To love, honor, and inform from this site forward: A model of dyadic information behavior in online-initiated relationships

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Abstract

How people engaged in a close, dyadic long-term relationship (LTR) share information behavior can be considered a hallmark non-romantic measure of online relationship creation success. Dyadic LTR information behavior, however, has not been addressed from an information science perspective. Drawing upon findings from studies in social psychology and economics, and other frameworks (transactive memory, lay information mediaries, everyday life information seeking, and principle of least effort), this paper presents a model of couple's dyadic information behavior that comprises six elements: context, seeking, storing, managing, sharing, and barriers as they occur over five stages (individuals meet online, learn each other's information behavior, merge information taxonomies, establish transactive memory, and eventually the couple dissolves—meaning shared information is lost). The model is additionally relevant to dyadic LTRs involving business, artistic, and other collaborations. Implications are discussed for a forthcoming empirical investigation, as well as the design of services, applications and policy.

1. Introduction

Nearly 70 percent of the US population is or has been married [55]. Add the number of people who are or have been in a non-married, long-term relationship (LTR), plus those with a best friend or a close, long-term roommate or colleague, and the importance and prevalence of intimate dyadic relationships becomes apparent. And yet research has all but ignored couples—married or otherwise—as a distinct and complex facet of everyday information behavior. This gap in the literature leaves many questions unanswered: Is a woman impressed by her date's ability to search/find information—much akin to the historic hunter-gatherer or other provider motifs? Can the ability to manipulate, share or manage information attract one person to another? How are these abilities deduced in the online dating world? Assuming the two online daters have luck, what are their information needs as a couple? How does their information behavior change over time? How can information behaviors drive them apart? What happens to shared information when the relationship ends or one of them passes away? How do gender differences affect the information behavior of a couple? How does the information behavior of couples change across cultures with different established gender roles?

Research suggests that increasing numbers of people, representing broad demographics, are engaged in online dating, with the aim of finding an LTR [6, 11, 18, 19, 36, 39, 48, 59, 62]. Moreover, many people report using online and mobile technologies for mediating their relationships [52, 64]. So, how can the success of a relationship be measured? Romantic indicators can include: length of relationship, spending weekends and holidays together, taking down dating profiles, relocating, cohabitation, marriage, blending families, etc. Yet, what about non-romantic indicators of a relationship's success? In this paper, we propose that the phenomenon of dyadic information behavior can be viewed as a non-romantic measure of online relationship creation success. We introduce a model for understanding dyadic LTR information behavior that is based on an intensive review of studies from social psychology, economics and other fields, and utilizes concepts from information science. The model, along with how it is being used to frame a new study of dyadic information behavior among couples, specifically those who meet online, and implications for future work are discussed following a review of key studies from different domains.

2. Literature review

2.1 Information behavior research: Groups, individuals, dyads

A subfield of information science, information behavior research addresses how people create, need, seek, give, share, manage, and use information in different contexts. More simply, it is how people

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experience information. The insights from information behavior research are used to design technology, services and policy. The field is known for its heavy development of theory and use of concepts from other domains, and breadth of research approaches.

Since the 1960s, information science researchers shifted the ways of studying information behavior, becoming more user-centered and employing different methodologies for investigating individuals in specific contexts, groups (particularly in scientific and business settings), and entire communities. Dyads or couples in a close LTR who frequently share tasks and goals, and sometimes living spaces have received scant research focus. Even though billions of people are part of symbiotic, dyadic relationships, their collaborative way of life has been largely ignored in the information science literature.

2.2 Couples' information behavior in psychology and family therapy

Outside information science, the literature most closely approximating an information behavior perspective of couples has focused on communication between romantic couples and its inherent effects on their marital satisfaction. Journals of family therapy, for example, commonly study how couples communicate and what that means for their marriage [e.g. 7, 34, 46], with the intention of treating marital problems and encouraging healthy behaviors. Information scientists bring a conceptual information focus, rather than a clinical approach to the same subjects. An information scientist's study of couples might examine the sources, types, and transmissions of information as data of interest in their own right; propose models to describe how information *is* created and used, rather than how it should be used; devise tools and technologies that could facilitate better information sharing and use between partners; and so on.

