The pragmatics of 'notifications': from phone rings to instant messaging[1]

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Abstract: This paper analyzes a class of interactional devices which share the property of being 'designed-to-occur' (e.g. alerts, alarms, warnings, calls, summons, etc.), and which can be more generally categorized as 'notifications'. This class of devices is directly related to interruptions and to attention management issues, and is crucial to the unfolding of communication events. In a review of the last thirty years of HCI research on this topic, the paper shows the transformation of the meaning of interruptions and notification devices. Initially perceived as disruptions in the accomplishment of tasks, interruptions have gradually acquired a positive value, while 'notification' devices are supposed to be more subtle and to embed some degree of 'intelligence' of the recipient's context. The paper moreover provides two empirical case studies regarding the uses of mobile musical ringtone and of instant messaging in organizations, which show the kind of work that users actually do to pattern their environments with an orientation towards shaping in advance the way in which they might be interrupted and notified. The concern with how they might be notified shows users becoming more skilled and turning into 'pragmatic amateurs', less inclined to accept the imposition of a summons (which also testify to a kind of 'crisis of the summons'), and with a keener sense for appreciating the working and pragmatic consequences of a given type of notification.

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Keywords
Notification, interruption, mobile phone, ring, instant messaging

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1. Introduction

What we will consider here is a set of particular devices: alarms, alerts, stock tickers, phone rings, pop-up windows, computer notifications, automated announcements, flashing electronic displays, etc. One common feature of the items in this list is their orientation towards supporting the occurrence of various perceptual events, which they are precisely designed to enable. This property separates them from the kind of artifacts which have been discussed by various authors interested in technologies, such as keys, key holders, 'sleeping policemen' (Latour, 1993) or door handles (Norman, 1988). A chair can for instance be said to 'happen' in the sense that I make it relevant to what I am doing through my unfolding activity, but such an event has a different quality from my kettle starting to whistle. The latter has been designed to produce a meaningful noise when the water is boiling. More generally all such devices are designed to produce accountable, mundane perceptual micro-events. They 'occur' in a way that a simple chair cannot. Whenever a boat horn blows, a warning light flickers, a phone rings or a pop-up window appears on my screen, such occurrences reshape the context of the unfolding activities in the situation in which they occur: they stand for various chains of other events (e.g. a boat passing by, someone trying to reach me on the phone, some trouble revealing itself on my computer, etc.), and they project a normatively organized set of alternative possible responses. Because all these devices compose a class in themselves, they deserve a closer examination.

The way communication events begin and end is a crucial topic for the 'ethnography of communication' research program (Hymes, 1964). A majority of communication events, and

particularly ‘mediated communication events’, have to start with some form of notification. That is because a central problem in networked (tele-)communications is to get a remote *alter* to somehow ‘appear’ in *ego*’s environment and experience in a proper way, and her/his ‘appearance’ to be acknowledged by the latter. Such inaugural sequences therefore rely on the use of many devices in the class we study, the phone ring being a commonplace example. It informs and warns that an *alter* is trying to reach *ego*, and marks the kind of sharp boundary that characterizes telephone calls (Hutchby, 2001). It also appears as the first move in a well-ordered interactive game in which participants orient towards the relevance of a canonical form of opening of phone conversations (Schegloff, 1986), and which is marked by an asymmetry between the participants, that is, the ‘hegemony of the caller’ (Hopper, 1992).

The development of Computer Mediated Communication (CMC) has led to the generalization, multiplication and trivialization of such notification devices, as well as to the refinement of their pragmatic functions. Since the development of the first graphic user interfaces, our computer screens have become a locus for the frequent appearance of many so-called ‘pop-up’ windows that may signal events as different as a system failure, a wait, the success of a connection, or the arrival of a message, or else, in more specialized environments, the fact that a stock has reach a critical level, etc. The recent success of social networking sites (the Web 2.0) strengthens this trend, for such sites make social networks visible and lively through the multiplication of announcements regarding what a member of the network is currently doing, feeling, thinking or whatever.

More and more invitations to (inter-)act materialize through the occurrence of cues in their recipients’ environments: alarms, alerts, warnings, announcements, summonses, etc. On a cognitive level, these cues are usually described as signaling or announcing something, and on a pragmatic level, as presenting such information as relevant and inviting the recipient to treat it accordingly. There is no single word to design this class of ‘designed-to-occur’ devices. To avoid relying too often on such a neologism, I will use the term ‘notification’ device, because it is the word used in computer interface research (which will be studied in the next section) and because it presupposes less the eventfulness of the information it is meant to convey than words such as alerts, alarms, announcements or warnings. However, a word of caution is necessary here, because the concept of notification in computer research embeds a cognitive bias for it is usually understood as an event implying the presentation of some ‘information

that X'. This may not be too problematic in the case of an error message window in a computer operating system, which actually frames such an 'information that X', but understanding a phone ring as the notification of the information that someone is trying to reach may constitute a more troublesome formulation. To paraphrase Wittgenstein, replacing 'I hear a phone ring' here by 'my ears are providing me with the information that a phone is ringing' or that someone is trying to reach me is putting an informational-cognitive gloss on the use of the ring, which does not bring us any closer to understanding how we actually hear a phone ring (Wittgenstein, 1958: para. 356). So we have to remain cautious regarding some of the cognitive implications that the use of 'notification' to categorize the class of designed-to-occur-devices may have.

Notifications occur, appear and surge up in our environments, and their occurrence is understood as a possible source of interruption. Notification devices shape the type of interruptions they occasion. They materialize the tension between focus and dispersion, between the 'internal' guiding of the activity (on the mode of an internalized plan) and an 'external' guiding by socio-technical '*assemblages*'. Turning notification devices into an object for research allows documenting and empirically analyzing attention-related practices and the way involvements are shaped, within a pragmatic frame. If we look at how notifications are designed, accomplished and treated, attention and involvement do not have to remain in individuals' minds; they may be located in the publicly observable and accountable relationship of such an individual with an environment saturated with devices competing for attention, and projecting relevant sets of alternative responses.

