facilitate online search is essentially a trade-off between familiarity and efficiency. Indeed, we found participants are more likely to gradually adopt a new form of technology if it is based on a mental model they are familiar with and can find comfort in, which eventually leads to trust.

*4.3.2 Being in a couple affects one's technology adoption.* We observed that although participants' attitudes towards technology vary as individuals, as a couple, their views tend to assimilate. While it is not surprising that couples who have both used computers in their past jobs tend to exhibit equivalent usage patterns or views of technology, couples who have not adopted technology with similar speed in their professional lives will also eventually come to similar views towards technology. In P1's case, P1B uses her mobile phone and social media apps frequently, whereas P1A does not have a mobile phone as he does not see its value (*"I use a real phone."*), yet both share the skepticism about how mobile phones are changing the way people communicate (*"People say they have cell phones...because they want to be connected but nobody ever answers the message."* - P1B).

We observed two reasons why couples who adopt technology differently as individuals may share similar views. One such reason is that the more technically proficient partner can influence the less proficient partner with their own understanding and mental models while supporting them to learn. For example, P2B learnt from P2A that the images on the search result page are usually ads, which led her to always avoid interacting with such images. The other reason can be that one partner is less opinionated on the topic, so the partner with stronger views speaks on behalf of the couple. In P10's case, while P10B is the primary user of Amazon, she comments on her usage on behalf of the couple, *"Before that, we have to go into the store, bring them all home, wrap them up and send them off. Amazon is perfect for us."*

## 5 DISCUSSION

In this section, we discuss our findings and how they address our RQs. To address RQ1, we situate older couples' CIS practice as "everyday information" [38] and as pertaining to "the pleasurable and profound" [23] (5.1). To answer RQ2, we discuss why older couples' CIS can be seen as a relationship maintenance behaviour (5.2), why relationship is a fundamental aspect in older couples' CIS (5.3), and how their long-term relationship may have shaped their CIS configurations and strategies (5.4). To address RQ3, we reflect on ways collaborative information systems can accommodate older adults' CIS considering challenges in their CIS practices and their ICT adoption (5.5). In thinking of the CIS community at large, we offer some thoughts on what the CIS community can benefit from understanding older couples' CIS, specifically the relationship perspective (5.6). And finally, we complete our discussions with a summary of limitations and future work (5.7).

### 5.1 Older couples' CIS as everyday life information seeking

Participants' answers to our interviews included multiple and diverse examples from different aspects in their lives that span a long period of time. This supports our findings about older couples' CIS behaviour being in the context of their lives. Our findings in 4.1 answer RQ1 by suggesting that older couples' CIS is part of their everyday information seeking. In the realm of "everyday life information" [38], older couples' CIS is more than "active seeking of effective information". Browsing, monitoring, sharing, discussing, and encountering information [14, 18, 38, 44] are all part

of their CIS practice. From an information behaviour perspective, their varied information needs range from the desire for “living independently” [46] to the desire to engage in information and activities that bring joy, feelings of accomplishment, and new knowledge. This is consistent with the findings of research studies on older adults' outlook on life [37, 47]. As such, these information needs can be summarized as information pertaining to “the pleasurable and profound” [23], as they contribute to a sense of fulfillment in one's life.

## 5.2 Older couples' CIS as relationship maintenance

In existing CIS research, many studies have focused on search tasks and search results, and few have investigated collaborative information behaviour through the lens of collaborators' relationships. While some studies [22, 42] looked at the affective and emotional dimensions using the information search process (“ISP”) framework [25], researchers recognize the complexity of emotions as a result of collaborators' interactions and dynamics [41]. To answer RQ2, we first address the role relationship plays in older couples' CIS. Indeed, the preliminary empirical data in our study suggests it plays an important role. Specifically, daily tasks and spending time together are the two most frequently reported relationship maintenance behaviours by couples [12], and are both common CIS behaviours reported by older couples in our study. Additionally, we observed that older couples' CIS can also be motivated by their relationships (e.g., when the goal of searching together is to share each other's interests or settle a debate as discussed in 4.1). To summarize, the analysis of our empirical data suggests that older couples' CIS is primarily a relationship maintenance behaviour.

## 5.3 Older couples' relationships as a fundamental aspect in their CIS

To further answer RQ2, we propose that the uniqueness of older couples' relationships combined with their longitudes, are fundamental to older couples' CIS configurations and strategies, which reflect their collaboration in general based on our observations in 4.2. As suggested in 4.2.1, older couples' long-term relationships allow them to collaborate effectively by developing decision-making frameworks to set expectations, reach alignment, and handle disagreements throughout their CIS and over time. By being in a close relationship, couples can and tend to have ongoing discussions and communications, which contribute to the effectiveness of their decision making during CIS. Lastly, in a committed relationship, partners are willing to do what needs to be done to achieve mutually beneficial goals [26], which is reflected in how older couples devise divide and conquer strategies by taking on various roles. Additionally, couples tend to construct similar views over time [13], which may have explained the effect older couples' relationships have on their views towards and adoption of ICT as discussed in 4.3. This implies the extent a couple will engage in CIS depends on either partner's willingness to use such technology, influence or to be influenced by their partners.

## 5.4 Older couples' CIS through the lens of their relationships

Having established that older couples' relationships may be the crux of understanding their CIS behaviour, we complete our answers to RQ2 by situating and examining older couples' CIS through the lens of their relationships and specifically in the aspect of the their CIS configuration, divide and conquer strategies, as well as the role communication plays in their CIS.

