Irreversibility and *forceback* in public interfaces

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ABSTRACT
We are starting to see walk-up kiosks and self-service machines everywhere in the public space. Indeed, it seems to be increasingly prevalent that service providers offer technological aid to customers so that they can perform more of the work entailed for themselves. Buying train tickets, checking in luggage at the airport or paying duty for excess merchandise upon returning home from abroad are examples of such *walk-up-and-use* services. It is surprising how such "simple" systems are not perceived as user-friendly. We believe that designing information technology for the public space poses distinct conceptual challenges. Yet, this has not been systematically explored within our field. This paper is based on an ethnographic study of the purchase and validation of ticketless travel for an airport train. It argues that public IT needs an extended framework of usability principles, which goes beyond well-known interaction design guidelines.

Author Keywords
Usability, public IT, design, guidelines, ethnography.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation]: User Interfaces.

INTRODUCTION
This paper describes an ethnographic study of ticketless travelling. More specifically, it is concerned with the boarding and exiting at different stations of an airport train. Previous work on the collaborative nature of travelling for tourists [1] and business travellers [2] does not like ours consider the open and exposed nature of interaction. In that respect, this paper is much more related to Brown's study of shopping behaviour [3], inasmuch as it is concerned with public and observable aspects of individual actions. Our contribution also demonstrates the role that *reflexivity* and *accountability* in an ethnomethodological sense [4] can play for the analysis of human-computer interaction in the public space. Moreover, we raise the question of considering the notion of affordances [5] as being a reflexive one.

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We have studied travelling behaviour with respect to the shared nature of cognitive plans, and start drawing implications for the design of self-service automata. The paper is motivated by the observation that many technologies, which are now deployed into a public space, regardless of their simplicity and intuitive usefulness, actually seem quite difficult to use. In our case of an airport train, many users fail to purchase access to the train (buy a "ticket") in the first place, they buy the wrong ticket or too many tickets. Users do not ask fellow travellers for assistance, even when they see others conducting the transactions successfully, and vice versa. We believe that this shows that the individually oriented and goal-oriented usability design traditions, which may have been appropriate when dealing with single-user applications for the privacy of an office, are insufficient when it comes to creating the design of IT for a public space.

It has been well documented that the focus on individual users in HCI is problematic, since it neglects variation between users [6]. Our paper is a novel extension of this concern. It draws designers' attention to the greater importance of social context, not only with regards to goal-oriented collaborative work *between* users or the situatedness of individual users' action, but as a common fabric into which the actions of each and every user is interwoven. To the extent that the design of public systems is based on the notion of users' mental models, the idea needs to be expanded towards supporting the notion that such models are shared with strangers. Today, many public IT systems attract the attention of onlookers, whilst unsuccessfully mimicking interaction in the secluded space of an own office. Thus, the presence of competent fellow users becomes intrusive instead of helpful. Users will over time become more efficient, but they are sometimes also put in situations that they perceive as embarrassing.

We have elsewhere suggested that the property of a user interface as being *protrusive* should be duly noted [7]. A protrusive user interface exposes users as failing incomprehensibly, whilst using a public IT system. We will in this paper propose as equally important the related concepts of *irreversibility* and *forceback*, when designing public IT systems.

The importance of offering to the user information about which results were associated with certain actions, is

indisputable and maybe even more important in a public space than within an office. This is intuitively well-covered by the notion of *feedback*. By the notion of irreversibility, we mean that the system can only offer to complete the ongoing action, and it may not be cancelled or reversed. With *forceback*, we explain how the user finds no correct way to complete an action, but still finds a way to persist and continue the interaction. Not choosing to go back and start again from the very beginning, which would be to opt for *reversibility*, the user continues to explore an erroneous path of action unabated by the feedback not being as expected. Irreversibility is explicitly, but perhaps unintentionally, designed into the system, whilst forceback comes as a inaptly conceived response to preceding feedback by the system, subsequent to previous user input.

A *sociable* user interface, which we have discussed in another paper [7], is conceived such that it makes the user able to deal with it skilfully in socially accountable terms, even when the user is a novice in technical terms. Avoiding to make a system that is irreversible or initiates forceback, is another important contribution to this design strategy, which we think needs to be taken into account when designing public IT.