While family therapy and psychology don't ask the questions that information science might, they do reflect the importance of communication, which can be seen as information exchange, to couples: shared reality theory research has addressed the importance of each dyadic member acquiring information about the other's views. Shared reality theory [26, 27] offers one lens for examining dyadic communications, postulating that shared attitudes and beliefs are central to relationships. Knowing one's partner's views and attitudes has been associated with better interpersonal functioning, and even lower blood pressure [50]. Married couples also are more likely to agree on political issues, and even when they don't, they think they do [42]. Couples that meet online might have an added advantage of knowing some of their partner's views from the beginning, if that information is available on their profile.

Communication is so central to couples' relationships that observed communication can foretell marital problems [12, 24, 38], and couples who go on to experience infidelity show more problematic communication premaritally [4]. Conversely, positive communication can lessen the impact of stress, and the couple can be happy as long as positive communication is maintained [34]. As information behavior is central to a LTR's success, it is an area ripe for examination within the field of online dating—to help identify and facilitate the types of information exchange that will result in the formation of LTRs.

Communication experts note the significance of non-verbal information exchange such as gestures, touch, and tone of voice. These kinds of information can be problematic; indeed, Parr, Boyle, and Tejada [43] developed a therapy that practices verbal communication rather than allowing couples to rely on potentially ambiguous nonverbal cues. We do not know if online meeting devoid of these cues could be beneficial or harmful to the future success of the relationship, although research by Whitty, a cyber-psychologist, [60] found that those communicating online did learn to verbalize nonverbal cues, hence adapting their behavior to the medium, and that the lack of emotional cues actually encouraged the formation of relationships, particularly for young men.

The medium of information exchange between couples is another consideration, particularly due to the increase in relationships which form online. Coyne, Stockdale, Busby, Iverson, and Grant [13] found that the majority of couples in their study frequently used cell phones and texting to communicate with each other, primarily to express affection. Meanwhile, Höflich and Linke [30] found that couples in the "continuation" state of an intimate relationship use mobile phones to conduct "remote nurturing" and organize meetings, tasks, and errands. Much of the information exchange between couples occurs in the home. As Rieh points out [47], the home environment carries different contextual elements from the work environment, which affect information behavior (in Rieh's study's, web searching). Therefore, information exchanges with a spouse or partner may be different from work and other information exchanges due not only to the relationship, but also the physical context.

2.3 Couples' information behavior and health

Health is a growing area of research in couple's communications. While medical policies generally put control in the hands of the patient, Gilbar and Gilbar

[23] found that breast-cancer patients want their husbands involved in the decision-making process. Arden-Close, Moss-Morris, Dennison, Bayne, and Gidron [5] developed the Couples' Illness Communication Scale to assess illness-related couple communication. Others have studied how couples' communication behaviors can affect healthy behaviors and weight loss [e.g. 14].

LTRs also have been studied in information science by assessing the role of one spouse as a "gatekeeper," who controls the flow of information to the family. Lewin [35] disproved the common belief that the man of the house determined the food eaten by his family, finding instead that the wife was the gatekeeper to the family's nutrition. Tourism researchers tested this idea, revealing that, despite the gearing of marketing language toward men [45], women actually play the primary role in initiating the discussion about travel, collecting the information, and booking the trip. In the middle stages of the process, most households make joint decisions, but when one spouse makes those decisions, it is more likely to be the woman [41]. These findings will help frame research into the way couples merge their information behaviors as they establish a relationship.

2.4 Concepts from economics

In *Spousonomics*, Szuchman and Anderson [54] apply economic concepts to relationships for a lay audience, and present several ideas that shed light on couples' information behavior. *Information asymmetry*, a term from economics and contract theory [3], explains the differences in information that spouses might possess where one partner might filter out information, assume knowledge of the other spouse's wants, or simply forget to include an important fact, resulting in one spouse knowing more about something than the other, which can cause misunderstandings and arguments.