Bernard Stiegler typecasts notification devices into the larger set of what he calls *'psycho-technologies'*: "the aim is to replace the social formation of attention by its automated management, reduced to a minimum on the side of the human 'subject', who is no longer between deep attention and hyper attention; he or she merely delegates his or her attention to automata that become sensors, counters, alarms, warnings, etc." (Stiegler, 2008). This author goes on to remark that by 'grammatizing' and standardizing attention-based processes, these *'psycho-technologies'* sever the relationship between attention and individuation. Only the experience of events within a continuing involvement frame supposedly allows the kind of transformation of past experiences and future expectations that is required for the constitution of the individual as a moral and desiring subject. In contrast, the media and communication

industries support a new 'industrial populism', with the construction not even of a public or an audience but of aimless crowds with transient attention spans and few deliberative capacities (Stiegler, 2006). In this framework, notifications lie at the heart of emergent forms of capitalism, and their design and uses support a critique of the way it shapes attention-based processes. Such a dystopian critique may however be pushing things too far. While it is true that, in the design orientation underlying distributed cognition and the development of computer interfaces since the 1980s, a well-conceived device is one whose perceptual grasp immediately lends itself to proper use, automatically, such quasi-automatic perception-action chains only operate in parts of our activity-settings. They cannot account for the organization of all of our actions and activities. Rather than denouncing notification systems as the sole nexus of a whole new form of attention-based exploitation, it may be interesting to study how such unreflexive cognition-action chains are geared to more complex forms of individual and collective involvements (Licoppe, 2007).

The aim of this paper is to analyze the ways interruptions and notifications are produced and treated, and to make such a study into an entry point for an anthropology of involvement and activity. How do we accomplish switches from one type of involvement to another in practical terms? What makes those switches, transitions and interruptions noticeable and recognizable as such? What actual devices and practical procedures constitute resources (and constraints) for the accomplishment of such transitions in an orderly way? Have there been significant changes in the last thirty years in the way we think about interruptions and about the design and uses of notification devices? First, I will show that this is indeed the case, by analyzing a corpus of human-computer interaction research dealing with the topic of interruptions and notifications. Second, I will look at how users choose and design musical ringtones as a resource to shape phone ring notifications in a way that testifies to a possible 'crisis of the summons'. Third, I will use naturally occurring data from an ethnography of the uses of instant messaging at work to show how users themselves continuously shape their 'notification-scape' and modulate the force of the notifications that might occur in a way which is reflexively tied to the accomplishment of their activity and which displays different regimes of involvement.

2. Research on interruptions and notifications in human-computer interaction (HCI) research

2.1 Interruptions and notifications : historical perspectives

A short history of alerts, alarms, warnings, etc.

What might a tentative history of these devices look like? The transition between the modern period and early industrial capitalism has been related to the experience of time (Thompson, 1967). To this historian, the scansion of time in the modern period could be symbolized by the sounding church bells in the countryside, which could be described as collective notifications and warnings addressed to whole communities, at a time when individualized clock-time was not the norm.

He goes on by arguing that one aspect of the Industrial Revolution was precisely the growing pervasiveness of clock time, associated to the disciplining of individual time, for instance in factory work. The need for individual alarm clocks and time devices was certainly also amplified by the development of steam-based mobility systems: widespread railway networks went along with train schedules and timetables, calling both for standardized time zones and individual alarm clocks (Cresswell, 2006). Unsurprisingly, the late nineteenth century saw a great number of patents issued for various alarm and warning devices. At the same time the development of telecommunication systems introduced other 'designed-to-occur' devices, such as the telephones' electro-mechanical rings, or stock tickers to inform traders of telegraph-transmitted variations of stocks (Prada, 2006). While collective alarm and warning devices had not disappeared, the industrial capitalism of the 19th century seems to have enjoyed a strong mutual affinity with individual, standardized notification devices.

It was unavoidable that notification devices would stir some interest in the late 20th century, marked as it was by a strong emphasis on flexible organizations, reactive individuals and the widespread diffusion of digital networks (Castells, 2000). I will argue below that part of the issue during this period was to replace individual standardized notification devices with personalized, adaptive, context-aware notifications, adjusted to the circumstances in which they might be activated, and somehow made sensitive to the way they might be received and to the kind of interruptions which might ensue. A good part of the research on these devices in the last thirty years was conducted in the HCI field by computer scientists and psychologists

(as well as a few anthropologists and sociologists). In the next paragraphs I will analyze the transformation of this research domain. My annalyss will be based on the analysis of papers relating to interruptions and notifications, published in the proceedings of conferences on Computer-Human Interfaces (CHI), Computer-Supported Cooperative Work (CSCW), and Ubiquitous Computing (UbiComp) since the end of the eighties.

The 1980s: the development of desktop human-computer interfaces

One of the origins of this research field probably lies in the studies undertaken in the 1980s, aimed at developing user interfaces based on the desktop metaphor, with which most personal computers are now equipped. This type of interface enables the user to have several 'windows' of different applications open simultaneously and thus to perform several tasks at the same time. An analysis of their usability has to take into account problems of multi-activity and transitions between activities. In a seminal article, Don Norman, one of the founding fathers of the distributed cognition model, examined the way in which computer systems could 'notify' the user that engagement in a task was relevant at a given point in time (Miyata and Norman, 1986). As any notification of this type could lead to the interruption of other tasks under way, the authors suggested that it could be important to take into account the timing of such notifications. For instance, their occurrence would be more appropriate in moments of transition between different tasks (when the subject is partially disengaged from the preceding task but has not yet engaged completely in the following one), than in the middle of a task.

Research during that period and later had four main characteristics related to the pervasiveness of a cognitive psychology paradigm: a) the typical situation of use was considered to be that of the isolated user, absorbed by his or her screen and the management of multiple documentary tasks in parallel, sometimes on line with someone else[2]; b) interruptions were seen as an unavoidable consequence of operating systems that proposed desktop-type interfaces and that routinely had to 'notify' the user that something relevant had happened concerning an ongoing task; c) interruptions were seen as disruptions in the

[2] In the early 1990s the CSCW community sought to orient the design of technical devices and especially computer technology, with a view to facilitating the collaborative activities of several individuals. One of the typical situations envisaged at the time was the problem of the collective writing of a document, where every author had to be informed of the actions of the other authors, and a 'mutual awareness landscape' had to be created.

accomplishment of ongoing tasks and were therefore perceived negatively; and d) the experience of interruption could be adjusted to the form of its external cause (notification), so that it was possible to intervene on the design of notification in a way that would make relevant interruptions more acceptable.

The 1990s: from the 'discovery' of the ambivalence of interruptions to the emergence of autonomous research on systems of notification

The perspective changed considerably during the 1990s. Whereas researchers who focused primarily on design carried on seeing interruptions as a disruption of ongoing tasks (MacFarlane and Latorella, 2002), several ethnographic studies on managerial staff in professions with intensive networked computer use showed the fragmented nature of their work. These managers' days were punctuated by multiple interruptions and very short, often unplanned face-to-face interaction (Whittaker et al., 1994), and the tasks underway were not always resumed after an interruption (O'Connail and Frohlich, 1995). In particular, the idea emerged that interruptions could play a positive part. For the sake of reactivity, certain managers deliberately allowed their activity to be 'steered' by interruptions rather than accomplished according to a plan (Hudson et al., 2002). The very notion of interruption became ambivalent.

