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Human-Centric Design of Unified Communications:
e-Collaboration Features

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ABSTRACT

This article describes a co-design process in the context of user experience (UX) and usability testing and analysis of a first proof of concept of e-collaboration features based on unified communications, co-designed within an organization aiming to optimize users' communication cognitive load. An initial digital prototype with a detailed graphical interface, and simulated user narratives was established and the qualitative validation process is described and discussed. The implemented R&D process is mainly supported on user-centred design (UCD) methodology, namely action research with service design thinking method and co-design techniques. Qualitative data was gathered with concurrent think-aloud activities (CTA) stimulated by user experience expectation questions, observation notes, with integration in an eye tracking technology system. The UCD process and results are discussed, substantiating the added value due to the individual contributions and consequent usefulness of a final unified communication service for the organization.

KEYWORDS

Collaborative Design, Eye Tracking, Unified Communications and Collaboration, Usability, User Experience, User Testing

INTRODUCTION

This paper describes a co-design, development and assessment process of a first conceptual, low fidelity prototype with an innovative UX and Usability test analysis for "Smart Entercom" project. This project runs in collaboration with GoContact, a company dedicated to solutions for Business to Client (B2C) interaction. The project's goal is to co-create a human-centric novel Unified Communications & Collaboration (UC&C) service aiming to optimise the company's human interpersonal communication and interaction, consequently, the performance of each individual with the optimization of their cognitive load. The project's transdisciplinary research team is divided in different work packages, such

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as: context awareness, software defined networks communication systems, interaction and interface design, and product development. The work hereby reported was coordinated by the Interaction and Interface Design team.

For the first co-designed proof of concept, research was based on iterative Service Design Thinking methods (Stickdorn & Schneider, 2011) inferred on the direct contact with stakeholders, in their working environment, for concept and interaction narrative validation. The present paper also adds an innovative feature to a UX and usability evaluation technique, with an eye tracking setup, which determined narrative and interface changes for the final version of a conceptual prototype. Since a self-reported, explicit opinion may not match with the corresponding implicit attitude (considering the social desirability influence), and because 'verbalizations are manifestations of thoughts and not necessarily thoughts themselves' (Elling, Lentz, & De Jong, 2012, p. 212), the reported interface improvement was not only based on the explicit data provided verbally by the participants during UX test sessions, but also sustained by the implicit data registered with an eye tracker and computer system that hosted the UX tests.

BACKGROUND

The current technological market displays a progressively increasing number of communication solutions in the form of tools and services (Riemer & Wulf, 2010). Although every solution may improve or solve one communication problem, its proliferation is also creating a new problem: how to identify and select the ideal service for each communication setting. According to Fuze (2017), communication tools should empower productivity, though it increases the need for organizations to analyse each solution, rejecting redundant apps and tools. As depicted, 'IT leaders are battling a productivity threat in the form of application sprawl: workers navigating between tools and devices to share, connect, and communicate' (Fuze, 2017, p. 11), which can lead to failed communications attempts, lost time, disruptive work interruptions and frictions in team collaboration (Riemer & Wulf, 2010). Furthermore, having to juggle between diverse modes of communication has been associated to interaction overload (when the level of interaction an individual needs to engage in exceeds his communicative and cooperative capacity) and communication deficiency (when a communication is established through an undesired mode of communication) (Ljungberg & Sørensen, 1998). Summing up, while a recipient wishes to be constantly accessible, the way in which a communication is carried out might not be desirable.

Also relevant in this context of research is the cognitive load theory (CLT). This theory is based on the notion of a limited working memory capacity related to an amount of information expected to be processed. Some research has been done in order to relate CLT to Human-Computer Interaction (HCI), mostly concerned with the development of educational interfaces (Chalmers, 2003; Hollender, Hofmann, Deneke, & Schmitz, 2010; Oviatt, 2006). As a usability goal and to succeed in the creation of an intuitive and usable interface, aiming to reduce memory load and decrease irrelevant load (extraneous) (Hollender et al., 2010; Oviatt, 2006), frees up mental resources that allow to perform main tasks better whilst remaining attuned to the surrounding context (Oviatt, 2006).