Fry, Firestone, and Williams [20] compared the performance of dating couples and pairs of strangers in a negotiation exercise. They found couples prioritized their relationship over optimal mutual outcomes; they didn't bargain as hard, and ended up with a lower total profit. This effect was even stronger in couples that scored highly on Rubin's love scale [49]; those who didn't show high degrees of romantic love performed closer to the control pairs. These results imply that partners negotiating against each other might not be getting the best financial outcome (though maybe they considered it a better outcome to save the relationship).

2.5 Non-intimate dyads

Social network analysis has studied dyads from the vantages of sociology, sociometrics, psychology, mathematics, and computer science. These approaches examine dyads as the connection between any two nodes on a social graph, not necessarily romantic partnerships.

Information scientists have looked at the interaction between two people: Pettigrew [44] studied the information exchanges between nurses and senior citizens at neighborhood clinics. Despite infrequent interactions, the nurses' caring behavior created elements of strong ties; perhaps close relationships don't have to be long-term or consist of spending a great amount of time together. McKenzie [40] studied communication and information flow among dyads of midwives and their patients, examining the value of small talk and informing in building the provider-patient relationship.

Dyad interactions between reference librarians and users have also been studied; Hernon and McClure [29] tested the "55 percent rule" found by other studies, by sending students undercover to ask predetermined questions of reference librarians at different libraries so that the quality of the responses could be judged (62% correct). Dewdney and Ross [16] repeated the study, but with questions they actually wanted answers to instead of fabricated ones and only 59.7 percent said they would be willing to return to the same librarian. Shachaf [53] compared the dyadic interactions between librarians and users with the reference provided by amateur users of the Wikipedia Reference Desk and found reliability, responsiveness, and assurance to be comparable in both services. However, these were short-term interactions; longer-term patron-librarian relationships might have different implications. Still, Gallardo-Virgen and DeVillar [22] found that pairing up students on a computer-based project resulted in greater academic gains than having students work individually. The students were classmates, indicating some level of familiarity, but were paired up randomly, so did not necessarily have experience working collaboratively with their partner, and yet the dyadic setup had positive results.

2.6 Transactive memory

Perhaps the most germane concept to the model presented in this paper is that of *transactive memory*. Published in 1985, Wegner, Giuliano, and Hertel's [58] "Cognitive Interdependence in Close Relationships" addressed the unique behaviors of intimate dyads but it went largely unnoticed, cited only a few times, and unavailable electronically. Wegner et al., reviewed theories regarding transactive memory, including its

processes (encoding, storage, modification, and retrieval) and structures (the differentiation and ultimate integration of memories), and proposed how failures of transactive memory might affect one's intimate life and vice versa.

Transactive memory [56] views multiple individuals' memories and their communication as a single system. In this way, other people become extensions of one's own memory, which one can access through communication with that person. Researchers have supposed, but not always been able to demonstrate, that transactive memory is more effective among people who know each other well: i.e. two people who are in a close relationship would be able to remember more working together than either one of them could alone, and they would be able to remember more than a pair of strangers working together on the same memory task. Indeed, Wegner, Erber, and Raymond [57] found that when couples could share the load of a recall task, they performed better than pairs of strangers if they were allowed to delegate who memorized what. Gagnon and Dixon [21] found that while couples who had been married for one to nine years did not perform any better than pairs of strangers, couples who had been married for 28 to 55 years did perform significantly better than pairs of similarly aged strangers. However, Harris, Keil, Sutton, Barnier, and McIlwain [28] studied the recall abilities of older married couples, and found that collaboration on recall can help or hinder memory, depending on how the couple interacts during the recall process. Transactive memory can have far-reaching effects Wegner [56] cites data showing that clearly differentiated domains of expertise, and agreement on who in a couple is responsible for knowing what, were correlated with relationship satisfaction.

