Staying "In Sync" and "In Touch": Two Challenges for Mobile Workers

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Abstract: This paper documents a study into the challenges for mobile workers. The main goals of the study were, firstly, to identify the consequences and challenges of mobile work – particularly with respect one's ability to stay up-to-date ("in sync") and connected ("in touch") with his or her distant colleagues; and secondly, to define guidelines to help target the design of potential solutions capable of addressing these challenges.

In addressing the first goal, interviews were conducted with two distinct groups of professionals – one (the "traditionalists") that was much more conservative in their use of new tools and media than a second group, made up of highly active networkers (the "highly connected"). The conclusions which were drawn from these interviews lead to a detailed exploration of the challenges that some mobile workers face in interacting with their departmental-level colleagues. Next, findings drawn from the first phase of the study were used to help meet the second research goal. This stage included coming up with several design guidelines for solutions meant to address the identified challenges.

Keywords: Knowledge worker, mobile work, distributed work, communication, information exchange, awareness, connectedness.

INTRODUCTION

The incidence of geographically distributed project teams is on the rise. This increase is due in part to the changing role of organizations and how they conduct business. Many corporations, for instance, are embracing an open approach to innovation (e.g., Proctor & Gamble [1]). This new trend necessitates the creation of collaborative teams comprised of individuals who represent any number of organizations and interests, and who are oftentimes based in different locations. Similarly, many distributed teams are created when organizations hire outside consultants or temporary help – or, likewise when they must implement plans and procedures that will affect multiple locations within in a large national or multinational framework.

Although most of the world's workforce continues to work in traditional (i.e., co-located) settings [2], not only has the number of distributed teams increased in recent years, but the very definition of distributed work has evolved. Distributed teams do not only encompass those who must work at another location than their fellow team members occasionally, but also individuals who work in entirely removed – or *virtual* – team settings [3, 4]. In this latter, more extreme case, people who share a common project goal might never meet face-to-face while working together. Rather, all of their interactions are pushed to the virtual world of technologically-mediated communication (such as through the use of the phone, email, instant messaging, and desktop sharing tools, for example). Thus, a second factor contributing to the increase in the number of distributed teams is the high number of low-cost tools that are readily available and capable of facilitating such work [3]. Moreover, as the prevalence of 3G mobile and freely available wifi networks continue to expand – and, the use of lightweight hardware in the form of smartphones and netbooks continues to rise – it will become increasingly convenient to work from virtually "anytime, anywhere" and still stay connected with distant colleagues [5].

As a consequence of these developments – that is, a change in the way that organizations conduct business, and the technological advancements which make distance work possible – individuals working within distributed teams must embrace the notion of mobility in order to adapt. Mobility, according to Kakihara and Sørensen [6], "is not just a matter of people traveling, but, far more importantly, related to the [types of] interactions they perform." In other words, working within a geographically distributed team forces individuals – who are separated by distance, time, and context – to find manageable ways to overcome a number of barriers in order to collaborate effectively. Cultural differences, time zone discrepancies, and an inability to communicate with the same ease and convenience as one does when interacting with another face-to-face are just few of the possible barriers to effective collaboration over geographic distance. So, although there is a need for distributed work – and there exist tools to support such work – psychologically, individuals who work in distributed teams must learn to adapt to this new way of working. Thus, the purpose of the current study was to examine some of the psycho-social factors that affect those who engage in mobile work[1].

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[1] We will refer to 'mobile work' rather than 'distributed work' to emphasize that "[…] mobile work is not just about a working mode or style to be done remotely from various sites; much more importantly, it also signifies *the increasing mobilization of human interaction* in work settings in terms of spatiality, temporality and contextuality" (Kakihara *et al*. [7]; italics in original).

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> *To that end, the main goal of the current research was to identify the consequences and challenges of mobile work – particularly with respect one's ability to stay up-to-date and connected with his or her distant colleagues; and secondly, to define guidelines to help target the design of potential solutions capable of addressing these challenges.*

This article documents the steps that were undertaken to achieve these goals. In addressing the first goal, interviews were conducted with two distinct groups of professionals – one that was much more conservative in their use of new tools and media than a second group, made up of highly active networkers. The conclusions which were drawn from these interviews lead to a detailed exploration of the challenges that some mobile workers face in interacting with their departmental-level colleagues. Next, findings drawn from the first phase of the study were used to help meet the second research goal. This stage included coming up with several design guidelines for solutions meant to address the identified challenges.

A brief description of the research goals and their underlying motivation follows in the next section.

Two Challenges for Mobile Workers: "In Sync" and "In Touch"

As mentioned in the previous section, examining the impact of mobile work on an individual's ability to stay up-to-date and connected with his or her distant colleagues was of primary interest to this study. This interest grew out of insights drawn from earlier research into the challenges faced by a modern mobile workforce (e.g., Slagter *et al.*, [8]). In particular, a series of case studies, explorative interviews and focus group discussions into the needs of mobile workers in various industries (e.g., finance, telecom, civil engineering, and government) identified a number of challenges for mobile workers. Among other things, these challenges identify (1) staying *in sync*, and (2) staying *in touch* as two of the principal issues that mobile workers are forced to confront [8].

For the purposes of this research, the first two challenges – staying in sync and in touch – can be considered synonymous with staying up-to-date and feeling connected with one's colleagues. Therefore, the first goal of the current research was to validate the dual concepts of in sync and in touch as they pertain to a highly mobile – or, in the extreme case, nomadic (i.e., those without any "home" office base) – workforce.