LITERATURE REVIEW

Unified Communications

One future challenge in areas such as mobile, ubiquitous, and multimodal-multisensor interfaces is for human-centered design to adequately model human communication and activity patterns more broadly, as well as usage contexts. (Oviatt, 2006, p. 872)

Kleiner Perkins' 2018 Internet Trends (Meeker, 2018, p. 272) reports that enterprise messaging threads are used not only for direct communication, but also to organise information and teams, providing rich context and interaction history. An improvement, but still not the ideal solution. As stated: "Gartner defines Unified Communications (UC) products (equipment, software and services) as those that facilitate the use of multiple enterprise communications methods to obtain that productivity goal." (Elliot, Fernandez, & Blood, 2016). Elliot et al. (2016) distinguish six broad product areas for a unified communications service: i) telephony; ii) conferencing (audio and/or video); iii) messaging (email and voicemail); iv) presence and instant messaging; v) consistent interface and interaction narratives through different devices and browsers; and vi) integration capabilities to connect external apps with internal services. In short, unified communications for collaboration (UC&C) are committed to create integrated and consistent infrastructures for info-communication and collaboration, though remaining conditioned by employees' acceptance and proficiency of use (Bolton, Murray, & Fluker, 2017).

Venkatesh, Morris, Davis, and Davis' (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) model proposes four core determinants of intention and usage, that help understand user's acceptance and usage of a new technology: Performance Expectancy (when a user perceives that by using a system his productivity and performance will be enhanced), Effort Expectancy (effort necessary to use a system), Social Influence (extent to which an individual perceives that others think he should use the system) and Facilitating Conditions (availability of resources to support the system). UTAUT was later adapted to convey collaboration technologies (Brown, Dennis, & Venkatesh, 2010) and multi-cultural collaboration aspects for adoption (Silic, Back, & Sammer, 2014).

As a solution against application sprawl and interaction overload, UC&C solutions aim to improve user productivity, enhancing collaborative operations in the process. Not just communication functionalities, but the overall user experience and acceptance, 'is about creating a holistic and dynamic approach to an organizational communication strategy that spans people, processes, and technology' (Bolton et al., 2017, p. 5470), establishing and maintaining the relation of human communication instances and context with business processes.

Users and their context should determine system functionalities. As seen in Orlikowski and Hofman (1997, p. 14), change needs to be recognized as an 'ongoing process made up of opportunities and challenges which are not necessarily predictable at the start', thus an UC service's effects and benefits cannot be deduced from its announced features, there should be an ongoing evaluation as users appropriate and embed the system into their daily practices as they become part of the organizational processes (Riemer, Froessler, & Klein, 2007; Riemer & Wulf, 2010).

Conclusively, unified communication technologies should allow that all employees and collaborators - apart from their physical location, virtually interact with each other through a rich and effective collaboration experience (Cisco, 2008), incrementing team productivity and cutting time and resources in constant work travels. Several papers have reported studies that analysed UC and UC&C services (Bolton et al., 2017; Palonka & Porębska-Miąc, 2014; Riemer et al., 2007; Shin & Bae, 2012; Wahl & Kitchel, 2016). However, beyond the integration of services and functionalities, UC and UC&C services lack the adjustment on user natural processes and still require users to find the right communication channel for each instance, enabling failed communications, communication deficiency and increasing user's cognitive load. In this setting, users adapt the UC technology to their context, when in fact the technology should predict and adapt to the users' context and communication needs. To this extent, there is a lack of availability of an UC&C solution that truly enables effective communications and thus, collaboration. The current trends, which point towards increasingly higher levels of remote work (Felstead & Henseke, 2017), further exacerbate the need for effective UC&C technologies.

Co-Design Techniques for Service Design

A UC&C framework must place "people" central to its goals. It is therefore essential that human considerations be taken into account when evaluating system needs and assessing end state success. (Bolton et al., 2017, p. 5478)

Having an interdisciplinary and always evolving approach, service design incorporates methods and tools from innovative technological processes with user-centred approaches, in order to attain the success of the service as a product, enhancing its overall user experience - not just for the end-consumer but for all involved stakeholders as well (Stickdorn & Schneider, 2011). To this extent, a service should be designed by an interdisciplinary team, composed by specialised technicians, users with strong communication and collaboration experience from multiple areas of expertise, consumers, and any entity involved in its development, implementation, operation and support. Research literature also mentions that user and stakeholder engagement in service design and development leads to a better acceptance and consequently, the use of the final service product (Lindeblad, Voytenko, Mont, & Arnfalk, 2016; Pirinen, 2016; Webb, 2013). Having access to a multidisciplinary team and company collaborators' personal insight, using co-design techniques in this project becomes an evident approach within action research and service design.