RESEARCH METHOD AND ORIENTATION

For the research project described in the paper, we have used an ethnographic approach of prolonged observation. We were given the opportunity to observe travellers as well as platform assistants in the airport train stations and at the airport. Days of observation were spread over a period of 12 months, so even seasonal changes were taken into consideration. The observations were also conducted at different times during the day, since groups (e.g. business travellers), tend to travel at certain times. The fieldworker identified persons to observe by the criteria that they were approaching the area for ticketless travelling. The fieldworker as well as the second author interpreted the data, informed by theoretical knowledge of ethnomethodology rather than any structured process.

The transcriptions contain evidence of much straightforward interaction, within which the system is working well, as well as the excerpts presented in this paper. The paper should thus not be seen as an inductive argument that the system as such is "broken". The idea is to use revealing examples of interaction with public IT to say something about the general nature of this *type* of use, rather than this particular system.

Ethnographic studies typically have long periods of fieldwork. For this study of ticketless travelling, this was not possible, and we ended up doing what Hughes et. al define as a "quick and dirty" approach [25] to ethnography. This approach makes it possible to have a short and focused study in order to get a general understanding of the situation. This study also has an evaluating aspect in that we wanted to study a set of design trade-offs, which means that one could also define this study as an *evaluating ethnography* [25]. Randall et al. [8] discuss which studies these two types of ethnography are suitable for. The "quick and dirty" approach gives us a broad understanding of situations, and therefore it is suitable to get knowledge for areas such as usability. Evaluating ethnography can be used to get a "reality-check" for a system, hence it is suitable for evaluate the design.

We see it as highly desirable to be able to document widely, the observations of "lived" use of any IT-system, and make these observations available as input to designers [9]. We need to acknowledge, however, that such observations may not always straightforwardly be converted into system specifications or implications for design even in a wider sense [10].

We think that this paper contributes to make designers aware of a broader set of usability concerns, which apply in particular to public IT systems. Our objective, in the first instance, is to use the lessons learned from our study to expand on frameworks of usability guidelines that exist in HCI.

DESIGN THEORY BACKGROUND

We also wanted the findings of this paper to be brought to bear on the theoretical orientation of HCI. In HCI, the tradition of looking for/at mental models and cognitive patterns, which characterize users, has always had a strong position [11]. It may be the case that such patterns indeed do exist, although it will always be harder to convincingly find out what exactly they are. Moreover, these internal models are not likely to be less in need of adaptation, articulation or re-negotiation than the set of externalised procedures which alternatively are often laid down as a foundation for design. Therefore, through its ethnomethodology, the paper also addresses this strand of HCI research, inasmuch as it provides an example of the practical use and communication and intersubjective usage of models, patterns, expectations and habits, regardless of the taught or given nature of such representations.

HCI has also drawn much from the development of a theory of interaction. The notion of feedback is arguably one of the most important design guides in HCI [12]. It is seen as a response to action from the user, by the system, which is intended to be used to evaluate the actual outcome of the action, in contrast with the expected outcome [13].

Affordances are another important theoretical design component in HCI. It was originally seen as an external attribute of a man-made artefact [12], which comprises clues with regards to how a set of functionalities furnished by the artefact can be accessed [14]. More recently, the notion of affordances has been made more nuanced [5]. The idea that affordances are also perceived, as opposed

to simply *given*, and as such need to be embedded in the overall accomplishment of social action, sits well with the ideas from ethnomethodology [15]. The notion that such affordances can be planned into action, or that it is something that one can anticipate or facilitate to be shared, is, however, not a straightforward implication. Martin et al., e.g., note that affordances can be seen as occasions for interaction, and that sometimes interaction is required to discover the affordances in the first place [16]. The study that we present here is methodologically suitable to examine even such claims.

TICKETLESS TRAVELLING

The case of this ethnographic study is a system for ticketless travelling at the airport train. The train company has since 1998 transported passengers to and from the airport with high-speed trains, and had 4.9 million passengers in 2006. The train serves 7 stations in addition to the airport terminal, and the time needed to travel from the airport to the final destination is 50 minutes. Most passengers board and exit at the main train station or the airport, between which the trip takes 20 minutes. The company operates with different price categories depending on the distance travelled.

