Conciliating XBRL Financial Reporting and HCI

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Abstract

There are several third-party software for composing XBRL financial reports available. However, performing such a task typically encompasses: dealing with XBRL problems ESMA report presented, taking professionals out of their role to compose XBRL financial reports, and wasting time dealing with the mistakes or inconsistencies committed. HCI design problems could cause the reported situations. This research proposes an attempt to change that reality while aiming to mitigate the XBRL knowledge required to elaborate XBRL financial reports problem, the HCI design solutions that XBRL financial reporting demands, and the lack of HCI studies related to B2G and G2G e-Government practices.

Keywords: XBRL Financial reporting; HCI; HCI design; e-Government; G2G.

1. Introduction

Issuers, investors, competent authorities, and people who adopt electronic or digital financial reporting aims for: better solutions than the current practices, better accessibility features, better-reported information analysis, better comparability of annual financial reports, and more suitable ways to financially describe their business' specific characteristics. Some of the most relevant issues for financial reporting include different financial reporting formats and standards, low data re-use, low interoperability, and limited or degraded comparability of qualitative information [1].

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The eXtensible Business Reporting Language (XBRL) is an open international standard for digital financial reporting managed by the XBRL International consortium. It is supported by private and public organizations. Over 50 countries around the world apply it to "represent the contents of financial statements or other kinds of compliance, performance and business reports" [2]. According to [1:33], "XBRL is currently the only standard for financial reporting that is globally accepted". The report from [1] revealed XBRL seems to be "the most widely used technological option" among European Union countries because it "would allow quality, accuracy, validation and greater comparability of Annual Financial Reports". It also presented evidence "supporting XBRL as a "de facto" International standard" [1:82]. To better understand and define the research problem, the authors conducted a literature review to identify previous primary searches published in ACM and IEEE Xplore research database, and the Brazilian Symposium on Human Factors in Computing Systems from 2015 to 2019 that consider HCI solutions related to e-Government. The research adopted the key search questions which one of the e-Government digital interactions (Citizen to Government (C2G), Governments to Government (G2G), Government to Employees (G2E), or Government to businesses/commerces (G2B)) are the HCI solutions focus on?, and what are the current HCI solutions adopted for the e-Government digital interactions?.

The exclusion criteria embraced duplicated papers (some papers showed up in the events' proceedings and the ACM Digital Library because some Brazilian HCI events publish papers via the ACM press), studies not available for reading, studies in other languages than Portuguese or English, studies not related to the search questions, and nonprimary searches. The database choice regarded authors' accessibility and the amount of primary and secondary studies about innovative technologies available. The bibliographic search used the previously set search strings "{(HCI) and [(electronic-government) and (e-Government)]}" and "{(IHC) and [(governo eletrônico) and (e-Government)]}". Figure 1 chart shows the number of papers retrieved from the selected databases. Figure 2 chart shows the titles, publication year, references, and citation count of the selected studies.

Results	Brazilian HCI				Results	ACM				Results	IEEE			
	ENSS		PTSS			ENSS		PTSS			ENSS		PTSS	
Year	Retrived	Selected	Retrived	Selected	Year	Retrived	Selected	Retrived	Selected	Year	Retrived	Selected	Retrived	Selected
2015	0	0	0	0	2015	1	1	0	0	2015	0	0	0	0
2016	3	0	2	0	2016	3	3	0	0	2016	0	0	0	0
2017	3	1	6	0	2017	0	0	0	0	2017	0	0	0	0
2018	4	1	3	0	2018	3	3	1	0	2018	0	0	0	0
2019	7	0	6	1	2019	3	1	0	0	2019	1	1	0	0
ENSS - English Search String						PTSS - Portuguese Search String								

Figure 1: Papers retrieved from the selected databases, with each search string for the HCI and e-Government literature review.