Eye-Tracking for Implicit Measurement

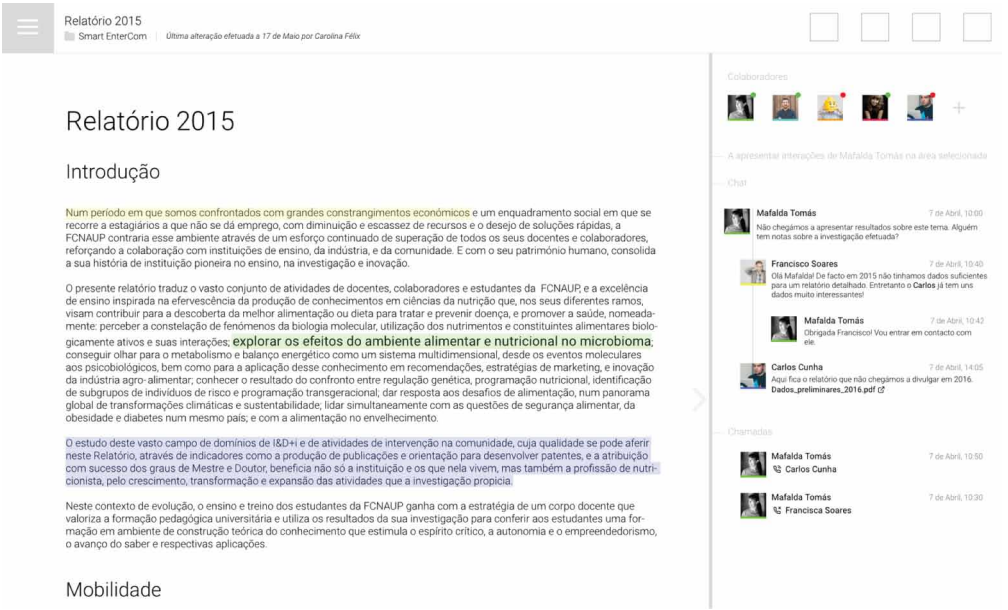
Research based on the direct contact with collaborators, where participants' opinions and experiences are self-stated and recorded in order to infer design choices, can sometimes lead to a subjective analysis. Though these techniques are commonly applied in UX/Usability design research, in this study a complementary implicit data source was also used: the participants' eye gaze behaviour. Implicit cognitive data depicts the processes that occur without one being actively aware of them. Acknowledging that participants' explicit opinion could either be biased by social desirability or a lack of ability in translating their actions into verbalizations; considering a company's structure, with its culture that drives from patterns of assumptions and common experiences, invisible barriers may also exist, even to identify alternative views; the eye tracker recordings and the implicit data it provided, served as a litmus test, providing pragmatic information which validated self-reported experiences. Thus, data recorded by the eye tracker, played simultaneously with the audio recordings of user expectations, allowed to discover usability and interaction problems. These problems were identified and classified based on Ehmke and Wilson's (2007) research, where they summarise correlations between common usability problems and eye tracking patterns. Another noteworthy reference for this classification is the work of Elling, Lentz, and De Jong (2012), where beyond verbalisations, silences in eye tracking with Concurrent Think-Aloud (CTA) sessions are also analysed. As stated, silences can provide important information about users' processes and experienced problems, as they often occur when participants have no 'cognitive energy' left to translate their mental processes (Elling et al., 2012, p. 217).

THE PROTOTYPE

This paper reports on the project's first proof of concept, a prototype of Collaborative and Unified Editing of Documents (CUED). Beyond allowing individuals to collaborate in teams, working on the same document or file, from several terminals, devices and/or locations to create a final version; it is also necessary to complement the software with the UC&C layer as a contextual innovative contribution.