Seventy per cent of all the passengers using the express train to the airport are business travellers, and in this category important aspects are often believed to be efficiency and time saved, instead of price.

Before the launch of the ticketless service the passengers had to buy a paper-ticket in advance of the trip. This system is still in operation, in parallel with ticketless travelling. The paper tickets are bought in staffed ticket offices or in ticket automata placed near the departure platform for the airport train. The purchase procedure for paper tickets is different according to the direction the passengers are going. On their way to the airport, passengers get a ticket, board the train, and validate the ticket in a scanner when they arrive at the airport. This procedure is the same for all departures bound for the airport. On return from the airport, passengers similarly purchase a paper ticket from the ticket office or at dedicated self-service systems, which are the same at all of the stations. This time, however, validation takes place immediately, before boarding the train. No further validation is then necessary to leave the train.

In order to make the transport of passengers to and from the airport more efficient, the company introduced the system for ticketless travel in 2003, complementing the existing ticketing system. The physical implementation comprises 26 card validators (Figure 1), which are placed on strategic places on the departure stations and platforms. Each is formed as a pillar with a screen and a card reader on the top. When users swipe their card in the vertical slot, the system responds with sound as well as visually. If the transaction is successful, the user will see the following response in green text "Card charged – please board the train". The passenger will also hear a sound, much like a fanfare, that indicates the fulfilment of the transaction. If the transaction fails, the passenger will see in red fonts an explanatory response along with a more "critical" sound. After successfully registering the card, the passenger enters the train. Using this alternative way of "buying tickets" implies that passengers travel without a physical token of their travel or a receipt.

Since the existing ticket system had its own procedures and physical architecture, comprising scanners and gates that had to be passed, the new system also had to adopt these procedures.

Figure 1: Card validator at the stations

Figure 2: The terminal's initial screen

At this point we need again to point out that the old system comprising physical tickets also had its design anomalies and weaknesses. The "workflow" of getting and validating tickets is asymmetric, and this asymmetry is emulated by the new system. The old system was used extensively, of course, being the only alternative. It is still preferred by the majority of travellers. The new system, on the other hand, is only used by approximately 1/3 of the travellers. We hypothesise that this is caused partly by the user interface, but mainly by users' lack of confidence in correct usage on their own behalf. With a paper ticket in their pockets, travellers can document right of access to the train. If interaction with the system fails, it is discovered immediately. This is not the case with the new system for ticketless travelling.

In order to get into the airport area, passengers who travel without a ticket have to swipe their credit card (again) at arrival in the *differently* modified validators (Figure 3). The new components are a LCD-screen and a card reader. The modified validators do not use sound as a status indication, like they did for boarding, instead the gates

open/remain closed. If passengers swipe their card in a card validator at a station, and then change their minds and choose not to travel with the airport train, they will be charged for a ticket anyway. If they enter the train without swiping the card first, and then swipe it at the airport in order to be allowed to exit the platform, they will be charged for the most expensive ticket, which is the end station, since the system then cannot decide where they boarded the train.

The adaptation to the existing ticket system resulted in a system that demanded from passengers that they learn *another* two different procedures, depending on the direction of travel. Modified entry gates in the airport were changed so they could read credit cards as well as scan paper tickets. The two sites were, thus, equipped with yet another set of different physical automata, card-readers and user interfaces, as shown in Figure 3 below:

Figure 3: Modified validator at the airport

The result was that user encountered new card readers on all stations' platforms. To assist novice users and gently enforce adoption by approaching customers who seem in doubt of their options, in the airport and the main train station there are now dedicated platform hosts who help passengers with the ticket automats and ticketless travels

The system is still subtly, but systematically asymmetric. Since the price varies according to stations, the system needs to compute the distance. Therefore the passengers have to swipe their cards twice on the outbound journey; before departure and at arrival at the airport.

Leaving from the airport, the passenger only swipes their card once, before entering the train. Here, they use the modified validators, which are similar to the ones they encountered on arrival at the airport. They must also pick which station they want, using the LCD screen. After the registration, they enter trough the gates, board the train and leaves at the chosen station. Swiping again upon arrival at stations coming *from* the airport, would be impossible. It entails physical barriers, which cannot be implemented on platforms which are shared with other trains.