**Co-located versus asynchronous search.** These are both common CIS configurations as suggested by our findings in 4.2.2 as well as past research [31], our findings also provide additional insights to when each configuration are likely to take place. Specifically, co-located search is commonly performed when alignment is important for decision making, or when couples wish to spend time together. In other words, older couples engage in co-located search

to optimize communication or companionship, but has the potential downside of conflicts when couples disagree. Asynchronous search occurs either when couples independently look for information, or when one partner does most of the preliminary search. In other words, older couples engage in asynchronous search to optimize efficiency or broaden search parameters, but has the potential challenge of easily tracking and sharing what they found.

**Divide and conquer with various roles.** Our findings in 4.2.2 agree with past research [31] that divide and conquer is a common CIS strategy. However, in the context of older couples' CIS, we surfaced insights about how older couples structure and assign their roles due to the unique relationship they have. While roles based on domestic ownership, domain knowledge, search proficiency, personal interests and personalities are more “fixed” within a couple—meaning one partner may always drive the search for something they are an expert or interested in, the “helper” roles partners take on seem more flexible and highly depend on the tasks. This indicates that partners are willing to do what needs to be done to achieve mutually beneficial goals for the couple.

**Communication for decision-making and relationship maintenance.** Communication plays an important role in older couples' CIS to achieve alignment and decision-making. The importance of communication and raising awareness has also been discussed extensively in the CIS community [41]. Our observations show that while couples tend to have ongoing communications towards decision-making, not everything needs to be explicitly discussed as couples have learnt what matters to each other as their relationships develop over time. On the other hand, some couples like to “over-communicate” by sharing what they found and discussing their opinions and feelings about it—meaning the communication has less to do with decision-making but rather to maintain and grow their relationships.

## 5.5 Reflections on designing systems mediating older couples' CIS

While most participants in our study share the sentiment that they do not aspire to spend more time than they already have to search online, our findings suggest searching together allows older couples to find better results (as one helps the other) or be more efficient (as they divide and conquer) than searching individually. With regards to RQ3, we offer some reflections on what designers of collaborative information systems mediating older couples' CIS may wish to take into account given the nature of their relationships and challenges faced in their CIS and overall ICT adoption. First, designers may consider making tracking and sharing what was found between partners more easily accessible and digestible, given challenges observed in 4.2.2. Another aspect to be aware of is the facilitation of divide and conquer strategies or role assignment considering older couples' CIS strategies that are unique to their relationships, since such divide and conquer strategies are not well supported by current collaborative information systems. Furthermore, in order to suit the communication and awareness features to older couples, designers may wish to leverage or take into account the fact that older adults already have deep knowledge about their partners. Lastly, considering that in some couples we saw that one partner was more proficient than the other in online search, designers may consider ways in which couples can be both involved to encourage learning and adoption of technology by the less proficient partner.

There is one final point of reflection on the design of such system based on our findings outside of older couples' CIS behaviours. Given our findings in 4.3.1 that older adults are more likely to adopt new technologies that are more familiar to them, and physical forms are deemed to be more familiar and reliable, we encourage designers to explore the possibilities of such a system with a physical form [17].

## 5.6 How the CIS community can benefit from understanding older couples' CIS

Our findings regarding older couples' collaboration agree with Stroughs et al.'s assessment that older couples are “collaboration experts” [43]. Not only so, the characteristics of older couples' collaboration discussed in 4.2.1 are highly

inline with the characteristics of effective collaborations outlined by past research [5, 8, 24]. Our earlier discussions posit that their relationships may be one key to achieve this level of expertise. As the CIS research community continues to investigate the theoretical issues of CIS and aims to improve collaborative information seeking for all, the relationship among collaborators can be an important aspect to focus on. As Shah [41] suggested, there are connections between “social ties” and “collaborative ties” that we do not yet have much insight into in the context of CIS. Our study about older couples' CIS and the role their relationships play in it may offer a starting point into this line of research for the future.

### 5.7 Limitations and future work

There are some limitations in this study both in terms of procedure and types of data collected. The most significant limitation was caused by COVID-19, which limited the ability of the researcher to fully situate themselves in the physical context of our participants. We partially mitigated the lack of researcher's physical immersion by guiding participants to describe the physical context of their CIS, including where the search devices were situated and how they physically engaged in their CIS, as well as increasing engagement efforts and actively prompting participants to share their contexts in multiple and diverse examples.

Our study offers a unique and first glimpse of the CIS practices of older adults, through data collected from open-ended interviews that prompted multiple and diverse CIS examples across a long period of time combined with demonstration of real-life search tasks. Future research could build on the insights gained from this study (which was limited to snapshots across defined periods of times in participants' lives), and expand the understanding of older adults' CIS practices through longitudinal data collection, such as diary studies that allow for a more complete data collection, combined with repeated semi-structured interviews.

## 6 CONCLUSION

In this paper, we presented findings from a qualitative study that sought to investigate how older couples search online together. Our study aimed to uncover the context, needs, topics, behaviours and challenges of older couples searching online together, and their collaborative information seeking from the age and relationship perspectives. Semi-structured and open-ended interviews were conducted with eleven older couples. This study filled an important demographic-related knowledge gap in the current CIS field by providing a glimpse into how older couples search online together in their life contexts. Our findings surface empirical evidence suggesting that older couples' CIS needs range from daily tasks, interests, to satisfying curiosity. More importantly, our study highlighted that older couples' long-term relationships play a key role in their CIS. Not only can older couples' CIS be seen as primarily a relationship maintenance behaviour, their long-term relationships are also fundamental in shaping how they collaborate in information seeking. To that end, our study provides unique preliminary insights to older couples' CIS configurations, strategies and challenges that warrant a reflection on the ways collaborative information systems can accommodate older couples' CIS in the context of their lives and relationships.

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