Thus, for the first proof of concept based on sharing and editing collaborative documents, an interface based on the approach of layered interactions was idealized. Two main layers are considered, related to editing the document, and the communication with other individuals collaborating on the same document. The interaction premise intends to, at any time of digital editing, enable the call or recall of a communications layer, possible to set off a contact from any stimulus presented in the working interface. As a first example, and in order to better understand this concept, the representation of a simple text document was chosen, as can be seen in Figure 1. By selecting text segments is possible to access an array of interpersonal communication possibilities, and choose the medium (text or voice comment, e-mail or voice/video call) that best suits the need to establish an interpersonal

Figure 1. Example of a document content relation with a layer of interpersonal communication (v1)



communication related to the document editing situation. This interpersonal UC layer, linked to all document editing and discussion situations, represents a detailed chronologic registration of context, with information on all human interactions and communication situations that were established during editing, till its finalization.

One of the basic interactions in this proof of concept prototype is to tag/associate text segments to an established contact/interpersonal communication, in doing so, CUED depicts in its interface the existing links between human interpersonal communications and specific document contents. Document contents can be tagged not only with text annotations, but also with rich interactions that consider voice replies, voice calls, email and private instant messages (IM). In addition, it is also possible to reply to any of these interactions using a similar set of methods (text or voice), initiating a thread that can in the future be marked as finished/resolved by its owner. This happens without the loss of unified communication and usage contexts. Considering that every interaction is allocated to the document/file, while reviewing it, one can have a perception of the areas where interactions occurred and choose to view or ignore them, enriching the experience and information delivered to its reader with the recall of the diverse communication situations that took place during editing. Having communications shortcuts appear when needed (and only the ones that can actually be established at the moment), CUED aims to optimize users' cognitive capacity, eliminating the extra task of searching for the right communication medium in every instance of collaborative work.

Table 1 systematizes CUED's features in comparison to other collaborative editing products. Distinctively, CUED's main difference relies on communications' contextualization and availability of several contact mediums.

METHOD

Prototype Validation, Explicit and Implicit Data Sources

To validate our proof of concept artefact, 8 UX sessions supported by an eye tracking system were carried out with project stakeholders (one session per user). These sessions used CTA technique

Table 1. Comparison table between CUED and other collaborative editing software products features

	Concurrent Document Edition	Document Version History	Track Contextualized Communications	Communication Mediums	Communication Trigger
Google Drive (Google, 2012)	Yes	Yes	Yes – only for comments	• Text comments	• selecting text segments
Dropbox Paper (Dropbox, 2015)	Yes	Yes	Yes – only for comments	• Text comments	• selecting text or image segments
Microsoft 365 (Microsoft, 2011)	Yes	Yes, if stored in OneDrive	Yes – only for comments	• Text comments	• selecting text segments
CUED Prototype	Yes	Yes	Yes – for all mediums, every interaction is registered and attached to its prompt	• Text and audio comments • Private chat (IM) • Voice and video calls • E-mail	• selecting text segments • hovering colleague's name • replying messages

contextualised by user experience and expectation questions, recorded in audio and observation notes. An additional 16 UX sessions with the same setup were carried out at an open science fair, with a random set of participants, to gather more data from a broader, and potentially less conditioned, audience. Due to the noisy environment, no audio was recorded (participants were stimulated to provide feedback and report their experience while notes were taken). All participants volunteered in their own free-will to perform the UX evaluation of the prototype and signed an informed consent before engaging in the test procedures.

Implicit measurements of eye movements and fixation times were recorded with the eye tracking technology. Eye tracking metrics allow researchers to analyse the visual modality during the human-computer interaction, enabling the identification of possible interaction and usability errors. However, no qualitative or subjective data can be depicted from this source. Thus think-aloud techniques were employed during the UX sessions. With this integrated and synchronised approach, it was possible to compare expectations and experience of each participant interacting with the prototype, exploring its functionalities and understanding the affordance achieved by the interface.

The combination of techniques fostered the recognition of the first set of errors in the interaction narrative and in the graphical layout of the initial interfaces. With these results, new mockups were created in order to better match user expectations, and doing so started a new iteration between prototype creation and reflection, as proposed by Stickdorn and Schneider (2011), improving CUED concept on every iteration.

Procedure

InVision web app was used to assemble the prototype, creating hyperlinks between graphical interfaces and animated interactions (hovers and clicks). Tobii Pro X3-120 eye tracker and Tobii Studio (version 3.4.5) software was used to record and analyse participants' eye movements. Audio was recorded with an external device. After calibration, each participant was requested to explore the prototype interfaces and verbalise the actions and decisions taken according to the intended tasks.