This ambivalence was reinforced by the awareness that many interruptions were linked to communication events initiated by other parties. During this period the development of instant messaging contributed substantially to this growing awareness of the role of communication, since the use of this type of device occasions many invitations to interact. These are in the form of notifications on the screen and make the context of the interrupted person partially visible through the indicator of presence. Instant messaging appeared as a new and ideal field for studying interruptions and notifications (Cutrell et al., 2001). Lists of typical examples of notification devices grew: "Commonly known notification systems include stock tickers, *instant messaging tools*, system load monitors or alerts and the like" (McCrickard et al., 2003, 510, my emphasis). Interruptions linked to communication tools became more and more the focal point of research on interruptions and notifications: "With the increasing volume of wireless communication, users are now frequently interrupted by auditory or visual alerts from cell phone calls, email and instant messaging notifications. This is because each of the user's computing appliances is designed to independently vie for the attention of the user with

each message delivered, regardless of the current engagement with other devices or people" (Danninger, 2005; 211).

The intensification of interruptions was attended by a growing concern to reshape their causes, that is, the notifications. These were defined as the presentation of relevant information for users, in a particular perceptual, graphic and linguistic format. A notification took the form of a perceptive occurrence conducive to it being noticed and to the processing of the information presented. For instance, the sound of my telephone ringing could be described as a presentation of the information that someone was calling me.

The concern to adjust the timing and format of the notification was expressed in many of the terms used to qualify ideal notification: for example, 'subtle cues' (Hansson and Ljungstrand, 2000), allowing for 'graceful switching' between tasks (Gievska and Sibert, 2004), possibly with 'aesthetically pleasing' visuals (Zhang et al., 2005). Researchers explored the modalities of presentation and graphic animation in relation to the nature of what was being notified (McCrickard et al., 2003). They studied the possibility of using the movement of icons and frames on a screen by developing so called 'moticons' to impact on users' peripheral vigilance (Bartram et al. 2003), and compared the effects of different sensorial, visual, auditory, tactile (heat) and other modalities (Arroyo and Selker, 2003). Questions of notification were no longer dealt with on an ad hoc basis for each system; they became the subject of a research stream in its own right, 'notification system research', which aimed to develop general design frameworks (Shen and Sun, 2002). Research on notifications had to become autonomous as it had the potential 'to become one of the farthest reaching areas of HCI in terms of impact and contribution to people's daily lives' (McCrickard et al., 2003 ; 513).

The 2000s: from ubiquitous computing to the Web 2.0.

The development of ubiquitous computing, in which people are seen as constantly having their computer terminals with them (Weiser, 1991), poses the problem of managing a continuous flux of mediated interaction. Interruptions concern all the situations experienced by users, and all the terminals they use, including in the domestic sphere (Nagel et al., 2004; Takemae et al., 2007) and in mobile situations (Abowd and Mynatt, 2000). This research field also encompasses mobile phones and PDAs which, in addition to computers, seek to capture

the user's attention and can thus induce 'irritability to interruption' (Ho and Intille, 2000). Mobile telephone rings and announcements of mobile text messages, along with computer screen notifications, compose a new landscape of interruptions and notifications: "With the larger volume of mobile communications, users are now frequently interrupted by auditory or visual alerts due to mobile phone calls and to notifications of email and instant messages" (Danninger et al., 2005). As competition for attention has become a constant issue, it is necessary to 'design for attention' (Roda and Thomas, 2006). Designers have to make notifications more intelligent, that is, to introduce enhanced knowledge of the user's context into the notification, in order to reduce her/his cognitive load (Fallman and Yttergren, 2005) and to build notification systems capable of 'reasoning' on users' attention (Ho and Intille, 2005) and of winning their 'trust' (Tullio et al., 2007).

The most recent development has been the Web 2.0 (with which instant messaging is sometimes associated), on which sites propose services oriented towards social networking. They either facilitate encounters (e.g. romantic relationships, finding old friends) or make social networks visible to support bonding (e.g. Facebook, Friendster, etc.). Even though they are rarely considered from this point of view, these services rely on a stream of notifications about the fact that someone went onto your site, winked at you, sent you a message, etc. in the case of dating sites, or about what members do, feel, think, etc. in the case of social networking sites. This endless 'notification buzz' is the basic resource of the kind of social networking provided by Web 2.0 sites.

2.2 Towards a 'pragmatics of notifications'

These three trends reinforce the relevance of understanding the pragmatic properties of interruptions and notifications, because they are currently becoming pervasive 'psycho-technologies' of attention. We nevertheless need to bear in mind that, situated at the intersection of research on computing and psychology, all the studies carried out on the subject contain certain biases:

- Users are mostly treated as *individual* subjects engaged in specific tasks.
- They deal mostly with screen-based activities.
- They have an informational-cognitive bias, which expresses itself in the use of the 'notification' category, which imposes a gloss that such occurrences offers the

recipient with some ‘information that’, made relevant here and now in the notification event.

- Their focus is on attention as a perceptive and cognitive resource (which constitutes a research theme for psychology) rather than on notions such as involvement and/or commitment, that is, forms of participation in activity that take into account their meaning and purpose, and include interpretive and normative dimensions into the analysis. This makes it possible to confine the treatment of interruptions and notifications to the problem of an optimal allocation of information, given the limits of ‘simultaneous’ treatment due to limited attention.

The aim of a pragmatics of notification is to remedy these biases and to examine and explain what notifications actually do and how they are treated by their recipients. It shifts the perspective of notification itself towards the understanding of observable notification/answer sequences. Notwithstanding the often trivial nature of these objects, this is a key question for a sociology or ethnography of communication.

Studies by designers of software and communication technologies, who have treated notification increasingly as a generic problem, have instituted a separation between notification devices and what they are likely to announce. Notifications are understood more and more as a way of displaying the relevance of a piece of information or communication, without in many cases referring to its content (which is often provided later, after the initial, inaugural event has been treated). The notification (and the interruption it causes) is thus often a separate move, distinct from the provision of the information it announces.

Becoming more widespread and autonomous, notifications do not presume that what they project as a relevant follow-up move will be of any kind of importance. They may preface (and most often do) routine communication events. This may be understood in the context of the contemporary salience of the imperatives of availability, flexibility and reactivity, the configuration of notifications which favors a proliferation of interruptions and informal interactions, which in many cases will be brief and trivial (Kraut et al., 1990; Whittaker et al., 1994; Hudson et al., 2002). Notifications are designed to signal both the most ordinary ‘communication events’ (often) and the most alarming ones (seldom). Unlike a ‘pragmatics of warnings’, sensitive to the way in which problems are brought to collective attention and

turned into general, public issues (Chateauraynaud and Torny, 1999), a pragmatics of notification must also account for the joint effort of designers and users to trivialize and routinize such occurrences.

