Interpersonal Interruptibility:
A Framework and Research Program

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Abstract

To date, research exploring interpersonal technology-mediated interruptions has focused on understanding how knowledge of an "interruptee's-local-context" can be utilized to reduce unwanted intrusions. However, the value of everyday interruptions are strongly tied to interrupter-interruptee relationships, interrupter's context and interruption content that we refer to as the 'relational context'. This suggests that a fresh approach to interruptibility research is needed that focuses on understanding how the knowledge of this relational context can be used to improve interruption management decisions. To address this concern a theoretical framework and associated research program are presented. The validity of fundamental aspects of this framework is then demonstrated through a study

of cell phone call handling decisions. It shows that "who" is calling is used most of the time (87.4%) by individuals to make call handling decisions (N=834) unlike the interruptee's current local social (34.9%) or cognitive (43%) contexts. In addition, a clear disconnect was shown between the influence of local interrupee-context and relational context in terms of call handling decisions, suggesting that interruption management systems that focus only on an interruptee's-local-context will be ineffective. An alternative design approach is described to address these short comings.

Keywords

Interruption, Mobile, Phones, Availability.

ACM Classification Keywords

H.1.2: User/Machine Systems - *Human Information Processing, Human Factors.*

Introduction

The abundance of technology-mediated communication tools such as the now ubiquitous cell phones has not only increased our ability to communicate but also the possibility of being interrupted. As a result, HCI researchers are keen to find ways to design systems that ameliorate the burden of unwanted interruptions. Since the term "interruption" when used in the context

of individuals' behavior often brings to mind negative connotations, it is not surprising that psychologists have typically explored interruptions in terms of limited attention capacity models [1]. In a similar vein, much of the current interruptibility research effort is directed by those exploring how sensor and agent technology [5][6]can be used to mitigate the negative effects of interruptions by identifying when an interruption will be least taxing in terms of "interruptee's-local-context": 1) cognitive context which looks at cognitive level of involvement in tasks and its effects on task performance [1]; 2) social context that looks at local environmental factors such as place, people around [5]

However, we know from workplace studies that interruptions are not always viewed as unwanted but are often sought due to factors such as cooperation, interdependencies and sociality of work [7]. In such cases a person might be open to be interrupted by a particular colleague even if he/she is cognitively and socially overloaded. For example, we may not want to deal with an interruption from A for any reason but might be willing to be interrupted by B even if our cognitive or social space is disrupted. This calls for a richer understanding of interruptibility beyond the social and cognitive contexts through what we term as the *relational context*. It encompasses people's preferences and biases in regards to the relationship between the interrupter and interruptee (who); and factors relating to the interruption that vary with each interrupter's interruption (what, why). Considering the examples above, it is clear that the design of everyday interruption management systems should be based on a deep understanding of the role that the 'relational context' plays in interruptibility.

Theoretical Framework

Interpersonal actions and communication motives are influenced by individual and cultural differences. However, treating human beings as rational decision makers, the willingness to be interrupted can be considered to be based on evaluation of costs and benefits of responding to an interruption. Using this perspective, a theoretical framework is derived from two rational choice communication theories that aim to explain information seeking behavior in initial social interactions between strangers: 1) Uncertainty Reduction theory [2] and 2) Predicted Outcome Value theory [8].
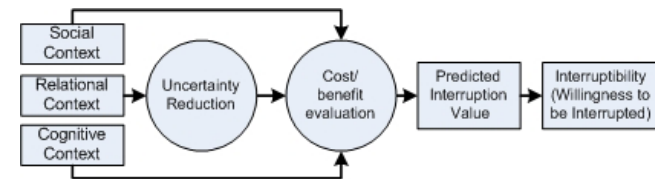

Figure 1: Interruptibility Framework

When individuals are interrupted by a technology-mediated request for interpersonal communication, as rational actors, they attempt to predict the interruption's value to determine the best course of action. As the accuracy of predicted interruption value (PIV) is dependent on knowledge of the relational context and as this is to some extent unknown, individuals will typically try to reduce uncertainty regarding the relational context to derive the PIV. This logic is presented in Figure 1, the interruptibility framework. The framework recognizes that individuals engage in uncertainty reduction as means to predict the value of an interruption and that this in turn influences their willingness to be interrupted. It also suggests how

the presentation of richer relational context information to the interrupter, by reducing uncertainty, can aid in an individual's interruption management decisions.