Defining the Challenges

Being in sync, when applied to the individual, means having an overview of what's going on within the context of either the team one is working with; the current project; or, task at hand [8]. According to Slagter *et al.* [8], keeping tabs on new developments that transpire within the context of these settings enables one to nurture an understanding of the so-called "bigger picture". In other words, that individual is able to develop a schema of what the project or team has accomplished already; where it is right now with respect to attaining its ultimate goals; and, where it's going in the future. Finally – and, perhaps most importantly – being in sync helps one to figure out where he or she as an individual fits into this framework, at any given moment[2].

Being in touch, on the other hand, has to do with a feeling of connectedness that exists between colleagues[3]. It is fostered by both formal (e.g., scheduled meetings) and informal (e.g., those that occur during coffee breaks) exchanges. Both establishing a connection and maintaining it can positively affect the collaborative process. On the other hand, it has been shown that when individuals lack a connection with their colleagues (both with regard to physical proximity and social interaction), it can lead to professional isolation (e.g., [12, 13]).

Although they are psychological constructs, it can be argued that being in sync and in touch are necessary components to any discussion on how people will work effectively in the future. If being in sync and in touch are, in fact, two requirements for job satisfaction, then being able to identify and develop tools to hone these abilities in individual workers is a fruitful enterprise. Moreover, if the adage, "a happy worker is a productive worker" holds, then a clear understanding of these concepts, and the development of tools to enhance them benefits organizations, as well.

For the highly mobile or nomadic worker who either spends much time away from colleagues (or spends the majority of his or her time working in distributed, ad hoc, or temporary teams), the ability to stay both in sync and in touch is jeopardized – particularly because research has shown that face-to-face contact is a critical factor in nurturing connectedness and opening the channels required for successful knowledge exchange (e.g., [14, 15]). So, the second goal of this research was to clearly focus on one or two obstacles that challenge the mobile worker's ability to stay in sync and/or in touch, and develop effective solutions to address those problems.

The next section addresses the first question addressed by this study – that is, to take a closer look at the constructs of in sync and in touch by determining what these terms mean to mobile workers. This section also explores how working in geographically distributed teams can affect one's ability to stay in sync and in touch with his or her colleagues.

EXAMINING THE ROLE OF IN SYNC AND IN TOUCH IN THE PROFESSIONAL LIVES OF MOBILE WORKERS

One-on-one exploratory interviews were conducted with mobile workers in order to examine the role of the dual constructs in sync and in touch in their professional lives. A detailed description of these interviews and the subsequent findings follows next.

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[2] Thus defined, the concept of being in sync shares characteristics with the concepts of *common ground* and *awareness*. Olson and Olson [9] describe common ground as "[…] that knowledge which the participants have in common, and they are aware that they have it in common." They assert that "[…] the more common ground people can establish, the easier the communication, the greater the productivity." The concept of *awareness* is described by Dourish and Bly [10] as: "Awareness involves knowing who is 'around', what activities are occurring, who is talking with whom; it provides a view of one another in the daily work environments."

[3] We borrow from the definition of connectedness described in Baren *et al.* [11]. They refer to connectedness as "a positive emotional experience" between individuals who share a social relationship.

Exploratory Interviews

One major goal of the interviews was to identify "critical incidents" as they relate to the mobile worker's experience in staying in sync and in touch with his or her colleagues. The critical incident technique is an interview (or observational) method used to pinpoint the situations and circumstances that lead to breakdowns or successful outcomes (thus making them "critical"; [16, 17]). The resultant data can then be used to identify the behaviors that lead to those outcomes. In the case of the current exploratory interviews, a series of questions was adapted from two sources: (1) a user study that addressed the application of interface agents in email notifications [18]; and, (2) an earlier study conducted within the Future Workspaces research project on the causes and effects of information overload [19]. The motivation behind using a variant on this technique in the current interviews was to discover common gaps or problems that mobile workers experience when trying to keep in sync with their distant colleagues. To a lesser extent, open-ended questions addressed how interviewees kept in touch with their colleagues, as well.

Because the interviews were exploratory, it is important to note that not all of the questions were asked of each individual. In other words, interviews were also used to get a sense of mobile workers' variable experiences when staying in sync and in touch, and so the interview structure remained flexible. This practice allowed each interviewee to describe his or her personal experiences and concerns in a manner that more or less followed the format of a loosely directed discussion rather than a formal interview. However, all participants were asked to share the following information:

1. What was needed in order to stay in sync[4] with distant colleagues?
2. To describe in detail at least two experiences that were highly significant because they lead to either a breakdown in staying in sync with their colleagues, or because the experience was particularly positive.
3. How trust[5] was established and maintained within the context of the distributed teams in which they were currently working.

Method

Interviews were semi-structured (as described above) and each lasted approximately one hour. All interviews were conducted by the same researcher. Sessions took place at each participant's workplace. Interviews were not recorded; however, participants were given typed electronic copies of the interview session notes for verification purposes.

Participants

Interviews were conducted with 10 knowledge workers (four female) who were employed by eight different companies. All but two of the participants worked for companies that employed between 1,000 and up to nearly 100,000 employees. Seven of the participants were engaged in some form of consultancy work and the other three were project managers. All had at least a bachelor's degree (or equivalent).

Participants were recruited by electronically distributed flyers. Criteria for selection were broadly defined as a practical matter meant to ease recruitment. The two major criteria for participation were:

1. Having a job role that required working extensively on at least one geographically distributed project.
2. Working away from a main office at least 50% of the time.

