
Factors defining face-to-face interruptions in the office environment

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Abstract

This paper presents an on-going investigation on interruptions in the office caused by face-to-face interactions between knowledge workers. The study aims to identify opportunities for interactive solutions that will support both, the interrupters and the interrupted. The study involves contextual interviews and observations of how administrative assistants manage interruptions.

Keywords

Interruptions, Ambient Intelligence, Smart Office, Contextual study

ACM Classification Keywords

D.4.7 Organization and Design: Interactive systems;
H.4.1 Office Automation: Groupware; H.5.2 User Interfaces: User-centered design; K.4.3 Organizational Impacts: Computer-supported collaborative work

Introduction

Knowledge workers are exposed to an increasing number of digital and physical interruptions, which with an average occurrence frequency of every 9 minutes and recovery time up to 25 minutes, become difficult to manage [4]. There are ways for dealing with digital interruptions. Mail may be unread or the user status on IM applications can be set. Moreover, related research is actively investigating solutions for supporting workers to manage their digital availability [1]. On the contrary, the physical domain gives less control, flexibility and efficiency to both, an interrupted and an inter-

rupter. Coordinating face-to-face (F2F) interruptions introduce cognitive costs related to mental workload and affective costs, e.g. loss of face, when denied or an embarrassment, when denying. We examine how technology can help in mediating between an interrupter and an interrupted by providing appropriate contextual information and by supporting coordination mechanisms that will reduce physical, mental and social costs associated with interruptions. We describe a study into how administrative assistants deal with interruptions directed at them and also at their managers. We discuss design implications and our current investigation of interruptions aimed directly at knowledge workers.

Related work

Interactive solutions for predicting and communicating one's interruptability have been proposed based either on daily rhythms or tasks. For example, AWARENEX [10] provides information regarding the availability of individuals over several communication channels by visualizing patterns in daily rhythms of their activities. In the experimental deployment, privacy concerns were expressed about sharing "rhythm" information with colleagues, which poses a question of how to balance cost/benefits ratio for managing interruptions [7]. Hermes [2] provides its users with a digital tool to leave notes on office doors, which can later be viewed by the owner of the room. In this way, it offers a location-constrained communication channel which helps communicate availability in a way that fits existing patterns of behaviour in the office environment. LibraDoor [9] provides functions helping to deal with F2F interruptions by displaying the availability status through an LCD display mounted on doors. It also encourages room occupants to display notes and artwork via a post-it notes' program running on their desktops. None-

theless, the design has not considered the privacy issues or the social connotations of such a system.

Interruptions in face-to-face situations

F2F interruptions are a vital aspect of daily work since they require an immediate redirection of human attention from a primary task [3]. Jett [8] distinguishes four types of those: intrusions, breaks, distractions and discrepancies. F2F interruptions fall into the first category. An intrusion is defined as "an unexpected encounter initiated by another person that interrupts the flow and continuity of an individual's work and brings that work to a temporary halt". The positive outcome of an intrusion is that the interrupted may receive information that is unlikely to occur through other channels, at least not with the same salience and timing. On the negative side, the intrusion can take time from time-sensitive tasks, can cause stress and/or influence one's state of total involvement in the task performed.

Clark [3] distinguishes 4 possible responses to an interruption (the underlined terms are used in the remaining part of this abstract as references to these responses):

- Take-up with full compliance (immediately handle).
- Take-up with alteration (acknowledge and postpone).
- Decline (explicitly refuse to handle).
- Withdraw (implicitly refuse to handle it by ignoring).

A F2F interruption is also a social act. A social act is a set of conditions, in which a particular joint activity is carried out [3]. In a social act people tend to compare what they put into it with what they get out. In the majority of situations they at optimizing the balance of benefits versus costs [7]. The problem occurs when one finds oneself in an unequal situation and has no means to withdraw from it. This is, in many cases, outcome of direct F2F interruptions. Dabbish and Baker [5] investi-

gated strategies administrative assistants apply for mediating interruptions. They identified 2 factors deciding whether to allow or disapprove an interruption: an importance of an interrupter and an importance of a problem or a task that the interrupter wishes to be handled by the assistant or her manager (for brevity will be referred to as the *problem* in the remainder of this text).