Finally, ticketless travelling is only available to passengers who buy a full-fare ticket, and receipts are available on e-mail exclusively.

RESULTS

The following section describes a selection of situations observed during the ethnographic field study. The excerpts are presented as examples as well as stepping stones from which we elaborate on the 'ethnomethods,' which we observed that people in this public setting used to deal with unexpected situation in the presence of strangers. Thus, this section contains observations from a 'thick description' as well as the pertaining analysis.

It is important that the users of a system understand what happens, whether or not their action towards a system has a result or not and what this result entails. This is correctly done through giving the user good feedback, either as visible or audible hints. Our observations revealed that this was not always the fact for the system for ticketless travelling. Often, the feedback confused the users, and in some occasions even made them angry [7]. Surprisingly, as we will show later, we also discovered that the feedback gave some users pleasure. Some users expressed finding the system fun to use.

If a system gives unexpected or wrong feedback, funny or not, it makes it difficult for the user to complete an action. On the card validators, the feedback "Card could not be read", is meant to explain why a registration of a card is not successful. This message could be perceived as if there is something wrong with the card, leading users to give up and start looking for an alternative. For instance:

A man walks towards a card validator [at the main station]. He swipes the card [with the magnetic stripe the correct way, but slightly too fast], and get the message that the card is not accepted. He tries all the card validators, but get the same message. He tries all the card validators again, and still gets the same message. He walks over to the ticket machine, and uses the card to buy a paper ticket.

Even if there is nothing wrong with the card validator, it is perceived that way by the user. From the perspective of the system for ticketless travelling, it could be that the user inserted the card at an angle, that the users swipe it too rapidly, or actually that they swipe the card with the magnetic stripe the wrong way. This can be characterized as user errors, by the fact that the user does not do what is required by the system. As Norman (2002) emphasises, however, if there is a way for the user to do something wrong, some of the users will do it wrong. If the system affords that the user can swipe it fast or with the magnetic stripe the wrong way, some are bound to do it. Thus, it represents an area of possible improvement for the system, regardless.

Providing the wrong feedback is bad, of course, but the lack of feedback may be even worse, as the following excerpt shows:

A man is walking towards the modified validator on the airport, on his way back to the city centre. There are no

queues. He swipes the card with the stripe to the left, which is wrong and gets no feedback. He presses the finger against the screen, and then swipes the card again. He stares at the screen. He presses the finger on the Visa logo on the screen, and swipes the card again, which yields no feedback. One of the security guards at the airport sees him, and helps him with the procedure.

This situation is a good example of how missing feedback can affect the action. The card readers affords to be swiped both ways, and since the physical design does not give any clear hints (Figure 4), the result is that the user swipes the card with the magnetic stripe the wrong way. The lack of feedback makes the traveller look at the screen for hints for further action. When he presses with his finger on the Visa logo (thinking that it is an icon), a low beep can be heard. The beep will come independent of where he touch on the screen, and has no meaning for the system, anyway, since the transaction can only be started by registering the card. For the customer, this "false affordance" of a touch screen, can be interpreted as feedback on an action, and something that makes him keep trying.

The excerpts presented so far shows how the design of the system for ticketless travelling can make it difficult for the user to understand and use the system. During the observations, however, it became clear that some of the seemingly novel users found the audible feedback funny:

A group of four men approaches a card validator at the main station. They all stops and find their credit cards. Even if all the card validators are free, the form a line at the same validator. Man #1 swipes his card and gets the message "Card accepted, please enter the train". He reacts to the sound, looks at the other men and repeats the fanfare-like sound. The others laugh. Man #2 swipes his card, and it is accepted. Again, they laugh at the sound. Man #3 tries to swipe his card but gets "Card not accepted", and thus he gets the other, more negative sound. He tries several times, but gets the same message and sound every time. Everybody laughs. Man #3 lets Man #4 have a try, he swipes his card and it gets accepted. Man #3 tries again, and his card is now accepted. Again, they all repeat the sound and laughs, and head for the platform.

This situation shows how the audible feedback can be used in a good way to indicate whether or not an action is successful. The sounds that are used are of such character that it appears to be coherent, between the sound and the textual message. We found, however, more examples that people travelling alone found the negative sound awkward and embarrassing, especially when there was a queue behind them. This indicates that the social nature of public IT can be a positive as well as a negative *resource* for the individually-oriented interactive sessions. Our findings, hence, point towards explicitly including these dimensions in the design work, rather than leaving such effect to chance.