Because of the proliferation of notification events, mediated by 'designed-to-occur' devices, it is the interruptive experience and the discomfort that they might produce which becomes an issue. Its pragmatic side concerns the modulation of the 'force' with which they project some response or other from the recipient. Notifications become paradoxical in the sense of necessarily remaining performative semiotic occurrences that call for some response, while aiming at being subtle and fleeting enough to allow their treatment to be easily delayed or sometimes even ignored, both at practical and normative levels. The traditional summons, symbolized so well by the phone ring, makes way for subtler forms of attracting attention, at the limit of which they might lose any form of performativity and blend into a 'culture of immanence' (Augé, 2008). This expression refers to an alleged contemporary orientation towards a 'theory of the event' which negates its very eventfulness.

To go one step further in our pragmatic approach to notifications we must study the way in which they are configured, produced and treated, and therefore look closely at the way users manage their notification landscapes and actually treat incoming notifications. Two empirical cases show the very concrete work accomplished by people to configure the notifications to which they could be subjected, and to orient their consequences. The first will deal with the *strategies* users follow in their use of mobile ringtones which, as we have just seen, have become one of the examples of notifications often quoted by researchers in this field, so as to render their phone rings more subtle and equivocal in order to fit their particular communicative needs. The second example will deal with instant messaging, which is another paradigmatic example of communication-related interruptions and notifications, and more specifically with the *situated* management of notification landscapes which is continuously adjusted to changing circumstances.

3. The design and uses of mobile musical ringtones: managing the notification landscape as a way to cope with a 'crisis of the summons'

Users, and not only designers, are concerned with the performative force of notification and active in shaping it. In this section I will discuss the transformations in the design and use of a commonplace form of notification, the phone ring, which, as we have just seen, has been introduced in the domain of notification research with the development of wireless communication and ubiquitous computing. Until the 1980s, telephone calls were initiated primarily by standardized and repetitive electro-mechanical rings. This produced conventional opening sequences of the type:

1 (ring) . (ring) . (ring) . (ring)

2. A: lifts up the receiver and says 'hello'.

When understood as an auditory perceptual event that informs that someone is calling, the telephone ring is an example of notification which acts as a cue for a conventional response ('answering the phone')[3]. Due to its repetitive organization, incorporated into the electro-mechanical device itself, the ringing can be interpreted as a summons. In the interactional perspective of conversation analysis, its occurrence constitutes the first part of a summons-answer duo (Schegloff, 1972).

The appearance of mobile phones with their capacity to store an address book and musical extracts has profoundly transformed telephone ringtones. It is now possible for users to choose or to design almost any form of sound extract for their ringtone. This is moreover one of the rare cases where users agree to pay for downloading music. I did an interview survey of how and why phone users chose or designed their mobile ringtone(s), which shed some insight on how they appreciate what the ring does and highlighted some of their mundane tactics for shaping what they expect it to do (Licoppe, 2008).

The first one consists in personalizing the sound extract in order to be able to answer 'automatically', 'without thinking', as the users themselves put it. This shows call receivers' concern with increasing their possibility to delegate the evaluation of the relevance of responding or not to the notification. The second one consists in symbolically manipulating the summons function, which is usually done in three very different ways: a) accentuating the summons by lengthening it and/or intensifying the repeated sound occurrence, e.g. 'beep – BEEEEP – **BEEEEEEEEP** –' etc.; b) weakening the summons by choosing a melodious

[3] Except in the case of certain practices, common in developing countries, in which the sound is used as a way of 'beeping' the receiver, not for him or her to answer but so that he or she can call back (Donner, 2007).

musical extract which no longer 'rings' like a telephone – so that its occurrence is also an invitation to listen and enjoy the fleeting musical experience that it proposes and to take the call; c) maximizing the ambiguity of the summons by making a highly rhythmical short musical extract played in a repetitive loop, so that the repetition exists but seems to be part of the music, thus producing ambiguous artifacts that can be perceived alternately as music or as summonses. The common point of all these practices is that they directly manipulate the traditional sequential organization of the ring, and reshape the way in which it summonses. The latter two (b and c) support the user's notion that experiencing the ringtone as music might compensate for experiencing the ring as a summons. Such users argue that the music 'softens' the summons; it enriches it with an opportunity for a fleeting moment of pleasure, in passing, that the coerciveness of the ring *qua* summons seems to make increasingly welcome.

The unforeseen success of mobile phone ringtones therefore suggests the emergence of a 'crisis of the summons'. Users see benefits in softening the imperativeness that characterizes the summons and is embodied in the repetitive sound organization of traditional phone rings. They look to musical ringtones as ways to 'soften' it. But softening the imperativeness of the phone ring in this way also partially cushions the obligation to answer that a 'pure' summons entails, which makes users more directly accountable for the fact of answering or not. Why might phone users be more sensitive today to the coerciveness of the summons which traditional fixed phone rings seemed to express and materialize? This tendency could be related to the development of 'connected presence' in communication practices. In a 'connected' mode, where the social link is maintained, it is the multiplication of contacts via all available media that guarantees the strength of a particular link. This form of maintenance of social relations allows for and contributes towards the proliferation of impulsive calls. 'Connected presence' is therefore particularly trying with respect to the recipient's availability (Licoppe, 2004; Licoppe and Smoreda, 2005), and the management of accessibility and availability (Licoppe and Heurtin, 2001). Recipients are expected to participate in such a management of social relationships by taking (and making) many calls, but their availability is constrained by their other activities and is often tested with the frequency of calls, many of them being trivial or even 'phatic' calls, for which a summons enjoining an immediate answer might appear retrospectively as an excessively imperative form of notification. "Connected presence" seems to call for ways to make the call recipient less obligated by the ringing of his phone.

The success of musical ringtones then appears as an outcome of such a "connected presence"-related 'crisis of the summons'. The two strategies we identified for mobile ringtone users exemplify the way such devices may be used to modulate the summoning force of the phone ring, and the way it projects some forms of user response as an expected course of action: a) weakening the summative force of the ring, by replacing it by a musical melody that is an invitation to listen, however fleetingly, and aims to provide a short-lived compensatory pleasure; and b) facilitating the decision to answer by personalizing the sound extract with respect to the callers (and thus having several different ringtones), which amounts to introducing a form of knowledge about the caller into the summons, and delegating to the ring device some agency in the shaping and the production of a proper response.