Objectives of the study

As a first step we set out to verify the model by Dabbish and Baker [5] and to establish the extent, to which AmI solutions for supporting knowledge workers to deal with F2F interactions could be based upon this model. Furthermore, we aimed to identify what other aspects of interruptions, e.g. urgency or social costs, should be taken into account when designing such a system.

Contextual Interviews

Dabbish and Baker [5] comment that administrative assistants are most capable to analyze the relevance of interruptions in an office. With a similar reasoning, we decided to study interruptions of 3 assistants, 2 at the university and 1 in an industrial environment. All 3 assistants manage the schedule of their bosses, handle communications by mail and phone and receive visitors. They also deal with issues of employees of their work groups. Observation and interviews were conducted on site and concerned both interruptions directed to the assistants as well as to their managers.

Method

The study took place in the offices of the assistants, who were observed for a day each. Firstly, the subjects were presented with the confidentiality agreement and the process was explained. Then the techniques used were a combination of an observation, questionnaires and semi-structured interviews.

Observation

The observer monitored F2F interruptions according to:

- Type of the interruption (social/professional).
- Importance of the interrupter (based upon an organizational chart).
- Importance of the problem assessed by the interrupter on a 5-point scale from very important to unimportant.
- Availability level coupled to the task performed.
- Outcome of the interruption according to the division by [3] (immediately handled/postponed/refused).
- Social ways of handling interruptions in a form of open questions.

The observer attempted to assess each interruption as completely as possible just by observing an event. In cases of ambiguity, she requested clarifications from the assistant. Observations impossible to classify were redirected to the assistant as open questions and later as more specific ones. Findings were recorded in a spreadsheet and analyzed for interdependencies between aspects defined earlier.

Brief questionnaire card

Each interrupter was asked to fill in a short questionnaire printed on a card with questions concerning:

- Importance of the problem as reported by the interrupter on a 5-point scale (as above).
- Urgency reported by the interrupter on a 5-point scale (from a problem needing to be handled immediately to one that may be handled in an undefined time-scope).

Interview

Each day observation ended with an interview. Questions were asked regarding the ways of handling F2F interruptions, factors influencing the evaluation of an occurring interruption and strategies for screening

them. Furthermore, the model by Dabbish and Baker [5] was discussed. In order to keep a precise record, each answer was recorded and transcribed.

Results

49 interruptions of 3 types were observed in the study: professional (39), professional with a social connotation (7) and social (3). It was often difficult to characterize interactions as strictly professional; many interruptions involved a social flavour, e.g., talking about families, joking, etc. 45 interruptions were intended directly for the assistants and only 4 for their bosses.

Importance of the reason for the interruption

The majority of professional interruptions were perceived either as very important or important by interrupters. The importance level in the perception of the assistants was slightly lower but mostly complied with the estimation of interrupters. Most important were direct orders from the manager or urgent and crucial problems of the employees. Interruptions perceived as unimportant occurred only in social occasions.

Importance of the interrupter

Regarding the importance of the interrupter, we identified 2 strategies; one for managing interruptions aimed at managers and another for interruptions aimed directly at the assistants. In the first case, the assistants do not ask an important person about the problem but allow for an interruption providing that the manager was available. If the manager was busy, the assistant self would interrupt in an appropriate manner and negotiate an apt moment for the discussion with an important one. In the second case, when an important person came to interrupt them, assistants would always inquire for the reason and then prioritize the problem according to its urgency, estimated time needed to deal

with it and their own availability. In our observation, an equal number of problems brought by people of equal or lower organizational status and brought by people of higher organizational status was handled immediately.

In the former case though, problems were more readily redirected either to other people or back to the problem owner. Such a situation never happened to interrupters of a higher organizational status.

Urgency

We also noted a relationship between the urgency of the problem and how soon it was handled. Urgent problems were either handled immediately or diverted to another person. Moderately urgent problems were dealt with according to their estimated time-demand. If they were easy to resolve, they would be handled immediately, otherwise they were acknowledged and postponed. Non urgent problems were not handled at all, mainly because these interruptions had a social connotation and there was no particular problem to resolve. A particular type of interruptions was eminent—confirmative ones. Interrupters dropped by the assistant's office to check whether an earlier request had been taken care of, e.g., whether a hotel booking for an expected guest had already been arranged. Such interruptions aimed also to convey the urgency of a task.