Figure 4: Screen on modified validator at the airport

At the airport, the airport train company has hired security guards who have the responsibility of getting the passenger trough the modified validator. Sometimes, they even have to interfere with the hardware:

A woman wants to travel from the airport to the city using her credit card as a ticket and approaches the platform host to get help. The host walks with her towards the modified validator.

Platform host: "Just swipe the card here, the [magnetic] stripe towards me." The woman swipes her card […] and chooses destination on the LCD screen

Platform host: "Just press OK and enter."

Woman: "But where do I get the receipt?"

Platform host: "You can't get a receipt here. To get one, you have to register your credit card on the internet"

Woman: "What? [Noticeable shocked]. No, then I don't want to travel like this." She chooses STOP [instead of OK], but this doesn't cancel the transaction, it only gives her the opportunity to pick destination again. "How can I cancel this, then?"

Platform host: "Eeh, the case is, since you have already swiped your card, you can't cancel it now. It's too late."

Woman:" What are you saying? I don't want to, I'm telling you now [irritated]. You have to fix this!" The situation is solved when a security guard, who is hired by the airport train company, opens the modified validator and restarts it. In this way the transaction will not be completed.

Consider also the following excerpt:

A train with departure from the airport is cancelled, and many travellers return from the platform and want to return their ticket in order to get their money back and

use other transport to get in to the city. Those passengers who have bought a paper ticket, easily get their money back [but the company cannot do the same for those who travel ticketless since there is no way of knowing which station they chose, and therefore how much money to return]. They instead get a card with the telephone number to Customer Service, which many finds irritating.

A man runs towards the platform at the main station. He stops and asks loudly if he can buy the ticket on the train. The platform host explains that he cannot, but that he can swipe the card [in the card validator], and just board the train. He swipes the card and runs towards the train, but miss it, and then return to the platform host. He wants to refund the ticket. The platform host explains that he needs to talk to Customer Service in order to get the money back. The man gets irritated. He asks if he can use the ticket in three weeks, [which he cannot]. He ends up waiting for the next train.

These are typical examples of *irreversibility* in action. As explicitly recounted by the platform host, once a card is swiped, the action cannot be undone. Even in a "one-step" system like the one furnished at the central station, it would be possible to implement a smooth cancelling routine.

According to the security guards, a lot of passengers who wants to travel ticketless press their card in the scanner for paper tickets. This is an extreme, but telling example of the *forceback* phenomenon:

Security guard: They just press it in [into the ticket scanner], the card you see; even if they can't do it. They don't see that they are supposed to swipe it up there [points at the card reader on the modified validator]. And then it gets stuck, and I have to open it [the validator] and take it out. And then they get angry at me for missing their train.

To a larger extent than for office systems, the support functions associated with the technology, are associated with the "opposition", the vendor or trading partner, against whom a legitimate claim of service can be posted. It must be seen as a *proxy*, rather than a medium or a tool. This is further exacerbated by the fact that public space systems usually are directly connected to having to pay for using the system or associated service. In the office, IT support is, by and large, "one of us". In the public space, they are "one of them". This is no argument in favour of discharging the support staff, however. Although individual users will become more proficient over time, and public space systems which are sufficiently complicated (or located in a sufficient interesting environment) is going to continue to attract novice users and user from a different linguistic or cultural background. Assistance will be needed, but, as we shall see, assistance also attracts unwanted attention. The following excerpt shows this clearly:

A company of 3 people [two men and a woman] approaches a card validator on the main station. The two men swipe their TPC card and register successfully. The woman does the same, but gets an error message along with the audio alarm that indicates that she has not registered her card. [In order to use a TPC card, the airline company must have activated it]. The staff member comes to help, and the woman says that it's supposed to work fine. She gets embarrassed in front of the two others and asks why she gets an error message that says that her card is not activated when she knows it is.[…] The platform host swipes her card in another card validator and gets a successful transaction. The party discusses the situation, and the need of help in order to understand the system.