In addition to subconsciously partnering on information storage and retrieval, couples may also find information for each other. Abrahamson and Fisher [1] developed the concept of lay information mediary behavior to describe seeking information on behalf of others. While there is no published data on spouses seeking information for each other, Abrahamson, Fisher, Turner, Durrance, and Turner [2] found that the large majority of people seeking information for others on a website were doing so for a family member. In some relationships, one spouse may have more time, fluency with the Internet, or motivation to seek out information, and thus engages in information seeking on their partner's behalf. The prevalence of this behavior has not been studied, nor have the results of that information seeking; that is, whether the information is acted on or retained. In the U.S. IMPACT Study [8] of how people use technology in public libraries across the United States, analysis of responses from almost 50,000 people revealed that 63 percent had acted as lay information mediaries within the past 12 months. Of these, 67 percent were on behalf of family members.

This paper brings together Wegner's transactive memory notion with an information science perspective to dissect the information behaviors that are part of the everyday life of LTR couples—from determining information needs to creating, assessing, seeking, storing, retrieving, sharing, managing, withholding, and losing information.

2.7 Gender, same-sex couples, and cross-cultural studies

The discussion goes beyond the information behavior of heterosexual, married couples. In fact, exploration of the differences and similarities in information sharing in opposite-sex versus same-sex couples might yield important insights into the effects of gender on information seeking. Studies such as Halder, Ray, and Chakrabarty [25], Hupfer and Detlor [32], and Burdick [10] have demonstrated differences of information seeking behavior by gender, and it is unclear what effects might exist in couples consisting of a male and a female, two males, or two females.

Similarly, these concepts should not be limited to studies of American and European populations. One major area of potential future study is differences in information behavior in couples across cultures; for example, in one study, Americans' marital satisfaction was more strongly related to marital communication behaviors than Pakistanis' [46].

2.8 Summary

When it comes to couples, one plus one does not always equal two. Sometimes it can equal more, in that a close pairing is perhaps capable of greater mental capacity, or in some cases it might add up to less, as when conflicts stifle the individuals' potential. Couples engage in complex interactions that have many implications for information behavior research and design. Bringing the study of romantic couples into the field of information behavior first requires comprehensive modeling. By applying a model of dyadic information behavior specifically to LTRs initiated online, this paper focuses on an emerging area of human interaction as facilitated by technology. The scope of this paper does not extend to modeling all dyads or off-line relationships, but instead seeks to open up a new area of study. Modeling information behavior for non-romantic dyads, or off-line relationships is an area to be explored in future work.

3. A Model of Dyadic Information Behavior (DIB)

The following model of dyadic information behavior (DIB) of people in LTRs is based around six prevalent factors: context, seeking, storing, managing, sharing, and barriers (Figure 1). It applies concepts from Information behavior to LTRs.