All participants satisfied the first criterion. However, the second criterion was relaxed somewhat to include one participant who traveled less extensively but was heavily involved in long-distance distributed project work.

Two qualitative analytical procedures were used to process the interview results. First, affinity diagramming (an open-ended coding technique, [20]) was used to uncover emergent themes common across interviews. Due to the high number of data points used to create these diagrams (approximately 500), a mind map was created to hierarchically organize the themes into categories and further refine the interview results.

The next section will cover the final results of the combined analyses.

RESULTS

The analysis resulted in four main categories: (1) "needs"; (2) "staying in sync"; (3) "staying in touch"; and (4) "other".

The category *needs* consisted of two subcategories, "immediate" and "secondary". From the interviews it was clear that most individuals were primarily concerned with staying up-to-date (i.e., in sync) and in touch with their project team, and as a consequence were satisfied with their ability to do so. Also, access to information from multiple locations or while on-the-go was a necessary component of mobile work, for many reasons. For example, many talked of checking email while traveling, or accessing relevant documents while at a project site – both activities which illustrate their need to stay in sync while engaging in distance work.

Knowing what was going on within the context of the larger organization was a secondary concern for all of those interviewed – but, it was still critical enough to be classified as a need. For the most part, critical breakdowns occurred at this level. Lack of an effective system for information exchange was a commonly cited problem. Generally, this breakdown was most noticeable at the departmental (or group) level, but individuals also conveyed a sense of frustration over not knowing what was going on within the company as a whole. Available information was either too spare and infrequently updated (e.g., when in the form of monthly newsletters) or distributed over too many channels (e.g., internal websites and databases). Likewise, many admitted to being personally unfamiliar with fellow colleagues who they did not work with on projects – despite the fact that they were affiliated with the same department,

[4] Participants were specifically asked about staying "up-to-date" rather than "staying in sync" to avoid confusion.

[5] During the interviews the terms "trust" and "feeling a connection" were used to tap into participants' views and experiences with staying in touch with their colleagues. Again, this practice was used to avoid potentially confusing terminology.

and oftentimes fulfilled similar roles for the organization. For the most part, such findings are not surprising. Many of the individuals worked in departments or groups that consisted almost wholly of mobile professionals, thus sharply reducing the amount of time that colleagues were able to interact face-to-face at the corporate or home office base.

Two major categories were devoted to issues related to the concepts of in sync and in touch. However, because it can be argued that the two concepts are highly related, it should not be assumed that these categories were considered to be mutually exclusive. Also, because the focus of the interviews primarily dealt with participants' experiences while staying in sync with distant colleagues, this category was more explicitly defined.

Close examination of the *in sync* category revealed a reliance on traditional communication tools by interview participants. For the most part, the mobile workers interviewed reported relying heavily on periodic face-to-face meetings and email or phone when staying up-do-date with their fellow project team members. The third most common form of mediated communication used by mobile workers was teleconferencing. Communication *via* instant message (IM) was rarely used (two out of the 10 mentioned using it regularly). However, half of the participants talked about using one's IM status to know whether the person would likely be available to receive a phone call[6]. Similarly, the regular adoption of other tools, such as the use of a web cam while having an online discussion was low (again, only two individuals mentioned reporting the use of this technology with any regularity).

Finally, the *other* category was used to address the few remaining data points that were thought to affect one's ability to stay in sync and in touch, but did not specifically fit within the other three major categories (e.g., "travel takes a physical toll").

Conclusions from the Exploratory Interviews

The interviews revealed that individuals who are embedded in geographically distributed teams – particularly those who work for large companies – are forced to adapt on two levels.

First, they must find a way to stay up-to-date (i.e., in sync) and connected (i.e., in touch) with their *occasionally* geographically removed *project-level colleagues*.

Based on interviews with a subset of mobile workers, it is possible to define this goal as a *primary need.* For example, one interviewee stated that each Wednesday she drove to work with her project team in a distant city. Her reason for doing so was that she felt things did not "go as well" when she failed to spend this time with her team, face-to-face. With respect to their project teams, fostering opportunities to engage in face-to-face communication was a priority for all those interviewed, but such interactions came at a high cost – i.e., time spent in transit. Those interviewed said that typically they might spend two hours or more traveling in each direction for such trips.

But those interviewed could not incur the time and monetary drain of travel daily, so they had to devise other methods for staying in sync and in touch remotely. Another interviewee said that each evening on his way home from work, he called his team to get updates on end-of-the day activities and to see if any issues had arisen since the last update. In fact, he was in phone contact with this geographically distant team several times a day.

Secondly, mobile workers must find a way to stay up-to-date (i.e., in sync) and connected (i.e., in touch) with their *oftentimes* geographically removed *departmental or organizational-level colleagues*. Based on interviews with mobile workers, it is possible to define this goal as a *secondary need*. Examples include the comments of one mobile worker who said that she "had no idea" what some of the people were working on in her department. She also said that one major problem was – despite the fact that her department scheduled periodic (e.g., monthly or biweekly) meetings and social events which were held in the evenings, attendance was inconsistent because her colleagues were working on projects in different areas of the country. For many, this distance made it difficult to return to the home office on a consistent basis.