This excerpt thus clearly illustrates one problem of public space systems, which ought to be clear-cut and obvious, but nevertheless is often not accommodated by the design. Attracting assistance, which is going to be welcome, is not supported technologically. This is unfortunate, inasmuch as assistance in public situations is more often than no better received if it is offered with discretion. In order to get noticed by the platform host, the failure to use the system needs to be publicly displayed, for all third-parties to observe as well. This is also, in one sense, a forceback-situation. The user has to follow the available yet undesirable path of failing *visibly*, in order to get the help that he or she needs. In this case, the system might have been implemented to invisibly buzz the platform host in case of, e.g., a card failing to be read.

In the public space, other people can see what users do, almost all the time. Several passengers expressed that they were uncomfortable using the system when there was a queue behind them. They felt that that if they used too much time, e.g. when the card reader would not register their credit card the first time, they would obstruct others from catching their train. A small fault, such as a scratched or dirty card (or a card validator with a faulty reader) would make them stand out; *protruding*, as it were, in front of their peers as an "unsuccessful" user. There is little sympathy to be read from the gestures of fellow traveller, as they look with disapproval at the person slowing down the line in front. Aggravating the situation even more for the user, is that the actual operations performed, which may be the expected and correct ones and exactly the ones fellow travellers would apply themselves, might not work. Thus, even if failure as such attracts well-intended attempts from bystanders to offer help, a more *understated* mechanism which subtly drew the attention of competent assistants from the airport train company, seems likely to be more welcome.

DISCUSSION

The train company thought that they had to create a system with a different workflow for outbound versus inbound journeys. There is no exit from the outbound

train before the airport, and the entry station is implicitly known. On the return journey, the situation is the inverse. System learnability is of course hampered by the resulting asymmetric design and clearly a more consistent solution would have been better. Nevertheless, the fieldwork described in this paper shows that the challenges of designing for use in a public space go much further.

The observable behaviour of people is not easily matched with their intentions. This is different from face-to-face, or even a more "closed" setting in which members more easily direct the action in a socially accountable way to ward explicit communication partners. Moore et al. has in a paper dealing somewhat analogously with online games, described this:

"*In real-life face-to-face, participants use a variety of kinds of observational information about what others are doing in order to interpret others' actions and design appropriate responses. In other words, accountability and tight coordination depend on participants' access to these kinds of observational information. Three important types of such information are: (1) the real-time unfolding of turns-at-talk; (2) the observability of embodied activities; and (3) the direction of eye gaze for the purpose of gesturing [17], p. 274."*

In the case of online games, avatars project more poorly this information, which makes online actors less accountable in a deep sense. This is, however, an unwanted side effect of the technology. Developers will keep looking for alternative media, and the technology will eventually improve. In our case, on the other hand, the design is intentionally *uncommunal*, with regards to the projection of "what others are doing" when they are users. Self-service systems, such as kiosks and automata in the public space, are usually individually oriented, and consciously private-by-design. But this does not prevent the projection of information; it only limits it and thus makes it annoying or even embarrassing sometimes. In a public space, similarly, non-users cannot avoid assessing as accountable their fellow users. This means trying to figure out what they are doing and by which rationale. Empathy as well as user support suffers from lack of rich and correct information, as we have shown. This is one novel aspect of our observations compared, e.g., to the seminal contributions of Harold Garfinkel and Erving Goffman [4, 18]. Interaction with "no-one in particular" does not mean that members are not concerned with how they appear to others, nor will they want to be unable to account for their actions, at any time, in a way that is reasonable and acceptable. Observers will want to be able to find reasonable and acceptable explanations of what they see. In terms of usability, however, the problem is that observers will not generally be able to link what they see with what the (current) users would ideally like to project, unless the principles constituting a sociable system have been acknowledged. As the excerpts above have demonstrated, the user may or may not be aware of this, and both alternatives may be equally problematic and come out as an embarrassing mismatch between perceived performance and projected intentions. This is a deeper finding than simply to state that a system ought to be designed so that it is predictable based on previous experiences, since it concerns the interaction between variously experienced users and non-users [19], as it were, as well as the user and the system. Aligning interaction with cognitive models is not the biggest problem. Making the process of aligning such models socially accountable in a productive fashion on the other hand, is a real challenge.

