Hard-To-Use Interfaces Considered Beneficial (Some of the Time)

Yann Riche
Riche Design
Seattle, WA
contact@yannriche.net

Nathalie Henry Riche
Microsoft Research
One Microsoft Way
Redmond WA 98052, USA
nath@microsoft.com

Petra Isenberg
University of Calgary
Calgary, AB, Canada
petra.isenberg@ucalgary.ca

Anastasia Bezerianos
MAS Laboratory
École Centrale, Paris, France
anastasia.bezerianos@ecp.fr

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Abstract
Researchers in HCI share a common understanding that 'easy-to-use', 'easy-to-learn' and 'intuitive' interfaces are beneficial to users. Designing such interfaces raises challenges and often requires multiple iterations. While we are generally prompt to discard more hard-to-use interfaces and smooth out usability issues, we want to raise here the issue of their potential benefits. We describe two cases in which we observed potential benefits from introducing barriers for collaborating and communicating with others. We attempt to shed a new light on interfaces with usability "problems" and how these problems may benefit system efficiency and user experience. We end with a discussion of the pros and cons of making systems harder for people to use, and how to integrate this perspective in the design process.

Keywords
Easy-to-use, hard-to-use, user interfaces, usability, user experience

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design, Human Factors

Introduction

Publications in HCI often refer to ‘easy-to-use’, ‘efficient’, and ‘intuitive’ as beneficial characteristics of an interactive system (see for instance [1] and [5]). This emphasis on smoothing out difficulties in users’ interaction with the system has led to designers and researcher placing a large emphasis on avoiding usage barriers and providing features to ease the execution of a task, including communication and collaboration. Building such systems often requires multiple iterations and a strong interaction with users either during the design or through usability studies.

Our own experience as researchers and designers provides examples of how often interfaces with well-known usage barriers and usability issues are promptly discarded. When building interactive systems, we often rely on our past experience and our knowledge of interaction heuristics to avoid introducing potential usability problems. If known usability problems do appear within our systems, we rarely linger to understand their effects since we consider their usability and usage issues a priori harmful. Yet, similarly to [7], we question the wisdom of this approach in the face of systems designed to be integrated in a more complex context, and in particular for systems designed for collaboration and communication. Fifteen years ago, Gilmore already challenged the wisdom of focusing on the optimization of operational control over the importance of user experience [4]. It is already acknowledged that barriers in interfaces can benefit game play [6], learning [2], to guide users to improve their efficiency with advanced features [8], and more broadly the experience with a system [3]. Yet, little is known about how such barriers can positively affect users’ experience beyond those specific domains, or what the failure to consider the benefits of these barriers might lead us to.

In this article, we relate two events that shed a different light on interfaces integrating interaction barriers in collaborative or communication systems. In the first case, we revisit the effects of a bug to which participants were exposed by accident during an experiment on co-located collaboration on an information visualization system [10]. We discuss the effects of this particular usability issue and describe how it affected the user experience but also how it may have enhanced turn taking and mutual awareness during the collaboration, achieving a better quality of results. In the second case, we describe how older adults in a recent research project [14] reported valuing ways in which people overcome barriers to communicate.

Based on these cases, we re-initiate the discussion on the possible benefits of willingly integrating barriers and limitations in user interfaces. In this paper, we refer to systems in which some of the interaction is limited, hindered, or cumbersome as *hard-to-use interfaces*. Hard-to-use interfaces do not necessarily mean that the overall experience is hindered, but that they integrate features that may be cumbersome to use. We insist that this paper does not argue that bugs or interactions are desirable, but rather that they can provide new and interesting perspectives on the design at hand, if considered carefully. We want to emphasize the potential benefits of these hard-to-use interfaces with respect to research and design, and try to identify how to achieve the fragile balance between user frustration and richer experience.

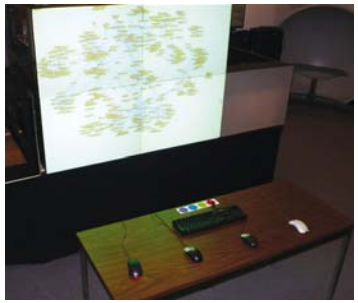

Figure 1. Setup of the experiment

Collaboration Barrier… or Not

While the field of information visualization is moving towards more collaborative systems such as ManyEyes [17], the very large majority of existing systems are designed for individuals. Strongly believing in the potential of collaborative visual analysis, we studied how to retrofit an existing graph visualization system to support co-located collaboration [10]. To evaluate the quality of our retrofitting, we asked one pilot group and another eleven groups of four people in three different research organizations to analyze their co-authorship network and create a poster to illustrate the research collaboration within their institutions. Using the collaborative graph visualization, groups had to create meaningful groupings of researchers (co-authoring multiple papers together or belonging to the same research group for example), to label them, and to arrange the graph layout in an aesthetically pleasant manner.