It is possible to characterize those interviewed as "Traditionalists"[7] because – although they can be classified as mobile workers – they were constrained in their attitudes and practices in such a way that many of their interactions with distant colleagues arguably mimicked those of traditional, co-located office workers. That is to say, most co-located colleagues prefer face-to-face and email methods of interaction with their colleagues – and, as was borne out in the interviews – so did these individuals, as well. Moreover, they were comparatively more conservative in their practices and attitudes towards staying in sync and in touch with their professional contacts than a second group of knowledge workers – the "highly connected" – that was later interviewed.

Problem Analysis

In their characteristic use of communication tools and practices, the Traditionalists expressed satisfaction in their ability to stay in sync and in touch with those in their project teams (i.e., the first level, as described in the preceding section). However, they complained of an inability to stay in sync and in touch with their departmental colleagues (i.e., a second level need).

Here is a detailed analysis of the problems faced by the Traditionalists:

1. First, in doing primarily off-site project work, the number of opportunities to interact face-to-face with their departmental/organizational colleagues were few.
2. Secondly, their primary needs dealt principally with the activities that supported their current project work and team – thus making anything that fell outside (including interactions at the departmental or organizational level) of this narrow focus secondary.

[6] Nardi *et al*. [21] refer to this as "outeraction", i.e., communicative processes that people use to connect with each other and to manage communication.

[7] Although others have identified some of the problems that mobile workers customarily face (e.g., [13]), to our knowledge the categorization "Traditionalist" is new.

3. The favored tools for staying in sync and in touch at the project level included the phone, face-to-face meetings and email (and occasionally chat clients, which were primarily used to check a contact's availability).

4. Finally, breakdowns occurred when the preferred tools for staying in sync and in touch at the project level were also used for interactions at the more highly-distributed departmental level.

Problem Implications

Stated differently, the problem for the Traditionalists occurs when they try to use the same tools and practices for staying in sync and in touch with their project-level colleagues to stay in sync and in touch with colleagues at the departmental level. The consequences which arise out of this problem include implications at two levels.

Direct implications. First, the direct effects of having a breakdown in one's ability to stay in sync and in touch with one's departmental colleagues are: (1), a difficulty in making new contacts within the department or wider organization; and (2), not knowing what departmental colleagues are either currently working on or have worked on in the past.

On the flip side, there also existed a lack of visibility to one's departmental colleagues; an example: All of the individuals interviewed said that they made a pointed effort to work in the main office when they could. They felt this approach was necessary to nurture relationships with colleagues and maintain good rapport with support staff. The problem with this tactic, however, was that departmental colleagues were oftentimes away, working on their own projects and so they could not count on particular individuals to always be present on a given day.

It is noteworthy to mention that all of these above factors – or direct implications – are symptomatic of professional isolation (e.g., [12, 13]).

Indirect implications. Secondly, the indirect effects of having a breakdown in one's ability to stay in sync and in touch with one's departmental colleagues lead to an increased risk of not receiving information – either in a timely manner or at all – that has implications for one's project work (e.g., pertinent developments in related projects, the outcome of budget decisions, etc.). For example, one man who was interviewed had tried to piece together a network of individuals who would keep him informed of potentially pertinent developments that might impact his main project. Oftentimes, however, he found himself in situations in which he learned of an issue only once it was "too late". In these cases, he would track down someone in the information loop and ask that individual to keep him informed of any new developments in the future. He conceded that this was not the most effective system, but the best strategy that he could come up with, given the circumstances. He said there was no system within the organization to widely distribute brief updates and news flashes, and that information tended to pass from person-to-person.

In short, breakdowns in one's ability to stay in sync and in touch with one's departmental colleagues certainly have direct implications for the relationships that exist with those colleagues. In addition, however, such breakdowns can also indirectly affect one's project work detrimentally.

Summary of Findings with Respect to in Sync and in Touch

The first goal of this study was to closely examine the role of the dual constructs, in sync and in touch, in mobile workers' lives.

In sum, the interviews that were conducted with mobile workers lead to the realization that a subgroup of individuals exists – the Traditionalists – who are quite capable of staying in sync and in touch with their project teams while relying on "traditional" office tools (such as face-to-face meetings, the phone, and email), but who experience difficulty when trying to use these same tools for staying in sync and in touch with colleagues who fall outside that circle.

EXAMINATION OF POSSIBLE SOLUTIONS

Based on the analysis of the problems faced by Traditionalists, the second research goal can now be refined as follows: how to support "traditionalist" mobile workers in their ability to stay in sync and in touch with colleagues at the departmental and organizational levels?

Constraints

In order to come up with solutions to adequately address the above-mentioned breakdowns that occur for Traditionalists in their interactions with colleagues at the departmental level (or beyond), it is important to also take into consideration the following constraints, which were also derived from the interviews. First, new tool adoption tended to be low among the Traditionalists, for a number of possible reasons including:

- Lack of organizational support (e.g., to provide employees with smartphones, mobile broadband cards, VPN connectivity, etc.)
- New tool adoption was low among their existing contacts
- Tool fatigue; in other words, they felt as though they managed plenty of tools already
- Their current tool set adequately satisfied their primary, project level needs

Secondly, a willingness to learn new tools and/or maintain their use was limited. For example, one interviewee said that the use of SharePoint was not widely appreciated or updated among his departmental colleagues because it was difficult to use. Moreover, several (six) interviewees said that the databases that had been developed for the purposes of cataloging the various areas of expertise within an organization were rarely updated by the knowledge workers themselves.

Finally, any solution should support either directly – or indirectly (i.e., have the potential to support) – primary needs in addition to secondary needs. In other words, a solution should not adversely affect the user's ability to complete work at the project level.