The first group of 8 participants were members of the project team, from a different workpackage (Intentional Sample), and had previous knowledge of the product's concept. However, they had never seen or used the prototype. Considering the distinct scenarios and tasks being performed in the transdisciplinary team, these sessions marked an essential moment for co-design within the team: to demonstrate and validate implemented co-design procedures and contribute with their personal feedback on the overall solution. Following the task briefing, a set of independent variables were added (gender, use of glasses and project/company role) and the audio recording would start. After a successful calibration, tests began by opening the inVision prototype in the browser. During the session participants were invited to verbalise: expectations concerning the interfaces; decisions taken according to intended tasks; encountered interaction errors (subjective to each participant); possible improvements and give their overall opinion on the interaction experience. In any instance, the participants were free to ask for assistance from the assigned researcher. After exploring the prototype, they could revisit any specific interface and comment it, ending the test session afterwards. The casual sample of 16 science fair participants ran a similar procedure, excluding the audio record.

Identifying UX/Usability Problems

A qualitative analysis supported by the implicit data presented in the Tobii Studio Software was carried out. For each test performed, its screen recording overlaid with the participant gaze path and attention points was observed while simultaneously listening to the audio of user expectations. Analysing what the user was doing versus what he said/expected with his actions, allowed to identify a list of UX and usability problems.

RESULTS

The former mentioned list of comments and problems was synthesised by identifying and selecting unique inputs and merging related situations. Depending on how each issue was identified it was classified as either: observed, verbalised, assistance required or as a suggestion (not a problem, but something that could be improved). In total 18 interaction situations were sorted out. Table 2 illustrates in which session (participant 1 - 24) each issue was identified and allows to promptly recognise frequent problems.

Interaction Situations are listed as follows and illustrated in Figures 2 through 4:

- **S1:** Email subject field not identified as an input box;
- **S2:** General list of contacts identified as a list of collaborators that have access and permission to edit the document;
- **S3:** Interaction hovers display confusing information (iconography);
- **S4:** Comments and registered interactions arrangement changes constantly, confusing the user;
- **S5:** User cannot distinguish public document comments from private talks;
- **S6:** How to add new recipients to an email;
- **S7:** User cannot identify the meaning of coloured circles on sound player;
- **S8:** Reply button is not identified as such, resembling an undo action;
- **S9:** Document previous interactions marker is wrongly perceived as a contact starter (write or phone a colleague);
- **S10:** Trying to click on a coloured text section does not open its corresponding interaction (the user expects so);
- **S11:** Checkbox '*anexar ficheiro*' - to attach the currently opened file, is understood as a button to browse and select files;
- **S12:** Lack of options to go back on/revert an action (for example, to close the view of a comment and go back to the previous activity). Being an overall issue, it was not represented in the figure;
- **S13:** Send email feature interpreted as a notification delivery system;

Table 2. UX and usability problems identified, where S(i) = Interaction situation and P(i) = Participant test

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
P1	O	V	V			A		V	A								
P2		VO		V	VA		A					V					
P3		V		V							V						
P4		OV	OA	V													
P5		V	V		O			V	VO	V	V	V					
P6		V	O	S	?			VA		O		V	V				
P7		V			O	VA		OA	O			V					
P8			SV						OV			V					
P9								V						V			
P10														V	V		
P11														V		V	
P12		V							V					V			
P13								V		V						V	V
P14														V			
P15										V							
P16			V														
P17			V	V	V				V						V	A	
P18	Discarded test																
P19															V		
P20																	
P21																	
P22														V			
P23			V		O												
P24																	

Legend: O - Observed | V - Verbalised | A - Assistance Required | S - Understood, improvement needed

- **S14:** Microphone iconography associated as a text-to-speech feature, signalizing paragraphs that have been wrote using this feature;
- **S15:** Text marker colour associated to corresponding interaction it symbolises;
- **S16:** '+1' in audio player associated to a 'thumbs up' interaction instead of number of replies;
- **S17:** Contact presence is not well represented - to be contextual it needs more than two states.