The success of mobile ringtone may also appear as a cause, and not only an outcome of the 'crisis of the summons'. The tools that mobile ringtones make available for modulating the pragmatic force of the ring also makes the ring more visible and enables users to become more sensitive to it, to evolve more subtle appreciative skills for experiencing and realizing what the phone ring does. This is evidenced by the kind of appreciations and judgments which underlie their strategies in reshaping the ring. The evolution of the notification device towards more subtlety and flexibility goes hand in hand with a refinement in interpretive skills regarding the pragmatic effects of notifications. It could be described as a kind of acquired taste, for like taste (Hennion, 2004), it is an enactive process, constructed through a succession of trials whose outcomes rely on collectively evolved and shared inference practices, embodied experience and what the notification artifacts do. This co-evolution of interpretive skills and notification devices involves a reflexive performativity loop in which the properties of notification devices are co-produced with the sensemaking resources to appreciate their effects.

I would like to move on now to a slightly different but related issue, that of the users' situated management of their notification landscapes in a way which is adjusted to the changing circumstances of their activities, based on video recordings.

4. Management of 'notification landscapes' and interactional engagements: the case of instant messaging

Like many recent computer-based communication services, instant messaging proposes several different notification formats. On most systems, when someone belonging to a user's contact list signs in, a pop-up window appears with a message like 'X has just signed in', sometimes with the contact's photo. The arrival of a message may be signaled in two ways: directly in the dialogue window if it is open on the screen or, if the dialogue has not been interrupted and the window is not active on the screen, by means of a task tab at the bottom of the screen, which changes color (to bright orange or dark blue) and starts flickering when a message arrives. This format therefore incorporates a lasting perceptive change (the change of color) and a summons (the flickering). Some notifications are nested. When the dialogue window is open, a notification like 'X is busy writing' may appear at the bottom of the reception window.

Figure 1: Change of color of the instant messaging tab when a new message comes in

Such a screen environment can be described as a 'perspicuous setting' (Garfinkel, 2002) which makes the temporal organization of the activity visible in the spatial arrangements produced during the course of that activity (Lynch et al., 1983). In this respect, the notification resources and the way in which they are used make accessible and intelligible the continuous work of the actors to: a) format their orientations and expectations regarding certain types of occurrence likely to arise contingently during their work; b) prefigure their status as events and their response to them; and c) configure in a visible and accountable way the forms of their engagement in the activity. Thus understood, the management of the notification landscape consists of practices that are contingent on the circumstances of the activity. It is based on operations which are most often accomplished automatically (and which may not have a name), and which become visible only in the systematic analysis of sequences of action. The case analyzed here is drawn from a study based on ten interviews and video observations of managers at work in two high-tech

firms which have generalized the use of instant messaging to the whole of their organizations[4].

3.1. Negotiating the legitimacy of an isolated request via instant messaging, and the interruption that it is likely to cause

During one of these one-hour recordings, we observed the following instant messaging sequence.

Transcription n°1

1. NicoleOMTL (12:10:57 PM): Hey Albert!
2. NicoleOMTL (12:11:03 PM): Do you plan to watch the LiveMeeting on mixed initiative?
3. albertrobson2356 (12:11:26 PM): What's that?
4. NicoleOMTL (12:11:31 PM): ☺
5. NicoleOMTL (12:11:50 :PM): Never mind then. It's that email that was sent out. I'm sure you received it.
6. albertrobson2356 (12:12:13): i'll take a look .. i'm at home today, not sure i can log in from there.
7. NicoleOMTL (12:12:39 PM): ha! sorry to bug you at home, i thought you were here …
8. NicoleOMTL (12:12:44 PM): never mind.
9. NicoleOMTL (12:12:49 PM): go back to sleep! ☺
10. albertrobson (12:13:05 PM): you couldn't bug me
11. albertrobson (12:13:06 PM) :)
12. albertrobson (12:13:19 PM): i'm wfh
13. NicoleOMTL (12:13:19 PM): ?? hu ??

Before the initiation of this sequence, Nicole was busy with an email invitation to a videophone meeting. After reading it, she sent the same message to two of the addressees of the initial email, asking them whether they were going to attend the meeting. This corresponds to the use of instant messaging for requests for clarification or verification that

[4] I would like to thank Renato Curicio and Serge Proulx, with whom I carried out this study.

concern an activity underway and are configured so that answers can fit into a single message without needing further elaboration. It is one of the most typical uses of instant messaging at work (Nardi et al., 2000; Quan-Haase et al., 2005).

The interaction starts with a greeting (‘Hey Albert’, Message 1). Nicole does not wait for her correspondent’s answer; she immediately follows on with a question (Message 2). This shows the routine nature of this type of request. albertrobson does not return the greeting but initiates a repair sequence by a request for clarification (‘what's that?’, Message 3). Nicole answers with a smiley (Message 4), followed by an expression indicating that an answer is no longer relevant because she is not informed on the matter (‘never mind’, Message 5). Finally, she concludes by referring to the invitation email and the fact that he was on the list of recipients. This legitimizes her initial question – a legitimization made necessary by the fact that there was no immediate answer.

After about twenty seconds albertrobson indicates that he will check, that he is working at home and that, due to the difficulty of logging on, he may not be able to do so that day (Message 6). She answers with a message of excuse for bothering him (the word ‘bug’ refers to the irritation that one sometimes feels when one is disturbed or interrupted for little things), justifying her request by the fact that she thought he was at the office (Message 7). She thus orients herself in relation to the potential inconvenience of making such minute work-related requests when the addressee is at home and may be busy with personal matters (which excludes any interruption of a professional nature, except in case of emergency), or else may be working but stayed at home precisely to get on with a very absorbing task, shielded from interruptions. She then repeats that her request is unimportant (Message 8), and follows with a joke about the difference of contexts between work at the office and teleworking from home (the injunction ‘go back to sleep’, Message 9). The idea of sleep topicalizes once more the notion that at home one may not be interrupted for short requests of a professional nature. He answers by reaffirming that she is not disturbing him and could not disturb him (Message 10), followed by a smile and the acronym ‘wfh’ for ‘work from home’ (Messages 11-12). He thus reaffirms the legitimacy of Nicole’s initial request by emphasizing a conception of telework that demands one’s availability for colleagues – an availability that must be asserted and shown even more visibly and conspicuously (hence, his justification) to avoid criticism (for instance the accusation of skiving). The dialogue then moves onto a playful conversation

about acronyms based on the lack of understanding that she indicates when he uses ‘wfh’ (Message 13).

We thus observe how: i) the participants orient themselves towards the sending of requests via instant messaging as a potential source of interruption; ii) such interruptions are warranted between participants who have frequent contact, when the addressee is supposed to be at the office and the presence icon indicates that he or she is on line; iii) once it appears that the addressee is on line but at home, the interaction and its interruptive nature are negotiated by orienting in relation to two opposite maxims: if one is at home, one is not available for interruptions of a professional nature, for minor reasons, but if one is teleworking, one can be interrupted, and perhaps even more than at the office (to display that one is indeed teleworking, and to justify the right to telework, considering the ceaseless demands of distributed teamwork and the fact that telework is still a fragile institution).