It might be wrong to see public IT as individual applications of office IT in just a different environment. Instead, they seem to resemble virtual worlds, within a mainly physical medium, with regards to many socially oriented aspects of interaction design. Another interesting characteristic of public terminals, which support this perspective, is that they are exactly *not* perceived as "terminals". They are not neutral media, which are only there to offer a service in a submissive, yet inflexible fashion. The users do not seem to see the system as such as their interaction partner. It is instead seen as a representative, for which we submitted previously the notion of it as a *proxy [7]*, between the user and the company for which it provides a service (or even the designer, who created it). Users see an active party interfering with their lives. This means that they demand a rationale for the design, and that they need to come to see the underlying model as reasonable given the enforced pattern of action. They want to know, from the platform assistants, why the system is asymmetrically designed. They do not accept that they cannot get receipts immediately. User look for alternative paths, applying necessary *forceback*, if they approach the system with one model of its behaviour and then find that the system challenges this model. It is not because users cannot learn new functionality or adapt to a different dialogue design. It is because they "have a plan" and the plan is embedded in broader social patterns, expectations and intentions. This is exactly why a system needs to be designed so that it is *sociable*. It is a notion, which comprises taking into account the diverse needs of users to communicate openly about what they are currently doing, and why, and to work privately when that is necessary. This is, however, not a simple trade-off of choosing one or the other. The projection of incompetencies, which may be needed to attract assistance, is perhaps usually exactly the same that will make users feel embarrassed. Thus, the sociable dimension might seem like a paradox in discrete, technical terms, unless one adopts the distinction between *manipulation* and *effect*, introduced by Reeves et al [20]: *Manipulation is the set of actions, directly or indirectly applied to the user interface and even to some 'non-operational' actions which may even to some extent be directed towards eventual spectators, such as intuitive or reflexive tapping or hovering above the screen. Effects, on*

the other hand, are the outcome of these manipulations, in terms of changes in the applications interface, or the observable effects of using the application of the users themselves.

Looking at the exterior design of the ticketless travelling automata at the airport train (Figure 3), it becomes clear that its design affords none of these types of "performances". Visibility is one of the most important principles in interaction design/HCI. The prominent components must be visible and communicate the correct message. An artefact is easy to use if all possible actions is visible and mapped [12]. For the system of ticketless travelling this would be associated with the card readers and the screens. Our observations show that this is not currently the case. As described earlier in this paper, a lot of travellers at the airport try to push their credit card in the ticket reader instead of swiping it in the card reader (circled in Figure 3). The ticket reader (the bottom circle) is the more visible of the two, it even has an arrow that indicates that you shall put something there. It may, for some, seem like it is afforded to press the credit card into this slot. This is mainly, of course a problem for first-time users. If a user has learned the lesson by actually putting the credit card into the ticket reader (a security guard must open the machine to get it out again), they are not likely to do it again. These situations could easily be avoided if the card reader were more visible so the first-time traveller would be likely to see it at once. With an optimal design travellers would swipe their credit cards in the card reader and put the paper ticket in the ticket reader, of course.

Today, there is no standardized way of swiping a credit card in a terminal, instead there are subtly different solutions for each system, many of which have implemented their own ways of swiping a card. When designing a new system, such as ticketless travelling, the designers cannot benefit from *cultural constraints* or other conventions, and the users probably do not expect the card to be swiped one way or the other. So in order to get the user to understand which way to swipe the card, the design has to make it clear. At the card validators at the stations this is done an instruction on the screen (Figure 2). For the modified validator at the airport, the only clue is a figure on the screen (Figure 4). In order for the users to understand how to swipe the card, they must get clues from the design. One possible way would be to benefit from *natural mappings* and place a line on the card reader at the modified validator (Figure 5).

Figure 5: Suggestion for card reader

The hardware is fitted into a post, which is decorated with signs and placards, which are enormously attention-seeking. This is understandable, since the company of course wants the public to become aware that this service exists. It is also very typical of public space IT. Strikingly, on the other hand, the interface is made small, discrete and private. There is nothing that can aid users in forming mental models before they start using the system for the first time, nothing to bolster empathy of currently active users and no way that they can present the 'self' in a favourable fashion, nor invite casual onlookers to come to their assistance.