The first two constraints above – regarding tool adoption and use – arguably have a lot to do with (although not entirely) attitudes; these attitudes have been shaped in part

by a sense of adequate satisfaction with their current tool sets, as well as a desire not to overburden themselves by adopting new tools unnecessarily. The final constraint addresses issues related to meeting their higher-level priorities.

The next section explores some potential directions for viable solutions to the Traditionalists' problems. Interviews with a second group of professionals, who are characteristically active networkers (or, are *highly connected*), were used as a basis for these directions[8].

Useful Directions for Solutions: Interviews with Highly Connected Professionals

Highly connected professionals tend to make extensive use of a variety of tools – such as blogging or other social media tools – in an effort to stay in sync and in touch with their networks. Some of the tactics that highly connected professionals employ might be of use when crafting possible solutions to the problems faced by less highly networked individuals, such as the Traditionalists. To that end, one-on-one interviews were conducted with six highly connected professionals in the hope that some of their practices might inspire supportive solutions to the problems faced by the Traditionalists.

Kidd [22] distinguishes between three types of professionals: knowledge workers, communication workers, and clerical workers. However, in making these distinctions, she states that the three categories are not immutable – in fact, all professionals exhibit some characteristics of all three, to varying degrees. According to Kidd, the main function of knowledge workers is to process information. Traditionalists, like the highly connected professionals later interviewed, are knowledge workers. However, highly connected professionals share two important characteristics with Kidd's class of communication workers: (1) they behave as tuner-amplifiers for information, collecting information from various sources and passing it on to others (e.g., *via* weblogs and other social media); and, (2) they have a strong personal motivation for forming relationships and influencing others (again, *via* social media such as weblogs).

However, in contrast to Kidd's communication workers, highly connected professionals do get strongly influenced by the information they collect and pass on; in fact, they typically display a well-developed curiosity and a strong urge to learn from others. Also, whereas Kidd's classes are based on job or role, our distinction between Traditionalists and the Highly Connected are based on attitudes toward communication.

Method

The interviews lasted approximately 1 – 1.5 hours during which time the participants were asked the following questions:

1. What does it mean for you to be up-to-date with your network?
2. What does it mean for you to be connected with your network?
3. With respect to questions 1 and 2 above, to what extent do face-to-face interactions play a role (and to what extent are the interactions in your network "virtual")?
4. What tools do you use to stay up-to-date and connected with your network?
5. What drives you to make and maintain connections?

Four interviews were done in person, the other two were held on Skype.

Participants

The professionals interviewed were "highly connected" insofar as they all identified with the term; they made active use of new technologies and media to make and maintain connections, and had either a need or a desire to maintain a large and active network of individuals outside of their immediate project teams and/or close collaborators. Most were highly mobile in that they spent a large percentage of their working time traveling or away from their project teams. Two of the six individuals worked in a large international corporation; the other four were self-employed.

Results

Because of the small number of participants, interviews were analyzed by way of discussions within the Future Workspaces research team. What follows are some notable exemplar responses and quotes of interest, by question.

What does it mean for you to be up-to-date?

One interviewee said that within the information shared by his network, he regularly would scan for newly developing patterns. Three others mentioned that they depended on those in their networks to stay on top of important information. In other words, the more often certain news was repeated within their networks, the more attention and weight they gave to that information.

Another interviewee said that "he realized around 2004 that he could tweak the web, so that it could bring information to him" (as opposed to him always having to go out and visit websites repeatedly in order to get the latest information, or ask for that information himself). To that end, he became an enthusiastic user of RSS feeds as a means of following information sources that were related to his work, and also individuals whom he considered to be knowledgeable.

Two interviewees said that they would modify their method of contact to suit the individual who they were contacting. For example, one said that when contacting members of a professional organization, he always used email. His reason for doing so was because members of this particular organization preferred email-only correspondence. On the other hand, he would contact other professional peers through Twitter, or engage them through their blogs. Another interviewee said that – although he did not prefer this particular method of communication himself – he engaged members of his work group through an online forum, because he knew that would bring him answers most efficiently.

[8] This does not imply that the traditionalists should adopt the networking practices of the highly connected. Rather, aspects of these practices could, *within the constraints outlined above*, provide useful directions for potential solutions that address the challenges faced by the traditionalists.

What does it mean for you to be connected?

Two of the interviewees that we spoke to said that they maintained distinct personal and private personas online. For example, one said that he used Twitter to stay on top of new developments in his field, as well as have conversations with professional peers – but that Facebook was something that he used to interact with friends. Another said that he used his blog as a "cold marketing tool" and that any conversations that arose from his posts strictly had to do with a product which he had developed. For conversational interactions with professional peers, he preferred Twitter.

Whether holding workshops, teaching or holding meetings online, one interviewee made a pointed effort to engage others more personally. She said that in the virtual world there is a risk of interactions being all about work, and so it is important when only dealing with others virtually to take the extra effort to make it "more human."

All those interviewed underscored the importance – and value – of brief interactions (e.g., "Hey, I noticed you just got back into town – welcome back!" on Twitter). These small interactions were thought to help support a sense of connectedness.

What is the role of face-to-face interactions (versus those that are technologically-mediated)?

Face-to-face interactions are "nice, but are beginning to disappear" according to one interviewee. The majority (4 out of the 6 interviewed) mentioned that face-to-face interactions at conferences or occasional workshops provided enough of a basis for supporting collaboration in the virtual world. "Previously I would sit for half an hour talking, but not anymore. Now we share small interactions. One sentence, one line email. But a lot of value for a small investment of time."