3.2. Two modes of engagement in the conversation via instant messaging

In the rest of this section I will adopt a perspective that is no longer that of the IM interaction itself, but is centered on Nicole’s activity, and based on both screen capture and video recording. I will consider two different moments in the interaction in more detail.

3.2.1 Dialogue window open full-screen, with ‘focused engagement’

I would first like to consider what happens after the opening and reading of Message 6, in a simplified transcription[5].

Transcription n°2

1. albertrobson2356 (12:12:13): i’ll take a look .. i’m at home today, not sure i can log in from here.

[5] To maintain a certain degree of legibility in the argument, I have not accounted here for certain details of the activity, like the hesitations and repairs in the typing of messages.

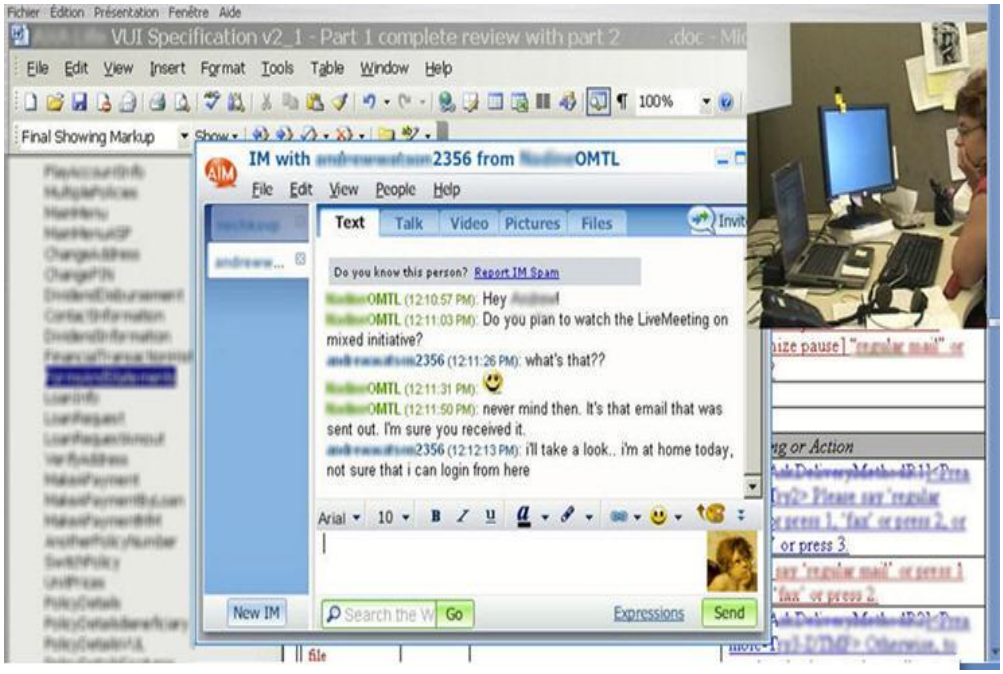

Figure 2: Nicole's screen when she reads Message 6, with the video camera image in the top right-hand corner. Some areas have been blurred for confidentiality reasons but one sees clearly haw the IM window is opened and centrally positioned on the screen.

2. *NicoleOMTL : (3.0)*
3. NicoleOMTL (12:12:39 PM): ha! sorry to bug you at home, i thought you were here …
4. NicoleOMTL (12:12:44 PM): never mind.
5. NicoleOMTL (12:12:49 PM): go back to sleep! ☺
6. *NicoleOMTL : ((readjusts her position on her chair and rearranges her hair, smiling))*

Figure 3: Readjusting her posture after sending 'go back to sleep'

7. *NicoleOMTL : ((leans forwards towards the screen, with the remains of a smile))*

Figure 4: Nicole, oriented towards the screen, in what I describe as a 'posture of expectation'

8. *NicoleOMTL : (13.0)*
9. albertrobson (12:13:05 PM): you couldn't bug me

During this sequence (and in fact for the rest of the instant messaging interaction), one can describe Nicole as fully involved in the IM interaction in several respects. The dialogue window remains open all the time at the center of her screen, covering all the other

documents. The open window "on top" corresponds to the most relevant active task at that moment. In the desktop metaphor, perceptive salience corresponds to a hierarchy of relevance. In this mode, the messages are fully displayed as they arrive. Their arrival can be anticipated only through the notification that the correspondent is busy writing, which leaves imprecise the exact moment of their 'occurrence'. Following the exchange in this configuration therefore supposes maintaining a relatively continuous orientation and vigilance with respect to the screen.

Which is what Nicole clearly does. For sixteen seconds after sending the message 'go back to sleep', she stares at the screen, and most of this time is spent in a position of expectation, her chest and chin tilted forwards. This corporeal and attentional orientation displays the fact that she is 'waiting for' the answer, and is completely absorbed in that waiting. At other similar moments, a little later on, she will alternate this waiting position with quick glances to the side, small rearrangements of her position, or a sip of coffee – all recognizably subordinate activities which require only minimal and occasional rearrangements of her posture and orientation. Even in these moments which may seem to be distractions, it is clear that watching the screen remains her base orientation[6], and that she carries on waiting for the next message without allowing herself engagement in activities that could significantly challenge the prevalence of this principal involvement.

Nicole's body language also marks her appreciation of the ongoing interaction. After sending the message 'go back to sleep' she smiles, partly in anticipation of the reception of her joke. Later in the sequence she marks the reception of messages in the same way. She thus indicates her orientation towards what the messages say and 'do' (since the interaction has shifted to a playful mode, close to a kind of professional banter between colleagues). This justifies the use of the term involvement, rather than attention, in so far as it is not simply an attentional orientation towards what is happening on the screen, but also a visible appreciation of the performative effects of these screen-based communicative events. Moreover, these embodied marks of appreciation lend meaning to the way in which Nicole 'waits for' messages for long seconds, rather than engaging in another activity, as she would on other occasions, for example in the waiting periods during the running of a computer application.

[6] The bottom half of her body remains constantly oriented towards the screen (Schegloff, 1996).

For long minutes Nicole visibly accomplishes only one main activity: this 'instant messaging conversation'. She manifests what I would qualify, by analogy with Goffman (Goffman, 1963), as a focused engagement in the conversation via instant messaging. This is however simply an analogy. The participants are not caught in an 'eye-to-eye ecology', so that her correspondent knows nothing about how she is engaged in the mediated conversation, and is waiting for messages (he has no way of knowing whether she is doing something else at the same time). Moreover, her appreciation of the messages, especially their reception, concerns 'whole' messages in so far as she does not have access to the way in which they are written moment by moment, as she would have in the case of a turn-at-talk in a face-to-face or telephone conversation. It is nevertheless still meaningful to describe her involvement as 'focused', in view of the way in which she produces a visible impression of absorption in the exchange via instant messaging, and the contrast with other types of engagement such as the one I will analyze now, which occurred earlier in the sequence.