Research Program

The framework suggests a research program in interpersonal interruption management focused on interruptee-side decision making. It raises 3 key research concerns: 1) The interrelationship between cognitive, social and relational context in interruption management decision making; 2) Uncertainty of the relational context and its relationship to the predicted interruption value (PIV) and 3) The design of communication tools that support effective interruption handling decisions by leveraging relational context information such as interpersonal relationships/affinities [6], interrupter's context such as location/place, social and cognitive activity [3], interrupter's importance and urgency of the interruption [4] and indication of interruption content. These research areas are being examined through 3 empirical studies of people's use of cell phones, as they are today's quintessential interruption devices.

Method

Study 1: This study used experience sampling methodology (ESM) to assess the validity of key aspects of the framework. Forty, participants were given a Windows Mobile cell phone loaded with survey software to be used for a week with their own SIM card and service plan. For each incoming call (answered, ignored intentionally, missed unintentionally), the following data were collected: a) information related to caller identification; b) the level of influence of relational (caller), cognitive (mental state) and social (place and people) contexts on call handling decisions.

This study validated the fundamental aspects of the framework. Firstly it showed that relational context plays an enormous role (87.4%) in call handling decisions unlike the interruptee's current local social (34.9%) or cognitive (43%) contexts (N=834). Single handedly relational context influences decisions 49.5% of the time while social and cognitive context influence only 9% and 1.8% respectively. Secondly, a clear disconnect was shown between the influence of local interrupee-context and relational context in terms of call handling decisions. Relational context did not correlate with either cognitive context (answered calls: Spearman's r=0.039, n=788, p=.27; ignored calls: Spearman's r=0.072, n=163, p=.36) or social context (answered calls: Spearman's r=-0.17, n=788, p =.000; Ignored calls: Spearman's r=-0.26, n=163, p < 0.001). Thirdly, individuals engaged in the process of uncertainty reduction in call handling decisions. 35.4% of calls were answered (N=729) to find out what the call was about. These findings confirmed the underlying premises of the framework and its assertion that the localized cognitive and social context on their own lack in providing the necessary subtext to understand and predict people's willingness to be interrupted.

Study 2: This ongoing study is exploring what kind of relational context information people already have, desire to obtain and are willing to share to reduce uncertainty for improved interruption management. Using the ESM approach of study 1 for each incoming call, we measure the level of uncertainty of a call by asking participants to report on how well they knew what the interruption was about before the call and the accuracy of that estimate after the call. Further, data is be obtained on their desire to acquire/share a) Synchronous relational context information such as

caller's ID, importance, urgency, reason; b) Asynchronous relational context information such as calling frequencies, average call time lengths.

Study3: To explore the ease and utility of providing additional relational context information to help interruption decision making, this study will build and test a lightweight interruption management tool for cell phones. The tool will enable users to provide and receive 4 types of information, 1) subject tag, 2) importance level, 3) urgency level and 4) caller ID. The tool will be field tested with groups drawn from an NSF supported mobile social computing test-bed 500+ individuals provided with cell phones embedded with the tool. The groups will include people who engage in frequent but unpredictable interactions in terms of timing, content and importance namely partner/spouse, a friend and a colleague whose nature of interactions may be social or errand/task based with varying importance and urgency levels.

Contribution

The interruptibility framework presented and validated through a cell phone usage study, addresses fundamental problems with the existing interruptibility research paradigms that focus predominantly on interruptee's-local-context. In addition, it suggests new areas of enquiry and perhaps most importantly new approaches to the design of effective interruption management tools that aim to empower the interruptee. The ongoing and proposed studies outlined here will expand our knowledge of how the relational context information (who, what) can be used to reduce the uncertainty around an interruption and aid in interruptibility decisions more generally within the area of mediated communication.

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