Figure 6: Attention-drawing yet un-communicating

Therefore, in a fashion which is just like the more performance-oriented notion of Reeves et al.'s "spectator experiences [20]," we think that an IT system for use in a public space, may be made more sociable if the trade-off described above also includes allowing the manipulation to create effects, which are different from simply observing the manipulation.

In the seclusion of our offices and with time at our hands, workarounds are a true possibility and they work well most of the time. Thinking on our feet, literally, having to make our minds up about the next course of action in a matter of seconds, we look for alternatives. Creative solutions, which might have been acceptable (even fun to try) if devised in real privacy, are not so tempting surrounded by curious onlookers. Protrusive systems may make us look bad and feel bad. The alternative is, in the moment, either to miss the train or get a paper ticket which does the job. Most people find that they have to get

to the airport, and they prefer to be able to get there in a certain style.

The matter of style is an obvious point, but one that we still find users using the system wrongly in order to attain for themselves, via *forceback*-principles. Whether it is a matter of pushing plastic cards into the ticket scanners or swiping paper tickets in the card readers, it seems not to be in lack of clear instructions, although they are also sometimes unclear or outdated. Nor is it a matter of affordances, since credit card readers are, arguably, one of the most widely dispatched, used, and stylized devices that exist. Similarly, most travellers know paper tickets in standard format, and the ticket scanner matches the width of the ticket exactly. So why forceback by shoving a credit card into the scanner? Failure is embarrassing, and persistence seems to be one way of dealing with pressure. Another common strategy is to give up entirely, and stop using the system. A missing or ambiguous response from the user interface upon attempting to scan a credit card or swipe a ticket, might lead users to try again, once. However, the attention of on-lookers makes it harder to read instructions, interpret system responses and use the creative capacities of human users so easily invoked in the office. Forceback or rejection are common and thus, better usability for such systems is clearly needed. Designing a system to be used in a public setting, therefore, the indication of system affordances and the constraints pertaining to possible operations, needs to be narrower and firmer, it seems, than in office designs. The social perspective, in parallel ought to be more aligned with collaborative than personal applications, although the intention of use is purely individual.

CONCLUSION

Many systems, albeit intuitively simple and useful, often do not work as well as expected. This paper has, in particular, reflected on usability and user performance as it is enacted in a public space. This is an emerging field of great importance, as kiosks, automata and Internet terminals at a growing rate replace human agents. Moreover, it furnishes unique design challenges, since users are observably sensible to the fact that they are users in a public space. Based on an ethnographic study of the usage of a ticketless travelling system for an airport train, we have suggested that usability models and design principles traditionally advocated by HCI are not sufficient for the public space, primarily since they do not take into account the need for individuals to negotiate their relationship to unknown strangers.

We have, in this paper, reiterated over the importance of such systems as being *sociable*, which means that the design ought to aid the presentation of the user's *self* towards fellow users and non-users, in a positive manner [7]. Moreover, we have added to the existing and intuitive importance of *feedback*, the notion of *irreversibility* and *forceback*. Even concepts such as *understated* mechanisms of computing and *communal* designs, have been outlined in this paper. We see all of these categories comprising a bigger notion of sociable systems, which require a different design philosophy from office IT.

We see these dimensions as contributing, together with theoretical concepts previously presented (*protrusive* designs and the system as a *proxy*), to a design framework for usability of IT in the public space. On a theoretical level, we have tried to show party how designers trying to match the individual users' private cognitive models and plans with an interface, is likely to be unsuccessful, in terms of replacing experience.

Cognitive models are of course not objective and given. For all users they are different, albeit probably converging through experience. It a simple, yet important point that a system that goes against the long-term experience of users, e.g. with respect to train journeys being symmetric with regards to the ticket purchase for independent journeys, is going to be seen as more difficult to learn. This paper makes an even stronger point, which is that these ideas about a system and its use are shared resources of interaction with the system, with users and non-users in the public space, and that users see each other as accountable (in an ethnomethodological sense) for their "cognitive models" and plans. All such resources become parts of a socially oriented interaction with the IT system, which may embarrass users and create resistance if this aspect is not taken into the consideration of usability. This insight may indicate a need to look again at some design guidelines for interaction in HCI. For interaction design to make the move into the public space, its design framework and usability principles needs to be extended accordingly. This paper is intended as one contribution in that direction.

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