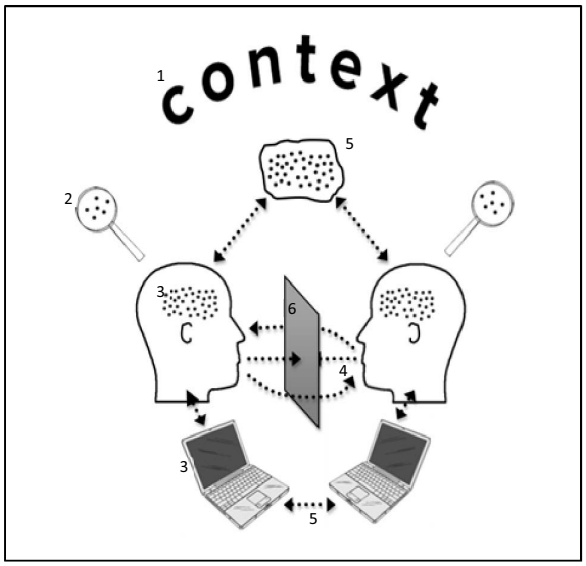

Figure 1.
A Model of Dyadic Information Behavior

1. *Context.* Context is a core, rich concept that has been approached from various angles by scholars in different disciplines such as communications and information science [15] and human computer interaction [17]; indeed, in information behavior—the ISIC international conference series since 1996 focuses on issues of context [33]. For the purposes of this research, context is defined as explained by Dervin [15, 33] and so, rather than addressing the effects of context on HCI interaction as outlined by Dourish [17], we consider the contextual factors that affect individuals' broader information behavior: what situational factors prompt partners to create information incidents, information, information needs? What factors frame these behaviors? How does context—including past lived individual experiences affect information behaviors?
2. *Seeking*. What skills does each partner bring to information seeking, both purposefully or directed, and opportunistically? How does each partner encounter and seek information for the couple's joint needs? Do they share and merge their information grounds, or keep them separate? Do they maintain areas of domain expertise?
3. *Storing*. If transactive memory functions as a sort of shared mind, which partner takes charge of encoding and retrieving each kind of information? How is technology used to store information, and is that information accessible by the other partner?
4. *Managing.* How is information reshaped to fit the couple's needs? How is information overload individually and collectively negotiated? How is it determined what information needs to be retained and what is to be done with it?
5. *Sharing*. How does each partner share the information he or she has gathered? How does information asymmetry come into play, when partners cannot or will not share with each other? What kinds of information are being communicated, and how (verbally or nonverbally)? How do couples use technology to exchange information? What tools can we build to better facilitate these exchanges?
6. *Barriers.* What factors—such as distance, lack of time, preconceptions, emotions, and intermediating technology—can act as barriers to information exchanges? What happens when necessary information doesn't get from one person to the other? How does that affect future information behavior?

As illustrated in Figure 2, the model's six elements are considered over time: we thus ask how the individuals' behavior changes throughout their LTR. Imagine two people: they view each other's profiles online at Match.com. Something about the information in the profiles, an email, or perhaps a phone call, prompts an offline meeting where the couple initiates assessment of their potential for successful partnership, and share further information about themselves.

As two individuals engage in dating, they learn about each other and their individual information styles. What kind of searcher someone is; how s/he deals with opportunistic information seeking; how many people s/he acts as lay information mediary for and who their LIMBs are; what kinds of information grounds a person has and whether their partner might be included at some; how does s/he deal with pressure and information overload, as well as their skills for deducing mis- and disinformation. As the LTR develops and the individuals have taken down their profiles, ended their Match.com subscriptions, perhaps moved in together, they've grown closer, and learned about the other person and their information management behaviors; loosely-kept calendars, notes, and lists—perhaps all on paper, and often misplaced, sometimes just kept in their head, tendencies to forget names, or email and text reminders.