Availability

Not many concerns were noted about choosing an appropriate moment for an interruption on the interrupter side. It appears to be a relationship between the perceived availability level and the task performed by the assistant. Conversations seemed most socially inappropriate to disturb. Especially in a case of phone calls, interrupters would hover around waiting for the conversation to end. Not a single interruption was perceived as annoying by the assistants, perhaps due to the fact

that their job is a series of rather short assignments and is interruption driven. In the majority of cases it was not difficult to recover from the interruption so, the cost of an interruption was relatively low compared to that reported for knowledge workers [4].

Discussion

This study partly confirms the findings by Dabbish and Baker [5] but also extends and contrasts them. Overall, F2F communication stimulated a positive attitude due to the fact that the interrupter took the effort to bring the problem to the interrupted personally.

The importance of the problem was broadly recognized as a significant factor when dealing with F2F interruptions. We also noted that most professional problems handled during our observation were perceived as important by interrupters. It could be that workers only resort to personal contact when the problem is important for them.

The importance of the interrupter also was confirmed as a determinant for how the interruption would be handled. However, it applies only to interruptions aimed at managers, where assistants act as gatekeepers. For interruptions aimed directly at the assistants, a different strategy was applied. Rather than prioritizing according to the importance of the interrupter, the assistants would apply the same strategies as in the case of regular employees: first find out the importance and the urgency of the problem and subsequently prioritize according to these two factors.

Our study has identified another important factor for dealing with interruptions: the urgency of the problem, which should also be taken into account when assessing interruptions in a future design. With respect to the perceived availability level dependent on the task per-

formed, we confirmed the applicability of the results of Fogarty et al [6]. Furthermore, time-demand of a task is another determinant we identified and we are focusing on in our follow up study.

Finally, we noticed that the interrupted was found in a weaker position comparing to the interrupter as he/she does not want to mistreat a person who takes an effort to come personally to his/her office. However, this may be an effect of the organizational role of assistants. This is why we are currently verifying these results for interruptions aimed directly at knowledge workers. Nonetheless, in this light, a system aiming at supporting interruption mediation should be designed to allow the interrupted to regain power and increase the alternatives to select the best moment for an interruption.

Current research

A design continuum for dealing with F2F interruptions emerges from our study so far. It is characterized by the locus of control that ranges from granting full control to the interrupted to granting full control to the interrupter. On the passive extreme such a system would indicate the occupancy of an interrupted and allow an interrupter to leave a message via the doors (which would play a mediating role). Then, the interrupter would wait for the interrupted to react. Such an approach may raise social issues, as it allows the interrupted to neglect the message. On the other extreme, the interrupter could request to be notified when an activity of the interrupted changes, e.g., a meeting or a phone-call ends, etc. Then the interrupter could decide whether to repeat the interruption. As such the system can support dealing with interruptions in moments of task switching as suggested by Czerwinski et al. [4].

To date we have looked only into interruptions handled by administrative assistants. Currently, we analyze how interruptions are handled directly by knowledge workers. Our study aims at validating our results described above, as to urgency and time estimation being the vital factors for allowing F2F interruptions; these factors concern the perception of both, the interrupter and the interrupted. Finally, we aim at collecting information regarding the design space associated with the locus of control for the interruption. We are using the following methods: camera recording of F2F interruptions of room occupants; brief questionnaires, where interrupters are asked for importance and urgency of their problem as well as semi-structured interviews with knowledge workers regarding preferred strategies for dealing with F2F interruptions in the offices.

Conclusions

In this study, we investigated interruptions of administrative assistants trying to verify a model by Dabbish and Baker [5]. 49 occurrences of F2F interruptions were intercepted and revised in the contextual analysis through direct observation, questionnaires and semi-structured interviews. We confirmed that importance and urgency of a problem are decisive aspects in F2F interruptions. Also the time-demand was identified as possibly important factor for assessing the interruption. It was not directly confirmed that the importance of the interrupter straightforwardly affects the interrupted.

Currently, we are investigating how importance, urgency and time-demand affect interruption negotiation in F2F interruptions handled directly by knowledge workers. Future steps will include evaluation in situ with knowledge workers of alternative design concepts representing different choices regarding the locus of control for interruptions with knowledge workers.

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