One interviewee faced some resistance from clients who were not used to only interacting through technologically-mediated communication. For example, she shared a recent experience in which a client asked her to travel across the country for a two-day meeting. Instead, she suggested they hold the meeting on Skype first – then, if it didn't work out – she told them she would fly out to hold the meeting in person. In the end, she said that both she and the client were happy with their online meeting experience, and ultimately a face-to-face meeting was considered to be unnecessary by both parties.

What tools do you use to stay up-to-date and connected with your network?

Five out of the six individuals interviewed said that they rely on their participation in periodic conferences and workshops to network and/or strengthen existing professional connections. But it is important to mention that those interviewed mostly described instances when they had used computer-mediated communication to stay in sync and in touch in the day-to-day. For example, four of those interviewed were bloggers, and engaged others through this medium either by authoring posts or commenting on the posts of others. Four interviewees said that they used Twitter or other social media tools to stay in touch. And finally, four interviewees said that they used RSS feed readers to stay on top of new events, information, and certain contacts – in effect, staying in sync with those in their field, whether they had a personal connection to them or not.

What drives you to make and maintain connections?

One interviewee felt that he needed to reach outside of his own company and make new contacts in order to stay on top of the new developments in his field (and in related fields). Another interviewee put it this way, "Nowadays connections are made with individuals who offer value and insight to the conversation, from around the world. Previously, such interactions were not possible." Not only has she sought out individuals, but through her own blog people have contacted her in response to her blog posts and her website. She considered this, too, to be an added benefit of actively sharing content with others.

Useful Directions for Solutions: Conclusions

The highly connected professionals that were interviewed actively maintained large and distributed networks. As mentioned previously, some of the tools and practices used by highly connected professionals were used to inspire useful solutions to the problems faced by the Traditionalists in their ability to stay in sync and in touch with their geographically distributed departmental- and organizational-level colleagues. What follows are some potentially useful "lessons learned" from the highly connected professionals. Highly connected professionals were found to engage in the following (see also Table **1**):

1. *The use of filters.* Filters help to cull information so that the most potentially important information is readily assessable. There are two types of filters that highly connected professionals make use of regularly:
   a) *Explicit filters* – For example, *via* the use of RSS or other information aggregators (e.g., FriendFeed). The defining characteristic of an explicit filter is that it funnels content on requested topics, individuals, or websites to the user automatically.
   b) *Tacit (or emergent) filters* – Tacit filters are driven by one's social connections. Tacit filters operate when one's contacts help call attention to information that might otherwise be overlooked. In some ways, this type of filtering can be considered emergent, because it arises naturally from interactions that take place between colleagues.
2. *The use of open communication.* Highly connected individuals share status updates and engage in brief conversations *via* the use of one-to-many (or many-to-many) methods of communication (such as through LinkedIn, Twitter, Facebook, or forums).

The highly connected professionals that were interviewed also displayed other noteworthy characteristics. For example, they were all bloggers – thus underscoring their willingness to share information, their viewpoints, and engage in an open dialogue on topics of interest. In addition, they also showed an overt willingness to adapt to their contacts' preferred methods of communication. And, generally speaking, they

Table 1. Key Comparisons Between the Traditionalists and Highly Connected Professionals

Level	Traditionalist Needs	Traditionalist Tools/Practices	Issues	HC Needs	HC Tools/Practices
Project	Primary – In Sync	Phone, Email, and IM*	Few-to-none	Primary = Secondary (all entail interactions with a unified network)	Diverse, experimental
	Primary – In Touch	F2F			Filters: 1) Emergent and 2) Explicit
Dept/Org	Secondary – In Sync	Phone, Email, and IM*	Breakdowns occur		Open (*vs* closed) communication
	Secondary – In Touch	F2F			

*The use of instant messaging (IM) is starred in this table because the traditionalists tended to use it for "outeraction" (communication management) only [21]

all considered face-to-face communication to be clearly beneficial – but not always absolutely necessary – not even for collaborative work.

It is important to address why other tools, practices, and strategies used by the highly connected professionals are not included as design suggestions. The above examples underscore how the communication practices of the highly connected professionals in this sample have been shaped by their attitudes. Whereas designing a system that makes use of filters and/or open communication is feasible, attempting to encourage the Traditionalists to rethink their deeply held views on the necessity of face-to-face communication, for example, would pose a formidable challenge.

DESIGN GUIDELINES FOR SOLUTIONS

Factoring in the aforementioned constraints and suggested directions for solutions, we came up with a number of design guidelines. These guidelines should be considered when coming up with viable solutions that might help support mobile workers in their ability to stay in sync and in touch with their departmental and/or organizational level colleagues.

Foremost on this list is that it is necessary to *maintain the integrity of the Traditionalist's original tool set* (i.e., we assume that this tool set is inherently mobile – but not necessarily "smart". It would include tools such as a mobile phone, email, face-to-face communication, and instant messaging, for example). In other words, any new solution should not necessitate the addition of new tools (e.g., smartphones, netbooks, or other mobile devices). Instead, any solution should be seamlessly integrated into the existing tool set of the typical Traditionalist (e.g., in this case, an adequate solution that makes use of a user's email as an input/output device).