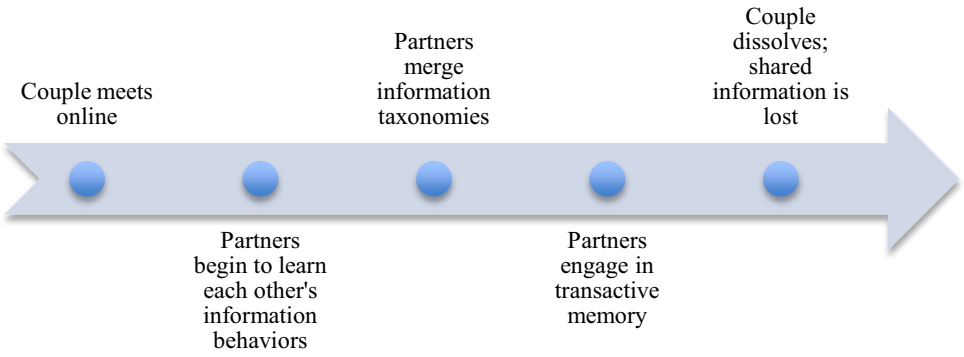

Figure 2. The Timeline of a Couple's Dyadic Information Behavior

Gradually the couple begins to accommodate each other's information behavior as they collaborate on grocery shopping, laundry and other household tasks. It becomes necessary to merge information taxonomies: how data that is relevant to their lives is categorized, filtered, kept, or discarded. They may adapt their information arrangements, perhaps taking their calendars to a digital format, so they can share their plans. Eventually, their information behaviors become synced, compensating for each other's weaknesses. Ultimately, when the couple splits, one passes away or grows ill, their shared information behavior dissolves. What happens then? Information poverty sets in. This Timeline of a Couple's Shared Information Behavior (Figure 2) represents these major stages, and is another way to view the information life of a couple as something shared and distinct. This timeline expands on the work of Whitty and Gavin's proposed increments of trust which mark the development of an online relationship by the exchange of personal information [61].

In addition to the frameworks noted (transactive memory, lay information mediaries), the proposed model draws from Savolainen's Everyday Life Information Seeking [51] and Zipf's Principle of Least Effort [63]. Rather than focusing on specific or job-centric activities, the DIB model takes into account the general information needs, seeking, and sharing that occur as part of daily life. During these interactions, information is both shared and withheld via verbal, physical, and textual means—and the understanding of, and response to these cues can affect the happiness of the couple. Savolainen's "mastery of life," it could be presumed, would entail mastering one's couple-centered information behavior as well.

Coupled with this, as Zipf theorized, is people's tendency to expend the least amount of effort necessary. Each partner only takes on the information that is easy for them to remember, and barriers might prove insurmountable. Relationships require maintenance, and if one partner doesn't put as much effort into information seeking and sharing as the other, it can negatively affect the relationship. Information behavior in couples is therefore something that, although not explicitly addressed in online dating studies so far, seems to underpin not only the search and selection of a partner, but can also foreshadow the compatibility and success of any resulting LTR.

4. Conclusion

When discussing couples, we limit ourselves to marriages, or LTRs, yet, when approaching dyads from an information perspective, models have focused on non-romantic dyads. By studying DIB in romantic dyads, we can open up the study and comparison of other intimate relationships which manifest between best friends, long-term co-workers, collaborators, or team members who know each other's work patterns, artistic collaborators, start-up cofounders, and partners in sports, who all engage in these information-laden behaviors, and could benefit from staying together for a long time. Scientists, too, have been found to use dating and marriage analogies when describing successful relationships with colleagues [37]. Whatever kind of couple is being studied, the focus on the close dyad—rather than just the individual, the small group, or the community—as a unit of information behavior has numerous implications for research, services and applications, and policy. The focus on dyad interaction is similarly relevant and separate in the online world; studies of online dating, as opposed to general social networking or community based interactions, will help identify behaviors that affect the development of online dating services and partner-match algorithms.

4.1 Future research

Research is needed on couples' information behavior *from an information standpoint*: the types of information sought, retained, shared, and lost. Primarily we are interested in the correlation of information behavior changes and relationship formation and success, particularly with a view to allowing comparison of in-person and online dating relationship information timelines. From a specific

online dating focus, the researchers are using the paper's model to inform the constuction of instruments, the selection of participants and guide the initial analysis for an exploratory study of how people assess their information behavior in an LTR, which will be explained in a future paper. Field work is being conducted with male and female users of online dating sites in Seattle. Interviews focus on how subjects assess their own information behavior style in relation to the six factors identified in the model, for example how they share information with a partner, what barriers they encounter and how their information behavior changes throughout the online dating and LTR experience. These studies record the perception of the subjects, rather than attempt to gather external positivist data or engage in on-going observation-based research.

We are also interested in whether the genders represented by the two partners in a couple affect the information activities in that dyadic relationship—whether gender affects the type of information that is sought, shared and retained, or whether couples moderate their information behaviors to make up for weak or strong areas of information behavior in their partners. As a follow-up question, we must ask what constitutes information compatibility, and how important this is to the success of a couple. It is also interesting to consider whether couples are *aware* of their own information behavior or information behavior that they find attractive in others. Studies have suggested that evidence of transactive memory helping with recall is found in some couples but not others; time together has been suggested as one differentiator, but we must examine what other factors are at play. Also related to gender is the fact that much of family-centered research has focused on women, ever since they were found to be the gatekeepers for certain information and decisions decades ago. Further research into the information needs and behaviors of men outside the workplace would help our understanding of information behavior at home.