From the list of issues above, a total of three interaction situations were selected to further detail this paper. These cases represent innovative UX evaluation examples on how the eye tracker data can be used as an implicit validation instrument of the explicit attitudes expressed by the participants during a UX evaluation of the prototype and as a complementary UX qualitative data capture technique. The choice of these three user narratives/features was based on the relevance of the implicit eye tracking data when related with the explicit issues reported by the users. Excellent examples to represent the contribution of implicit and explicit data relation integrated in one only study framework, the eye tracker.

Figure 2. Problems S4, S5, S10, S15 and S17, with chat section opened

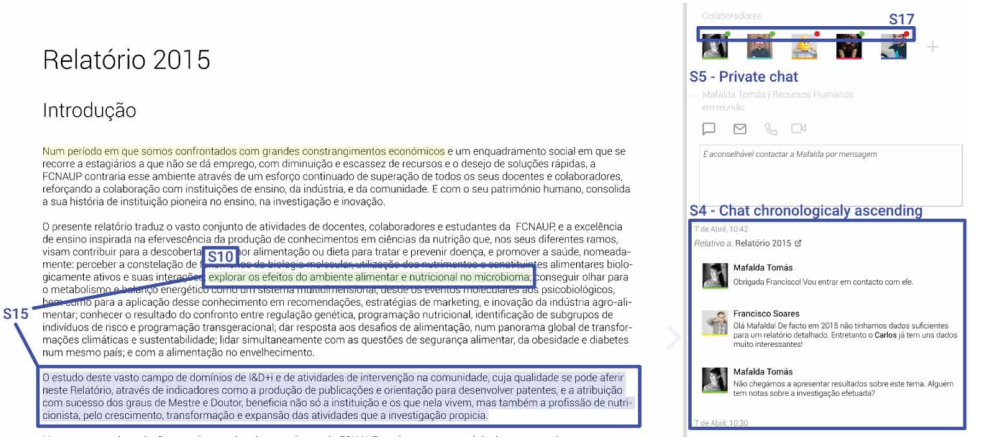


Figure 3. Problems S2, S3, S7, S9, S14 and S16 with an audio comment selected

Figure 4. Problems S4, S5 and S8 (left) and problems S1, S6, S11 and S13 in send e-mail section (right)

S2 - Interaction Situation

List of contacts identified as a list of collaborators that have access and permission to edit the document.

Interaction situation S2 refers to the top area on the communications section where a list of personal contacts intended to be universal (not directly related with the document editing task at hands) is displayed (represented in Figure 5). In the first round of UX tests, it was apparent that its interface objective was ambiguous, as most of the participants inferred, it seemed like a list of colleagues working on the document.

Implicit data revealed that the most common gaze pattern observed shows fixations throughout collaborators thumbnails with scanpaths in a quick back and forth motion, with some large saccades that lead back to the main document or down the communications list, usually followed by another list scan. This demonstrates that participants, faced by this ambiguous section, attempt to find logical relations between the list and the remaining information available on the interface. In some cases, fixations alternate between collaborators' thumbnails and the section title 'Colaboradores', possibly in attempt to find a correlation between those elements. Since this contact list is displayed wherever the communications section is visible, in some cases fixations move from the first colleague's thumbnail on the top list, followed by a fixation on its corresponding picture down on the communication presented, as illustrated in Figure 6.

There is an inconsistency with what the user expects. The terminology '*colaboradores*' (collaborators) used as the section title could be the reason behind this confusion. As seen in Ehmke and Wilson's (2007, 125) findings, some fixations on target followed by further fixations

Figure 5. List of contacts in first version (v1)

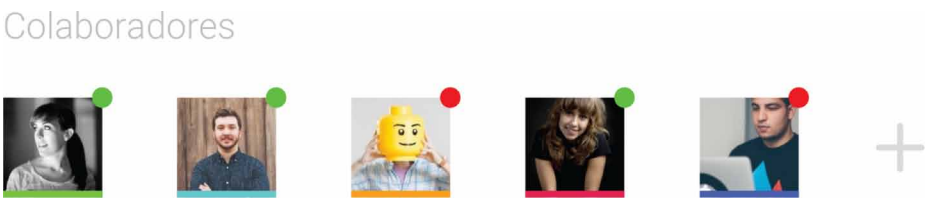


Figure 6. Gaze path on prototyped chat (v1) represented with red lines and circles

across the page with regressions back to the unclear element, is recognized as a pattern that represents unclear terminology. Moreover, informed by the participants verbalizations, having this list always present in the communications section can incorrectly resemble as a list of contacts available for the action intended. As a solution, an evident and unambiguous separation of contacts and document actions is required.