Next, any solution should require *zero-to-low effort in the initial set-up of the system*. Mobile workers are characteristically busy, and have little time to set-up a complex system regardless of how effective the ultimate result of that effort might be. Not surprisingly, we also suggest that participation in the system should require minimal effort (e.g., this could be done *via* the use of automatically generated status updates).

Two guidelines were inspired by interviews with the Highly Connected professionals that were interviewed as part of this study. First, any suggested solution should *push relevant information to the user via the use of filters*. Secondly, any solution should *support one-to-many or many-to-many communication via the use of status updates and/or information exchange*. Naturally, given the nature of the work in question, system elements should be available to the user while he or she is on-the-go.

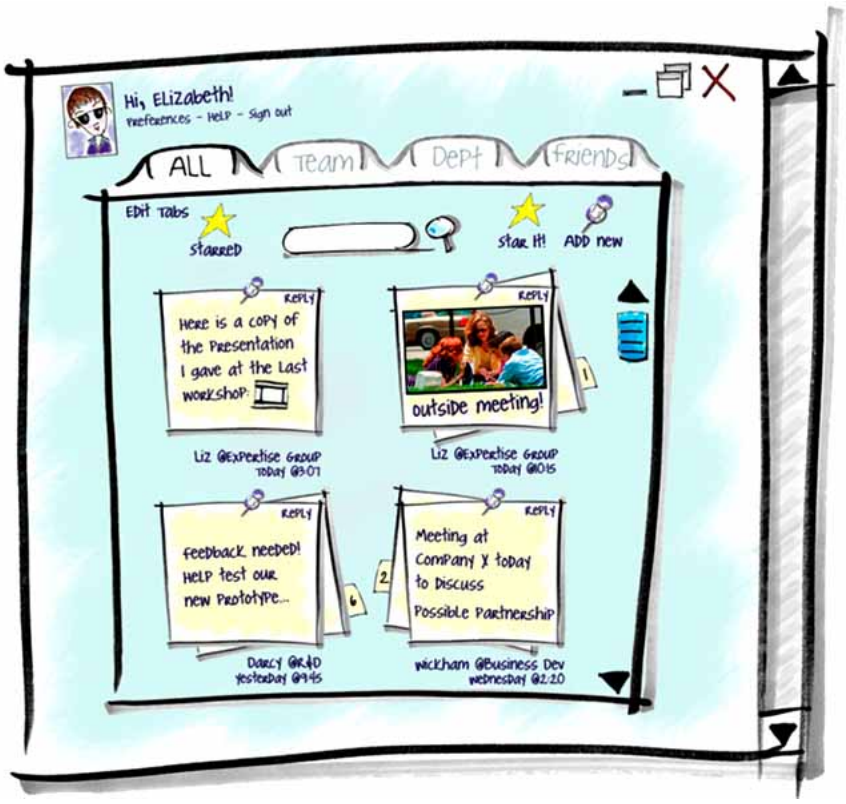
Exploring Some Possible Solutions

An iterative user-centered design process was followed in which sketches and video prototypes were used to come up with potential solutions and to elicit feedback from Traditionalists as well as the Highly Connected with regard to the above design guidelines. Evaluation of these prototypes occurred over the course of several weeks, and included two focus group sessions, follow-up one-on-one interviews with six of the Traditionalists originally interviewed (two of whom were women), and an online evaluation (which was completed by 10 mobile workers). In all, three concepts were designed as potential solutions. The evaluations of the concepts examined the extent to which the design guidelines could be used in the design of effective solutions to aid the Traditionalists in their ability to stay in sync and in touch with departmental- and/or organizational-level colleagues.

Fig. (**1**) shows sketches of the three concepts: (1) *Ping*, a mobile application for facilitating impromptu face-to-face meetings between colleagues by making them aware of their presence and availability; (2) the *Bulletin Board*, an online tool for sharing content and short messages within a professional environment; and, (3) *Status Sharing Tools*, software which could be used to help colleagues keep track of each other through the use of short updates which displayed information regarding their current professional activities and availability.

The purpose of *Ping* is to allow users to establish a form of location-based awareness of their colleagues' whereabouts. Although other mobile applications (e.g., Google Latitude) currently allow users to track their connections' location, Ping is different from these in that it does not require the use of a GPS-enabled smartphone to work. It would help mobile professionals easily discover when their geographically-distributed colleagues are nearby so that they can then contact one another for an ad hoc, face-to-face meeting.

(**1**)



(**2**)

(**3**)

Fig. (1). Sketches of the three concepts used in the final evaluation: (**1**) Ping; (**2**) the Bulletin Board; and, (**3**) Status Sharing Tools.

The *Bulletin Board* would provide users with a means of sharing status updates, short messages, and multimedia (such as video, images, or presentations). Shared information would be filterable by group (e.g., "Project Team", "Department", or "Organization"). In addition to sharing information, users could comment on information shared. The application would act as a sort of dynamically updating desktop wallpaper, with the most recently added information given priority in the updated queue.

With the *Status Sharing Tools*, when hovering over the name of a colleague – for example, when composing a new email message – a small window appears that displays that contact's latest status update (e.g., as fed from their calendar). This information could be used to help one decide which method is best for contacting an individual at that moment – be it email, phone, or face-to-face communication. Additionally, this tool would provide users with an easy method for updating their own status manually, in the form of an input box located on their computer desktop. A more detailed description of the three concepts and their evaluation can be found elsewhere [23].

Reflection on the Design Guidelines

Both those interviewed and those who filled out the online evaluation indicated that both the Status Sharing tool and the Bulletin Board had the potential to help them stay up-to-date with their colleagues, to an equal degree. Ping was also thought to be a useful in sync tool, albeit to a slightly lesser degree than the other two concepts.