3.2.2 'Reducing' the instant messaging (to a tab) and 'doing' unfocused involvement in the communicative event

Consider what happened during the thirty seconds preceding the arrival of the message that inaugurated the sequence analyzed in the preceding section.

1. NicoleOMTL (12:11:50 PM): Never mind then. It's that email that was sent out. I'm sure you received it.
2. *NicoleOMTL : ((goes to the window of another correspondent whom she had asked whether he was going to the same meeting, looks at the incoming message, treats it as a closing message by completely closing the conversation, which brings her to the screen with the window of dialogue with albertrobson))*[7]
3. *NicoleOMTL : (5.0)*
4. *Nicole OMTL : (('reduces' the window of dialogue with albertrobson))*
5. *NicoleOMTL : ((following this 'tabbing' of the instant messaging window, the initial mail mentioning the LiveMeeting returns to the foreground of her screen, as*

[7] I am summing up the complex actions related to the fact that she holds two conversations simultaneously on the same subject, a point that I do not have the space to consider here.

does the list of instant messaging contacts that she used to initiate the dialogue with albertrobson))

6. *NicoleOMTL : ((closes the window of the list of contacts))*
7. *NicoleOMTL : (6.0)*
8. *NicoleOMTL : ((closes the email so that her list of incoming messages is displayed on the screen))*
9. *NicoleOMTL : (3.0)*
10. *NicoleOMTL : ((puts her cursor on the AXA tab at the bottom of her screen, corresponding to a file of specifications on which she was working; this brings this file back onto the screen))*
11. *NicoleOMTL : ((the instant messaging tab corresponding to the dialogue with albertrobson turns dark blue))*

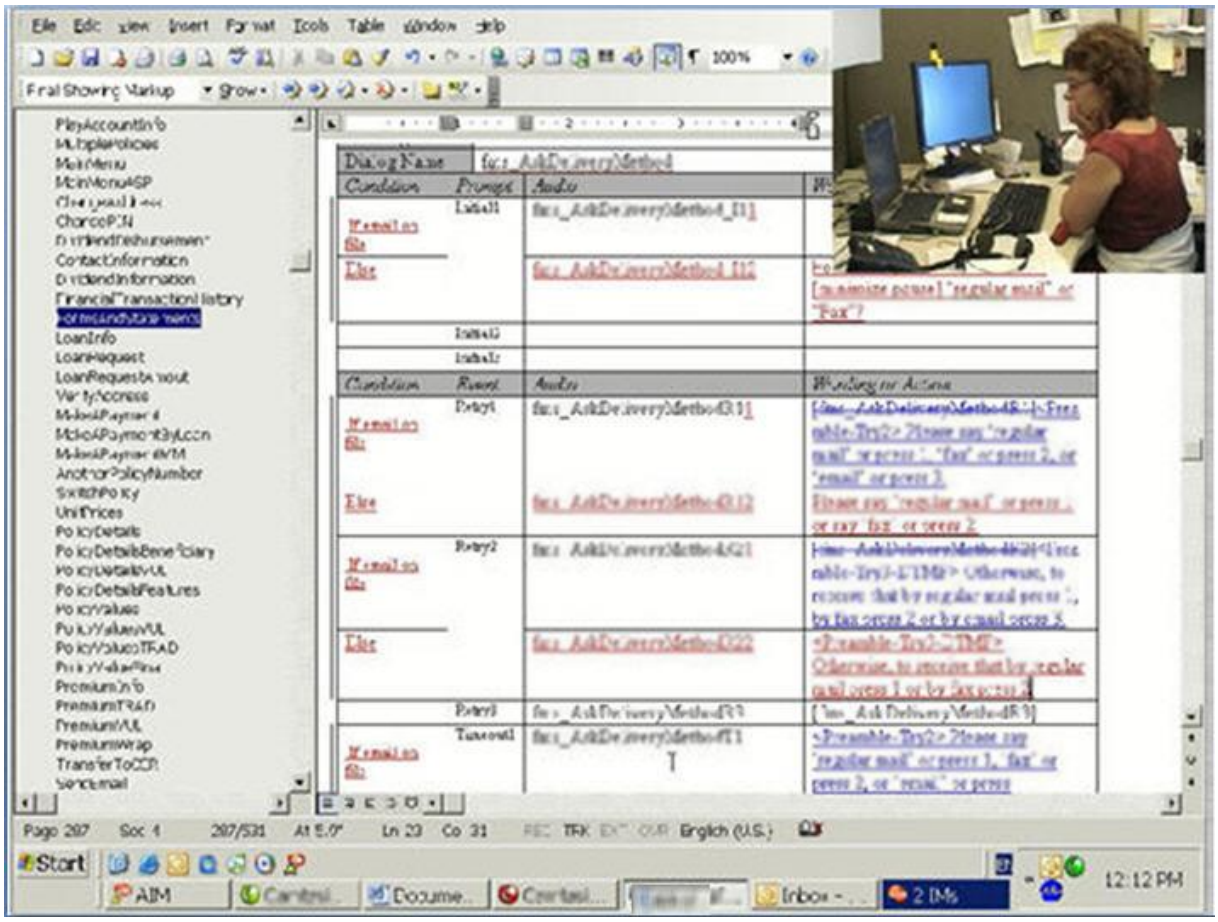

Figure 5: State of Nicole's screen when the instant messaging screen changes color. Some areas are blurred for confidentiality. One can see the colored active IM tab on the bottom left on the screen (actually flickering on the video.

12. *NicoleOMTL : ((as soon as the flashing starts she shifts the cursor onto the tab and clicks, which reopens the instant messaging window and produces a screen similar to the one in Figure 2))*
13. albertrobson2356 (12:12:13 PM): i'll take a look.. i'm at home today, not sure i can log in from there.

Nicole first closes the first instant messaging dialogue window concerning the videoconference meeting. She then reduces the window corresponding to the dialogue with albertrobson to an active tab. She closes the list of contacts that she used to initiate the conversation with him. She then closes the message about the future LiveMeeting, the opening and reading of which had triggered the two instant messages. She closes her email application. Finally, she opens a reference file (still open) on which she was working just before dealing with that email (the treatment of which appears with hindsight as a sequence 'inserted' into another activity thread). The series of actions from 2 to 10 can be interpreted as a near complete closing of everything concerning the search for information on the LiveMeeting, and the reorientation towards another activity pertaining to a technical draft.