Additionally, as our timeline shows, there is opportunity for research into how information behavior changes over the life of a couple. Information is not a static possession; rather, it is something that couples are continuously creating, re-creating, and managing to fit their needs. It would be illustrative to know whether information sharing and use changes with shared experience. Research is needed into what happens to the information that one partner managed for the couple when that partner leaves the relationship; perhaps each partner learns to rebuild those skills, or perhaps it becomes a struggle that remains for life.

Once data is collected for romantic dyads, further research could extend to comparisons of romantic and non-romantic dyads and on and off line relationships. Most of the conclusions drawn here are American-centric; in order to separate behaviors and lessons that are culture-dependent, further cross-cultural research is necessary. We need examine how information is shared and used between couples in different places, comparing individualistic and collectivist cultures and places where gender roles are different from the U.S.

4.2 Services and applications

Personal information management is an area of significant entrepreneurial focus: from EverNote, which helps people record and organize information in one digital environment; to applications that allow calendar sharing; Orchestra, which allows people to share tasks and to-do lists, and chat about them within the application; and Grocery iQ, which allows collaboration on grocery lists. There is room for development, but the real challenge is creating a tool for two different people who have different information storage styles. If one person prefers a paper calendar but the other keeps one on a smartphone (or, no system), what kind of application will work for both of them?

Another area warranting development is communication systems; which is the most effective for relationship success? Perhaps reminders can be automatically transferred from messages to one's calendar or GPS-enabled device (so phone issue a reminder to pick up nonfat milk when near a store). Brown, Krishna, Sellen, and Harper [9] at Microsoft Research have explored "audio-tactile messaging," in which flicking, twisting, tapping, or stroking one's phone sends one of twelve sound effects to the other phone, making the sound effects into a separate vocabulary for couple communication.

Once data is gathered to explain information compatibility, we can envision there being tools created that allow couples to measure and evaluate their information strengths. If understanding each other's capabilities makes transactive memory more effective, then a tool that reveals those capabilities could benefit one's relationship, and indeed, the process by which one finds a potential partner through online dating sites.

Research could illuminate what kinds of services should be targeted toward one partner versus the other: who tends to be the gatekeeper in certain situations, and which are shared by both partners? This would be useful for targeting advertising for services (like travel) towards the decision maker of the couple.

Another important service could help someone who has lost their partner cope with the information loss. By better understanding what information dissolves

with the relationship, and how to preserve it in case of this event (perhaps a standard for an information will?), and how to rebuild it after it's gone, information scientists could alleviate some of the stress associated with losing a loved one.

Since it takes time for these kinds of bonds to be formed, it could be beneficial for schools and offices to encourage long-term partnerships on projects, rather than rotating students or workers from one team to the next. If a dyad is smarter having worked with each other longer, then these dyads should be maintained for as long as possible, from an information standpoint.

This work has policy implications as well. If research supports Gilbar and Gilbar's [23] findings that couples want their partners to be involved in their healthcare decisions, this needs to be taken into account in places that do not yet have domestic partnership or civil union laws that allow unmarried partners to have the same rights in terms of medical visitation and judgments as spouses.

4.3 Information compatibility: Central to a couple's success

In 1985, Wegner, Giuliano, and Hertel [58] recognized that couples are a unique group; in the case of these intimate partners, the whole is more than the sum of its parts. Information behavior is so central to a couple's ability to maintain a healthy relationship that much of the limited research on the topic comes from the disciplines of therapy and clinical psychology. Before a long term commitment is made, couples look for compatibility on a number of levels: family, tastes, religion, lifestyle. Information behavior, though difficult to quantify, is just as important a measure of compatibility, if not the most vital. When a couple promises to love, honor, and keep each other for as long as they both shall live, perhaps they should add sharing information to the list.

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