Although all of the concepts were considered to be adequate "in touch"-tools, the Bulletin Board was considered to be the tool that was best suited to this goal. Both those interviewed and those who took the online evaluation noted its usefulness in sharing more personally-relevant information with those in their wider organizations.

Ping and the Status Sharing tool were perceived to fulfill similar functions: these tools help people to make decisions about when or how to best contact their colleagues. Many felt that the best time to use Ping would be for informal get-togethers, such as when meeting up for breaks or lunch. When returning to the main office, Ping also had the potential to help them find nearby colleagues more easily. The Status Sharing tool was appreciated for its simplicity, with some mentioning that it fit their current way of working.

The required effort to use a tool seemed to be the dominant factor underlying the participants' evaluation. The Bulletin Board was perceived to require relatively the most effort by all those who took part in the evaluation. Ping (for those interviewed) and Ping and the Status Sharing tool (for those participating in the online evaluation) scored best in this respect. Although these tools were not perceived to be the best tools – hands down – for staying either in sync or in touch, they were considered to be the easiest to use; were thought to have the lowest cost-to-benefit ratios; and, would require the least amount of time. Thus, it can be argued that perceived effort in use was given the most weight when assessing the concepts.

The evaluation indicates that tenable solutions to challenges faced by Traditionalists can be designed using the guidelines detailed in this paper. Ultimately, the results of the evaluation make us believe that Traditionalists are best served by extremely modest solutions to their problems. In fact, the design guidelines already underscore this point. For example, in designing a solution, the initial exploratory interviews made it clear that workable solutions should not force the use of new tools or require much effort to operate. To a certain extent, these requirements dictate the design of an almost "invisible" solution – that is to say, one that integrates seamlessly into currently used tools and practices to such an extent that it is almost invisible.

Whereas the Highly Connected professionals rely heavily on new tools and media to interact with their colleagues, it is doubtful – given the strong preference for face-to-face communication that all of the Traditionalists expressed – that they would adapt well to any solution that requires such a large shift in principle beliefs. To a large extent, that is why we believe that only very modest solutions should be proposed to the problems faced by the Traditionalists. The potential benefit in providing modest solutions, however, is that they might lower the threshold sufficiently enough so that the Traditionalists can meet both primary and secondary needs effectively.

CONCLUSIONS

Interviews were initially undertaken with a group of mobile workers in order to determine the value of staying in sync and in touch with their distant colleagues. Because all of those interviewed worked primarily in distributed project teams, they all spoke of expending a great deal of effort in order to nurture a sense of connectedness and stay up-to-date with their immediate, project-level colleagues. To that end, they generally traveled in order to hold regular face-to-face meetings with their team members, or were in daily contact with them by either phone or email (or both). So much effort was poured into activities that supported staying in sync and in touch with one's project level colleagues that all those interviewed expressed satisfaction with the outcome of these efforts. Staying in sync and in touch with one's project team was so important that it came to be considered a primary need of the mobile workers interviewed.

However, breakdowns occurred when they tried to use the same tools for staying in sync and in touch with their project teams as with colleagues in their departments or wider organizations. The problem arose when they used what one might consider traditional office tools – i.e., principally face-to-face meetings, phone and email – to infiltrate this second, much more widely dispersed and loosely connected group of individuals. Thus, these individuals were categorized as Traditionalists, namely because their choice of communication tools most closely resembled that of traditional, co-located office workers rather than a second group of highly connected networkers that were interviewed. To a lesser extent, staying in sync and in touch with one's departmental or organizational level colleagues was considered to be of value; communications at this level were thus designated as a secondary need.

The problems for the Traditionalists were found to have two distinct levels. First, breakdowns in their ability nurture connections with their departmental/organizational level peers had dire consequences for the relationships that they had with those individuals. Some Traditionalists expressed a sense of

confusion over what others in their department were currently working on; in extreme cases, the identities of some departmental peers were not even known. Not only were there potential direct implications of not being able to stay in sync and in touch with one's departmental peers, but there were found to be indirect implications that had potentially detrimental repercussions for their project work, as well.

A second set of interviews was conducted with highly connected professionals. Findings from these interviews were used as inspiration for coming up with solutions to address the problems of the Traditionalists in keeping in sync and in touch with their departmental- or organizational-level colleagues. These were: (1) integrating the use of information filters into any solution; and (2) supporting one-to-many or many-to-many communication. Evaluations of some concept-based solutions to the challenges faced by the Traditionalists revealed that the design guidelines can serve as a useful basis when designing for this distinct and – we suspect – growing population.

In conclusion, this study systematically examined the dual constructs of in sync and in touch and the role that they play in the professional lives of mobile workers. The Traditionalists were identified as a subgroup of mobile workers for whom the act of staying in sync and in touch was uniquely challenging. We believe that the emergence of this subgroup is due in part to the changing demands placed upon a modern, increasingly mobile workforce. Traditionalists represent those individuals who have difficulty making a transition from dealing in predominately co-located or face-to-face interactions to ones that are largely technologically-mediated. We believe that mobile workers who work for large, decentralized organizations are particularly likely to adopt a Traditionalist approach to their interactions with colleagues. More work needs to be done to examine the extent to which initiatives internal to organizations can help support all mobile workers in their attempts to stay in sync and in touch with their colleagues – and their company, as a whole – effectively.

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