Altered co-located collaborative experience

We retrofitted an existing graph visualization system and allowed four mouse inputs to manipulate a single visualization projected on the wall in front of the participants (see Figure 1). Coincidentally, during our pilot study session, we discovered a bug in the management of multiple mouse pointers. The mouse pointers were dependent on each other, causing slight deviations on a given mouse pointer when the others were moving at the same time. In addition, this pilot group also experienced hardware performance issues at some points in time, causing the system to slow down when too many actions were performed at the same time.

Before describing the positive and negative effects of this inadvertent co-located experience, we would like to make our reader aware of the fact that this experiment was not designed to capture the effects of such situation and that these effects were not controlled. We are not attempting to justify the presence of the bug—which was in fact fixed for the actual experiment—but rather report in the following sections our observations and hypotheses to initiate a discussion in our community. Further experiments and evidence are required for asserting of the pros and cons of introducing barriers in co-located collaborative visual analysis.

A change in analysis and collaboration strategies

As our pilot group was composed of computer scientists, they discovered the malfunction and its cause quite rapidly. The bug only slightly affected the mouse movement, and we observed participants in this group change their behavior with the system only when precise actions had to be performed (for instance a complicated lasso selection). In these cases, participants paused in their interaction on their own and let others perform a given task; or explicitly asked their collaborators to stop their interaction for a short period of time in order to undergo their actions requiring fine movements of the pointer. Compared to the collaborative experience in other groups, the experimenter had the feeling that these participants reached a higher awareness of each other's actions. While many factors might have affected this outcome, we hypothesize on the role of these pauses in the interaction which allowed individual team members to more frequently observe what others were doing.

Overall, we observed that the participants changed their behavior and tried to minimize their mouse movements and the number of complex interactions to improve their collaborative experience. At one point, instead of creating multiple smaller groups requiring

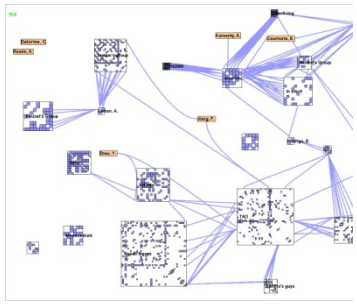

Figure 2. Result of the pilot group

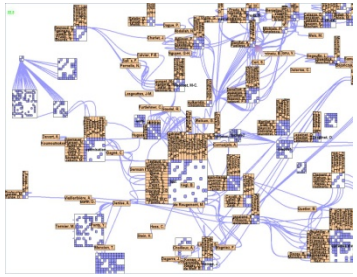

Figure 3. Results of another group

precise lasso selections, these participants created a single very large group and then collaboratively removed elements from it. Interestingly, this strategy proved very effective in the end and led to results of good quality (groupings made were sound, clearly organized in space and appropriately labeled in a short period of time) compared to other groups. In the pilot group created an almost complete actor grouping and community naming result (study task), and took steps to beautify the layout by removing unnecessary actor labels and minimizing edge crossing. shows results of another group, typical of the final result in most groups. The task of grouping actors and naming communities is not as refined or complete as the pilot group, and little effort has been made to improve the appearance result.

Channeling user frustration

As we previously mentioned, this pilot group also had to perform their collaborative task with a low-performance machine. Thus, they encountered rendering lag on several occasions when all four people performed complex actions at the same time. Both this lag and the bug made the system sometimes cumbersome to use and, throughout the session, the experimenter noted a rising frustration amongst participants. For example, one participant expressed his frustration out loud: *"Oh no! What is it* [the system] *doing now, what did it do with my item?!".* In fact, the experimenter perceived that the group somehow teamed up against the system. When frustration was raised against it, the rest of the group would stop its task, ask the frustrated member what the problem was and try to find a solution to help him. This led to greater awareness within the group and a tighter communication and collaboration amongst team members than would possibly have occurred had everyone been able to work in parallel unhampered by system performance.