In the following version of the prototype the contacts list was hidden but easily accessible through a drop-down available in the header (exemplified in Figure 7). It has a search field to easily find any contact and three sorting options: 'suggested', 'recent' and 'alphabetical order'. All contacts display their availability and current context (i.e. working remotely, on vacations, etc.; also solving situation S17) with the possibility to start communications through chat (IM), voice or video call.

S5 - Interaction Situation

User cannot distinguish public and private conversations.

For the chat/messaging interface, as represented in its original proposal (Figure 8), it was decided to convert this whole section into a private chat, to maintain the consistency with established interaction procedures inside this "communications section". These changes did not affect the feedback of interaction history with a selected colleague. As it was verified, this was leading to interaction confusion and was disrupting a focus on the task at hands besides the conversation currently taking place, clearly affecting an optimal cognitive load for this task. As such, even though it was prototyped as public (commenting) and as private (IM) communications, some participants did not identify when the interactions were occurring in private, which may have been caused by the atypical interaction design within this chat section and its resemblance to the (public) commenting action. Though this finding is not completely surprising, it was expected that by applying the same communication interaction procedure for the chat it would preserve interaction consistency throughout the prototype.

Figure 7. Contact list as a drop-down menu in the improved version

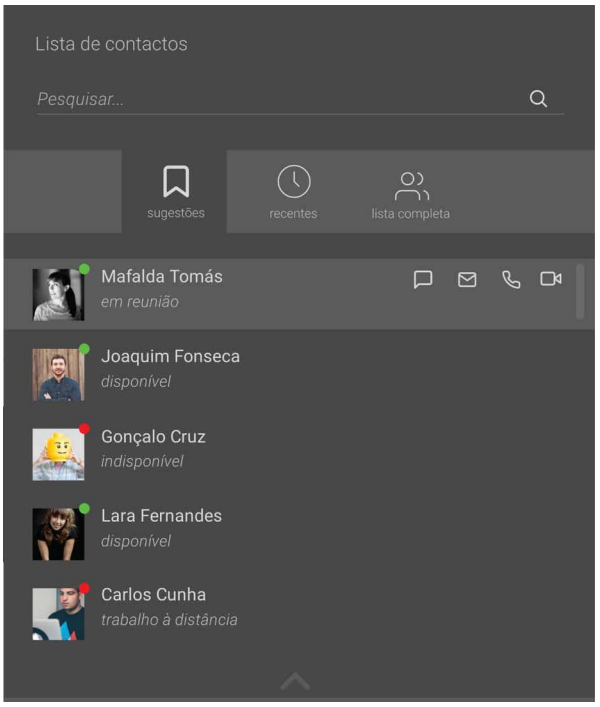


Figure 8. Private chat section

For Ehmke and Wilson (2007, 125), having fixations scattered on different areas of the page, without fixations on the unclear area could indicate an unclear grouping of information which conflicted with the user's mental model. Analysing the exported eye-tracking heatmap of the users whom did not identify the chat page as a private interaction (represented in Figure 9), it is noticeable that fixations are dispersed around the page, with an evident focus on the top area of the communications section (colleagues list, input text box and first message on the list), with few or no users scrolling down. For the page redesign it is evident that a more common layout is favoured, which will sustain interaction consistency with the established chats in social networking universe.

As a result, the chat was re-designed to resemble a more common 'chat window' layout, as exemplified in Figure 10. Having the chat window as a top layer, allows for multitasking, or at least to retain attention on the work artefact while contacting a colleague. New functionalities have also been added, it is now possible to add participants (group chat), send files, content search and start a voice call. As in the initial version, all interactions shared between both participants are listed and by clicking on one the user is referred to the original communication context.

Figure 9. Heat map on chat page, representing most looked areas in red/darker

Figure 10. Chat in the improved version

S12 - Interaction Situation

Lack of an option to 'go back'/revert an action (for example, to close the view of a comment and go back to the previous activity).