The only thing she does not close is the dialogue window with albertrobson. It is only reduced to an active tab. This operation consists in clicking on the small minus-shaped icon that appears in the top-right corner of most windows in Windows environments. It causes the open IM window to disappear from the screen and to be reduced to an active tab, often situated at the bottom or the side of the screen. 'Reducing' an application to an active tab means it will not be visible any more, but it can still be made so with a single click on the tab. Such a reduction leaves the screen free for other windows whiles maintaining the corresponding activity thread open.

Why didn't Nicole completely close the instant messaging application? Albertrobson had shown that he was not aware of the meeting and Nicole had made it unnecessary for him to look further, so that nothing interesting concerning the initial question could be expected from the dialogue. But there had been no recognizable closing sequence. It was therefore possible for the conversation to die there (if he did not produce a new turn) or to be revived (if he produced a new turn). In the latter case, as it was Nicole who initiated the conversation with a

request, she was in a relative obligation to answer this possible turn, even if it was largely unrelated to her initial question. This makes relevant and warrants the 'reduction' of the dialogue box at that precise moment in the IM conversation[8].

This 'tabbing' of the instant messaging dialogue window constitutes a form of management of the notification landscape in which Nicole's screen activity takes place. Reduction to an active tab is a recognizable way of shaping in advance the occurrence and the eventfulness of a future message. In this mode, incoming messages will be notified by the change of color and flickering of the tab. This orients the user towards a different form of vigilance from the preceding situation where messages were open full-screen – that is, a peripheral awareness where the waiting and the concern about receiving the correspondent's next message are delegated to the micro-event constituted by the change of state of a notification device, i.e. the flicker and change of color of the tab. Just after Nicole opens the specification draft, the tab changes color and Nicole reacts by quickly clicking on it (in the space of a flicker). This opens the message and inaugurates the sequence of focused involvement that I analyzed in the preceding section.

This reconfiguration of the notification landscape and of the type of awareness that it induces constitutes another particular mode of involvement in the instant messaging exchange. By 'reducing' the dialogue window rather than closing it, Nicole orients towards the possible arrival of another message. By not keeping the instant messaging fully open, she displays that she possibly expects the occurrence of a next message, but that she is not waiting for it. Because of the sequential placement of this reduction operation, she shows an anticipatory appreciation of the fact that this message might be only marginally relevant compared to the initial object of her request. It will consequently not be much of an 'event' from the point of view of the communication under way. The intelligibility of the reduction operation, the minimization of the eventfulness of the message that might follow, and an orientation to treat this message if it arrives without waiting for it, are constituted mutually and reflexively. Our example shows how an operation directly pertaining to the management of the notification landscape, the reduction of the instant messaging window to an active tab, probably

[8] As regards the position of the 'tabbing' in the order of closures, independently of the dialogue itself, the applications are closed almost in the same order as that in which they were opened.

accomplished without thinking, constitutes an artful accomplishment, finely tuned to the changing details and contingencies of the activity.

The whole sequence shows how the fine-grained management of the notification landscape and the type of involvement of the subject in the activity are mutually elaborative, and constitute a joint accomplishment. The different ways of organizing the notification of incoming instant messages and of shaping in advance the kind of event that the occurrence of a message is likely to be and how it might be treated are based on standardized and conventional operations allowed by the software operating system. They are publicly intelligible for any member of the community competent in using this type of software at work. In this respect, the notification landscape, constituted moment by moment during the activity, presents a form of 'scenic intelligibility' (Jayyusi, 1988) within a computer-literate community. It makes visible to the competent observer the relevance of different modes of involvement with respect to the ongoing communicative event.

5. Conclusion

I have studied in this paper a class of interactional devices which share the property of being 'designed-to-occur' (e.g. alerts, alarms, warnings, calls, summons, etc.) and which I have categorized as 'notifications' to stay in line with current HCI research. This class of devices is directly related to interruptions and to attention management issues. The increasing emphasis on the reactivity and availability of individuals and the sharp development of communication networks have led to the proliferation of such devices in our information ecologies, since most mediated communication exchanges start with a micro-event occasioned by the activation of such devices, or at least involving such a device.

In a review of the last thirty years of HCI research on this topic, I have shown a significant change in the meaning of interruptions and notification devices. Initially perceived as disruptions in the accomplishment of tasks, interruptions have gradually acquired a positive value. Workers (and particularly managers and workers in knowledge-intensive activities) say that they let themselves be driven by them in the course of their work, for they have realized that noticing and dealing with interruptions may ensure some degree of adaptation and optimization of their activity with respect to rapidly-changing environments. There has been a

simultaneous and correlated change in the design rationale of 'notification' devices. They have been made more autonomous with respect to the occurrences they signal. They are more independent from the 'eventfulness' of such occurrences, in the sense that they are now designed to notify users of events of all kinds: routine and trivial (mostly) as well as momentous ones with far-reaching consequences (rarely). They have been made more subtle and have been given some degree of 'intelligence', in the sense of being endowed with capacities to anticipate some of the circumstances in which they might be used. Their design is therefore more and more marked by a tension between the need for them to be perceptually salient (to be noticed), while proving less intrusive, causing less of an imposition on their recipient and allowing her/him more leeway in their acknowledgement and treatment.

In the two empirical case studies discussed here, the first one on users' strategies for choosing or designing a mobile musical ringtone and the second on video recordings of the use of instant messaging in organizations, users are shown to pattern their environments with an orientation towards shaping in advance the way in which they might be interrupted and notified. In the case of mobile ringtones their strategies display an orientation towards softening the potential coerciveness of the ringtone, a 'crisis of the summons' which is probably a more general phenomenon. The cleverness and delicacy of their strategies for choosing or crafting mobile musical ringtones (such as 'compensating' the coerciveness of the ring *qua* summons with the pleasure of the ring *qua* music), go hand in hand with increased pragmatic competencies, i.e. skills in assessing and appreciating what a given ringtone does. In the instant messaging video study, I was able to show how the management of notification landscapes constituted a situated, artful accomplishment, sensitive to the particulars of the unfolding situation and reflexively tied to the production of intelligible forms of involvement in relevant activities. Here also, interpretive skills and competencies) co-evolve with the resources available to users for managing their notification landscapes.

The systematic study of the pragmatics of notification devices which this paper calls for is also a way to research how we may be becoming 'pragmatic amateurs', less inclined to accept the imposition of a summons(which testifies to a kind of 'crisis of the summons'), and with a keener sense for appreciating the fine details of the way a given notification is crafted, of how its occurrence produces us as subjects, makes relevant a response, and orients the possible forms that such a response may take, as well as its meaning. If such pragmatic amateurs are

the most likely denizens of a highly connected world which praises flexibility, reactivity and accessibility, in the sense of adapting to it and evolving with it, then the varied forms of notification devices which I have studied are a constitutive part of its '*umwelt*'.

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