User feedback

At the end of the study (and pilot study), we collected qualitative feedback from participants about their collaborative work, the task progress, and the system. Surprisingly, our pilot group that did experience both bug and lag did not emphasize negative points in regards to the slowness of the system but rather the difficulty of the task and the analysis itself, similar to other groups in the study. Surprisingly, despite being strongly affected by the bug and lag, our pilot participants commented having enjoyed their experience and stated that the task would be too difficult to do alone.

Concerning the group awareness, participants in all groups (including the ones in the actual experiment) commented that they gained awareness when they stopped interacting and watched the overall group progress. Participants in groups not affected by the lag commented that they also stopped to watch the group activity. However, they mainly did so when they felt stuck or were finished with their current tasks. In contrast, we observed that participants in the pilot group had interruptions at different points in time and that during these interruptions they often used the times in which they were unable to interact to help others. While it is difficult to assess the benefits and drawbacks of such behavior *a posteriori*, it raises the question whether the introduced lag encouraged better awareness and communication between group members.

An enhanced collaborative experience?

All participants including the pilot group commented that they had low awareness of the work of others and

Figure 4. Participatory design sessions with older adults

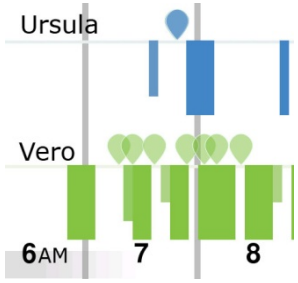

Figure 5. Vero used the simple symbols to celebrate Ursula's birthday by sending 7 symbols over a two hour period.

that additional awareness features would be beneficial to include in the system. Our observations led us to wonder whether, on occasions, bug and lag issues did not force participants to interrupt their actions and to pay better attention to what others were doing, thus improving group awareness. We also observed that these issues introduced different analysis strategies and collaboration styles. For example, these barriers caused participants to minimize their mouse movements leading to unexpectedly good strategies and better performances.

As described earlier, introducing bugs or lag had also drawbacks. In particular, it may raise users' frustration and potentially discourage less motivated users. However, we observed an interesting counter-effect where participants would team up against the system. We observed that the bug led our participants to assist each other more often than in other groups. In this case, channeling people's frustration against the system may have enriched and stimulated the collaboration. While in most of the cases usability issues cause negative effects and are quickly discarded from user interfaces; this serendipitous positive experience raised our attention on the potential benefits of hard-to-use interfaces.

Ease of Use and Computer Mediated Communication

In an earlier project [14], we conducted workshops with older adults to design novel communication systems which would reflect their desires and values and support aging in place (see Figure 4). The initial focus was to design easy-to-use devices called "communication appliances" [11]. Seven women and one man participated in the study, all aged between 62 and 88 and living independently. The study ran over the course of eight weeks and comprised six workshops, each lasting about two hours. It included various design activities, and in particular left room for discussion of the researchers' interpretation of the insights from previous sessions and of important topics raised during the design process.

Value in Communication

During our initial discussion, participants reported finding digital communication less attractive than traditional ones (e.g. letters, phone). For various reasons, they perceived communication exchanged over a digital medium as less valuable because it is easier to create, and less sensual. Participants explained finding a special value in the effort others made to create and send messages. In particular, they often disregarded the use of SMS or emails as being easy to use, and as such, of no consequence. A letter, for instance, requires more effort than an email; it must be put in an envelope and posted; it takes more time to arrive to the recipient; it is physical and personal; and it can last centuries. Discussion of this phenomenon led to the realization that showing that the person has put some effort and thoughts in the communication was particularly appreciated by the participants. Digital communication devices were considered tools designed to make things easier, whereas the effort used to create the message, or the difficulty to send it, was considered as part of the message's worth and reflecting the engagement of people in the conversation and hence in the relationship.

In a subsequent field deployment [15], we observed that an older woman fitted with a device capable of very simple communication (using three predefined

symbols) would use creativity and re-appropriate the technology to craft new, more complex messages. The effort spent crafting one simple birthday greeting involved sending the same symbol seven times over a period of two hours (see Figure 5). The recipient of the message later reported having felt valued by the effort and the creativity involved into hacking the simple messaging system to wish her a happy birthday.