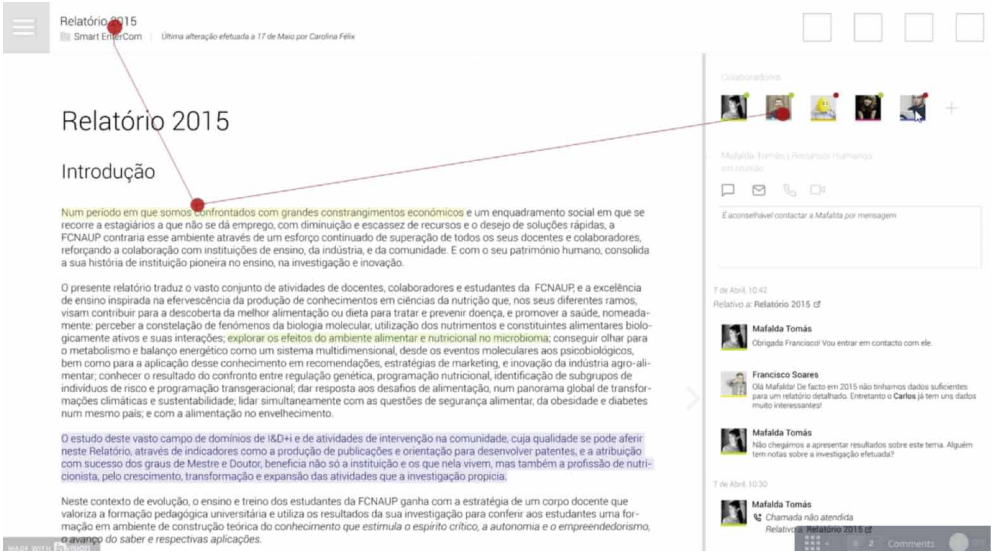
This was expressed by the majority of participants and some even tried to press the 'esc' key in attempt to return to a previous page. As for the implicit measures, some quick back and forth activity was recorded of small fixations interpolated by a larger amplitude of saccades, covering the area between the element that expects to be closed and the remaining page (as exemplified in Figure 11), also incorporating some experimental clicks in specific areas. This pattern occurred when the participants stated that they could not reverse the performed action or simply go back a step. The fixations are scattered around the page, revealing possible locations for a button/option to revert actions. In the specific case of closing the communication section, these possible locations include the top area (both corners), but also the top left corner of the header (which already had some navigation information as placeholders).

As a solution for the results obtained, a 'go back' option was added to the top left corner of the communications section that redirects the user to the previous activity performed.

CONCLUSION

UC&C are a promising concept for enterprise collaboration, improving individual performance by removing redundancy from ordinary work processes. The disclosed research represents the first iteration for interface and interaction design on the Smart Entercom project. The proposed interface features and user-narratives represent the first co-designed, enriched with subjective participation, proof-of-concept on communications for collaborative production and editing of documents, denoting the project's human-centred concerns. The design approach of this project uses the optimal cognitive load as a reference, leading to UC&C functionalities that relate diverse information and technological instruments to preserve communication and collaboration instances and contexts at all times. The prototype's main functions reported in this paper are: effortlessly tagging document contents with rich interactions that go beyond text messages, as voice replies, but also initiating voice calls, email and/or IM; the reply to any of these interactions with text or voice; and the threading of interactions

Figure 11. Amplitude of gaze saccades across the page represented with red lines and circles



that compose its context and enrich the information delivered. The re-contextualization of any communication or collaboration situation is more efficient with this approach due to the iterative process supported by the expectations, cognitive needs and optimization tuned with all participants representatives of key users, project stakeholders and anonymous individuals. On every iteration, interfaces were improved based on participant's comments, substantiated by implicit data gathered by the eye tracker recordings. The optional use of an eye tracker did prove added value, providing a great source of user input when used as a complementary innovative qualitative data capture technique for traditional UX research methods, enabling to identify inconsistencies and issues that not even the participants were aware of. This process implicitly considered as a theoretical reference the core determinants of intention and usage of the UTAUT model (Venkatesh et al., 2003), even so, a validation of the use and benefits of a final contextual UC&C product should be considered, in the future, based on the Brown et al. (2010) revisited UTAUT model.

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