Encouraging serendipity in research: Designing technologies to support connection-making ☆

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ABSTRACT

Mobile applications have the ability to present information to users that is influenced by their surroundings, activities and interests. Such applications have the potential to influence the likelihood of individuals experiencing 'serendipity', through a combination of information, context, insight and activity. This study reports the deployment of a system that sends push text suggestions to users throughout the day, where the content of those messages is informed by users' experience and interests. We investigated the responses to and interactions with messages that varied in format and relevance, and which were received at different times throughout the day. Sixteen participants were asked to use a mobile diary application to record their experiences and thoughts regarding information that was received over a period of five consecutive days. Results suggest that participants' perception of the received suggestions was influenced by the relevance of the suggestion to their interests, but that there were also positive attitudes towards seemingly irrelevant information. Qualitative data indicates that participants, if in an appropriate time and place, are willing to accept and act upon push suggestions as long as the number of suggestions that they receive is not overwhelming. This study contributes towards an understanding of how mobile users make connections with new information, furthering our understanding of how serendipitous connections and insightful thinking could be accommodated using technology.

1. Introduction

Understanding the way that people think and make associations among their own interests, resources and other people is important not only for encouraging communication and collaboration but also for identifying key elements that contribute to making unexpected connections – something that can be termed 'serendipity'. Notions of serendipity have been widely documented as being '*a happy accident*', something' *unexpected*' or a '*pleasant surprise*' (Bawden, 1986). Furthermore, sagacity – that is the ability to make *valuable connections* among 'unconnected' information – has been documented as being an important element of serendipity (Kop, 2012). However, other researchers argue that

something needs to be *interesting* as well as *surprising* in order to be considered serendipitous (Ge et al., 2010) and that serendipity can facilitate information browsing (Marchionini and Shneiderman, 1988). Recent research has identified that the conceptualization and realisation of 'serendipity' involves insightful thinking, promoting the idea that 'serendipity' is not just a 'happy accident' (Friedel, 2001; Makri and Blandford, 2012) but requires some proactive input from the individual. Serendipity has been researched in numerous contexts including counselling psychology (Krumboltz, 1998), information seeking (Foster and Ford, 2003), ubiquitous computing (Newman et al., 2002), entrepreneurship (Dew, 2009) and medicine (Klein, 2008; Ban, 2006). In Human Computer Interaction (HCI), serendipity has been explored especially under the context of recommender systems because they provide an excellent test-bed to tackle the so-called 'serendipity problem' (Iaquinta et al., 2008) and the overspecialisation of recommended information, which can impair serendipity (Gup, 1997), while aiming to provide richer experiences in suggestions. Our own work (Sun et al., 2011) has shown that the concept of

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serendipity is also relevant to the work of those who are conducting research, in both an academic and non-academic setting.

While other researchers acknowledge that 'inaccuracy' can be critical for developing recommender systems (McNee et al., 2006), the majority of the recommender systems incorporate commonalities, relevancies and previous data patterns and choices (i.e. bookmark lists) as their operative core (Adomavicius and Tuzhilin, 2005; Resnick and Varian, 1997). However, new methods of data recommendations have emerged in recent years such as prediction techniques, content-based methods, collaborative methods and hybrid methods (Adomavicius and Tuzhilin, 2005). In an attempt to enrich the experience and data pool of modern recommender systems new approaches have been suggested such as ambient recommender systems, which utilise users' emotional responses, machine learning and intelligent agents to provide focused and more personalised suggestions to the users (Gonzalez et al., 2006).

However, a critical question here is whether absolute personalisation and content fit is the optimal answer to efficient and successful recommender systems. In a serendipity context, one could say that inaccuracy and 'open-mindedness' in systems is of fundamental importance in order to design and implement a system that can accommodate serendipitous encounters because such a framework allows wider reflection and surprise, open information augmentation and acceptance – qualities that can support serendipity (Gaver et al., 2003). While serendipity is a slippery concept (Makri and Blandford, 2012), attempts have been made to introduce serendipity into systems through serendipity heuristics (Iaquinta et al., 2008), shuffling algorithms (Leong et al., 2005), through design for reflection (Maxwell et al., 2012), through ambient intelligence and interactive data mining (Beale, 2007) and in music recommendations (Zhang et al., 2012).