Increasing the Worth of a Message

More generally, we believe this phenomenon is not restricted to older adults. Our informal questioning of friends and colleagues revealed that most would spend extra time crafting letters or emails to special people, e.g., close friends, family, loved ones. They would rely on less labor-intensive means of contact for a larger group of people such as Facebook status updates, blog entries, or group emails. However, using these systems, some people attempt to create messages where the effort and care put into communicating is apparent and explicit. Letters are hand-written and decorated; emails are sent individually and reflect personal connections; and twitts become poetry.

This regard of messages as artifacts which are being exchanged to establish and maintain a relationship mirrors Mauss' concept of gift exchange [12]. While this perspective has already been mentioned in the study of texting phenomenon amongst teenagers [16], little work has been done to understand how messages, considered as gifts, were given a value both by senders and receivers of a message and consequently how this perspective can be used to inform or inspire the design of communication systems.

During our workshops, participants' concern about their lack of ability to use their skills to fashion messages to exchange with their social networks highlighted their need to generate explicit value, which can be perceived by the other person in the relationship. The value of a message can be different from both ends of the exchange. On the one hand, the fact that the sender spent a considerable amount of time editing the letter can be entirely lost to the receiver, since this part of the process might not be explicit. On the other hand, receiving a long hand-written letter from someone who usually sends brief emails can be very meaningful to the receiver. As a concrete example, many participants reported sending personalized hand-written postcards to friends and family during holidays, and that younger generations often failed to reciprocate. In this case, the value of a postcard is not necessarily relevant to people who do not send any. The perception of messages' value, when created or received, is relative to people's culture and interpersonal relationship. As such, the cultural differences between the elderly and younger generations, especially regarding technology, can impede the perception of value.

Making it Harder, or Designing to Create Explicit Value

When regarding communications as a way of establishing and maintaining of relationships through the exchange of messages (gifts), systems designed to support communication serve to not only transmit (carry) a message (gift), but also to create (craft) it. The implications for systems design are many. When considering effort, one could design a system that explicitly makes it difficult to create a message, requiring skill, commitment and time. In other word, we could consider designing hard-to-use communication systems whose usage would explicitly imply an effort being spent in the

relationship. For instance, we could design a system where a person must sustain the means of communicating, like a plant. If the plant is not doing well, the person is unable to send messages. The commitment of the person in the relationship is reflected in the commitment in maintaining the plant[1].

Yet, spending time and effort crafting a message might imply that fewer messages can be sent, or that they may be less substantial in content. Other easy-to-use communication systems, such as instant messaging systems (IM), facilitate both frequent and informal communications. In fact, many existing technologies allow some kind of re-appropriation necessary for users to create more valuable messages with easy-to-use systems. Yet those often imply making a complex task out of something initially easy. Thus, rather than advocating that existing systems do not allow the creation of valuable message with their focus on ease-of-use, we suggest that we could design communication technologies with more emphasis on how messages can be crafted, and how the effort of creating and sending a message can be made explicit to both sender and receiver.

Moreover, we believe the emphasis on the effort required to send a message can partially explain the success of popular social networking websites such as Twitter or Facebook. These systems further ease the exchange of simple, small, or group messages between wide social groups, and thus provide an explicit support for informal and loose connections between individuals.

[1] This concept is coincidentally similar to the representation of your communication with yoru social network as a garden by John Kestner: http://web.media.mit.edu/~jkestner/

We argue that these systems have lowered the stigma put on people using technology that permit crafting (e.g. letters, postcards) without using this capability. If people can spend time writing a long email to their grandma, why did they only send one line? On the contrary, if all this system allows them to do is to send 140 characters, no one will ask why they did not do more (although, one might ask why they did not use an email instead).

On the one hand, a system can be artificially and explicitly made hard-to-use, allowing users to demonstrate their commitment to the communication yet probably implying less frequent messages due to the efforts required, and possibly some frustration. On the other hand, a system can be made easy to use, allowing more informal communication and more frequent exchange of information, possibly at the detriment of its ability to effectively sustain a relationship.

Making Interaction Harder Considered Beneficial (Some of the Time)

In both of the above examples we examined systems that had features which *a priori* we would have discarded as causing usability issues and frustration. In both cases, we were surprised about the possible usefulness of these barriers for the overall communication and collaboration process. This led us to think that introducing barriers may be beneficial some of the time. While our cases focus on collaborative expe-riences, we also wonder if interaction barriers might not sometimes be beneficial in other contexts and domains.

In the case of the collaborative information visualization system, the initial design idea was to improve collaboration by allowing every team member to edit the

visualization simultaneously, each using his or her own mouse for moving one's own cursor. In groups without the accidental bug, team members worked on the task in parallel for long time periods. At the end of the experiment, many participants asked for additional visualization features that would allow them to better remain aware of other team members' actions while performing their own interactions. In contrast, we felt the participants were more aware of each others' work during our pilot study. In this case, we believe that the accidental bug might have been beneficial to the collaboration because participants were forced to pay attention to interactions of their peers. Previous work established collaboration rules and policies to explicitly force people to become closer collaborators [13]. However, our bug had the advantage to provide an *implicit* effect and made the group become closer "naturally". Understanding the pros and cons of such implicit policies and how to introduce them in collaborative systems is an interesting aspect to further investigate.

In fact, when we discovered the bug during the pilot study, we quickly fixed it and performed the study. After analyzing the videos and results of our 11 groups (without any bug) as well as the comments of all participants, we identified the need for more awareness. We brainstormed on several visualization techniques to enhance our tool with awareness indicators and also reanalyzed the pilot study in which we remembered that participants had been more aware of each other. It was not until then that we noticed that features which would require certain team members to stop interacting at certain points (as with the bug), could be viable design solutions. Even if introducing a bug or lag into systems does not turn out to be the best solution in the end, we believe that studying how people react to and work around a usability problem can, in certain cases, lead to a more complete set of design considerations and in the end to possibly better systems. To go a step further, while we may often fix a tool as best as we can before a study, sometimes a less perfect system may encourage participants to creatively work around it and potentially lead us to more interesting design solutions.

Similarly, communication systems, as in our second case, are often designed to make it easier for people to exchange information. The reaction of the older adult participants in our project suggests that they sometimes perceive the ease of use as diminishing the value of the relationship it is supposed to maintain. When designing computer mediated communication systems in the workplace, the emphasis is often on exchanging information (e.g. reports, meeting times, and workload awareness). While we were wary of avoiding a generalization of these concepts to the home, we initially focused on this exchange of information and overlooked the gift-exchange aspects of social communications. Our collaboration with users pointed out that from an interpersonal relationship perspective, the difficulty of the task added value to the result (for example the cost of creating a message). While our experience took place during the design of communication appliances for a specific population, we believe the discussion presented here can shed a different light on communication systems for the home and the workplace. In addition to the role of information and awareness, this observation underlines the inherent personal involvement in exchanges.

Generally, we would like to raise the questions whether we sometimes label features as usability issues too early. Sometimes it may turn out that specific aspects of

systems that are well known to cause usability issues in one context but may well be supportive in others. It is an open question what types of systems could benefit from introducing what would normally be called "interaction barriers" - to support communication, awareness and relationship building. We wonder if systems that do not deal with collaborative situations could benefit from occasional barriers in the interaction, as is already the case in learning [2]. We question whether barriers can be used as a way to explore users' solutions in user-centered design. Used as technology probes [9], could hard-to-use systems allow some radical exploration of design decisions and help us to build on seeing how a group is able to overcome issues creatively? Technology probes allow researchers to expose end-users with design concepts which might be voluntarily limited. As a result, they encourage users to react creatively and provide an opportunity to better understand the various aspects of a design problem in the absence of clearly defined practice. Results from observations could be used to challenge assumptions or to inspire novel solutions.

Our findings are based on limited observations, yet they raise several questions regarding the design process and its focus on swiftly removing known usability issues. If we accept that some barriers to interaction can be potentially beneficial, how can we make the difference between a useful barrier and a useless one? How and when should usability issues be smoothed out so that useful side-effects are not ignored, an issue partially discussed by Greenberg and Buxton [7]? Fixing usability issues early in the process might lead to ironing out useful or innovative features, yet performing it too late might overburden users.

More broadly, we need to better question how people overcome something considered "hard-to-do" and what the benefits of this process are. Often the benefits of overcoming a complex task has added value. For example, unplayable GameOver [6] was created to teach game programmers guidelines for accessibility design, thus integrating a large number of usability issues and making the game really hard-to-use. Yet, it raised entertainment value for a number of players. We believe that identifying the right barriers and experimenting with their potential benefits and drawbacks can lead to enhanced social experiences and possible design breakthroughs.

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