A system that can accommodate serendipitous encounters may not strictly be a 'recommender system' – according to past recommender systems' definitions (Felfernig et al., 2007; Ricci et al., 2011) – however, there is value in developing a framework that provides the basis for new technologies, beyond traditional recommender approaches, to support elements of serendipitous encounters and encourages free connection-making between resources and people.

Making *new, loose associations* that can lead to *valuable, concrete connections* in a mobile-dominated world is challenging due to the amount of information that is shared and forgotten. While there are models of serendipity that may incorporate the notions of connection-making (e.g. Sun et al., 2011; Makri and Blandford, 2012), the stage of connection-making, what influences it, and how technology can support it, is yet to be specifically examined.

Despite the fact that we live in a world that values information and information sharing, there is a need to identify the role of technology and system design in supporting connection-making (Palmer, 1999). At the same time, information browsing and information encountering reaches new levels and offers new opportunities due to technology ubiquity demonstrating that environmental context plays an important role in information seeking and information understanding (Erdelez, 1999, 2004). We argue that there is value in exploring the value technology that is used every day, such as phone-based text messaging, as a medium to facilitate insightful thinking and connections-making, whilst also allowing time for reflection (e.g. through the use of a mobile diary application). By understanding the qualitative elements of connection-making we will be able to inform the design of systems that support serendipitous encounters and connection-making.

According to empirically-driven models of serendipity (see Fig. 1), unexpected associations may be influenced by the environment in which new information is encountered (location), the timing of receipt of new information (time), the circumstances of information presentation (context) and the individual's preparedness for new thoughts and ideas (Makri and Blandford, 2012; Sun et al., 2011). Furthermore, 'noticing' and 'examining' presuppose the 'capture of attention' and 'engagement' of the user (Sun et al., 2011).

Other researchers note factors that can influence unexpected connection-making including memory (Auble et al., 1979), creativity (Sternberg and Davidson, 1995) and engaging in activities that allow reflection (Mann et al., 2009). McCay-Peet and Toms (2011) have previously discussed specific elements that they have found that may induce serendipity encounters. Such elements include facilitating *connection-making and exploration* between information, exposing people to *unexpected and varied information*, accommodating *browsing of information*, promoting *divergence and triggering curiosity*. McCay-Peet and Toms (2011) have particularly looked at the importance of environment in inducing serendipity and unexpected connection-making by designing information environments that offer similarity-based recommendations based on (1) what users report as their likes/dislikes, (2) their tracked browsing history and (3) their previous search keywords.

More recent research has particularly looked at design for positive experiences with special focus on the role of delight in serendipitous encounters (Kefalidou et al., 2012). While the concept of 'delight' is found to be associated to e.g. customer engagement and satisfaction (Chitturi et al., 2008) and positive user experience (Fleck, 2003), it is also found to be linked to the notion of 'surprise' when designing for ambiguity (Gaver et al.,
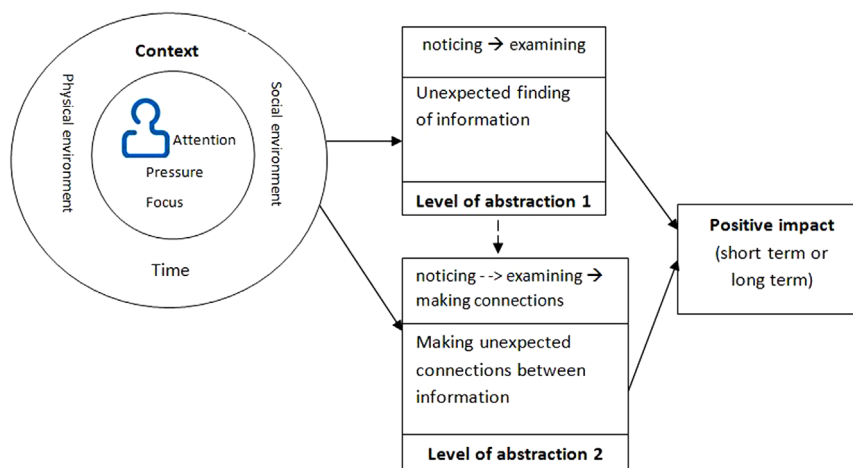

Fig. 1. A model of serendipity (as presented in Sun et al. (2011)).