Title	Year	Reference	Source	Citation Count
Citizen centered e-government? the case of National Migration Institute in the Southern Mexican border.	2015	[3]	ACM	1
Social Media User Behavior Analysis in E-Government Context	2016	[4]	ACM	8
Technologies for popular participation: a research agenda	2016	[5]	ACM	7
The Model of Accessibility to Electronic Government: applicability in DATAPREV	2016	[6]	ACM	2
Accessibility recommendations for mobile applications: a contribution to the Brazilian digital government standards	2018	[7]	ACM	1
Redesign of User Interface for E-government Application Using Usability Testing Method	2018	[8]	ACM	1
Usability Evaluation of the eTax Portal for Uganda	2018	[9]	ACM	1
E-participation Service in Malaysian E-government Website: The User Experience Evaluation	2019	[10]	ACM	2
An Exploratory Study to Investigate Citizens' Experience with E-Government Mobile Services in Saudi Arabia	2019	[11]	IEEE Xplore	0
Aceitação e Uso de Tecnologias Interativas de Governo Eletrônico por Pessoas com Deficiência	2017	[12]	Brazilian HCI	0
Analysis, Redesign and Validation of Accessibility Resources Applied to an Official Electronic Journal for the Promotion of Equal Access to Public Acts	2018	[13]	Brazilian HCI	2
Mensurando a Maturidade na Tomada de Decisão em Sistemas de e-Participatição	2019	[14]	Brazilian HCI	0

Figure 2: The selected papers's data for the HCI and e-Government literature review.

Excepting from the study [6] performed, all the selected papers focused on Citizen to Government (C2G) e-Government digital interaction. According to the review conduction results, the current HCI practices regarding the e-Government digital interactions consists of:

- To deploy quantitative/qualitative usability and UX evaluation methods to assess technical features of e-Government web portals and mobile applications (regardless of redesign purposes) concerning international and national standards of usability, accessibility, and functionality [3,5,7,8,9,10,12,13].
- To provide insights about how citizens interact with government mobile or web services [4,11].
- To provide guidelines, a research agenda, or evaluation models for assuring usability, accessibility, and functionality of e-Government's mobile or web services, and citizen participation within the public sector [5,7,14].

The answers for both research questions denote studies regarding the other interactions, Governments to Government (G2G), Government to Employees (G2E), or Government to businesses/commerces (G2B), should represent relevant literature contributions. Still aiming to contextualize the research problem and understand how do XBRL financial reporting software users relate to it, the authors applied an online quiz created with GoogleForms© free toll. The questionary heading consisted of a title and an introductory note, which presented the research context, and its purposes. It also assured volunteer's anonymity and granted the gathered

information research exclusive use. GoogleForms© privacy settings toll also helped to ensure it. The quiz identified not only a demand for HCI solutions but also revealed the financial reporting needs. While the former questions related to demographical and contextual information, the later ones focused on specific information for research conduction and solution development. The quiz had different types of questions such as multiple-choice, differential scales, range of values, open. Whenever it was necessary, the question text contained instructions to help volunteers to understand how to fill it. This activity relied on 23 volunteers' support from different Brazilian federative units and countries and made public through STN and Yahoogroups© user's platforms from March to June 2020. An XBRL and an HCI expert reviewed the quiz before volunteers answered it. The review improved questions' understandability, unambiguity, objectiveness, and purpose coherence. The quiz results revealed over 90% of the volunteers have been working in their jobs for at last two years and have a Bachelor's or higher college degree. The majority of the subjects declared to have a consistent domain of computer usage. About 39% of the volunteers were XBRL experts, 26% of them had intermediate knowledge about XBRL, while 35% had some or no knowledge about it. 52% of the participants have already had experience with XBRL financial report software. However, only 30% of them stated they were experts using the referred software. So, the majority of the volunteers do not master the financial reporting tools they use. Only 23% of the subjects considered learning how to use the XBRL financial report software their entities adopt as a very hard or extremely hard task. However, some of the XBRL expert volunteers were within this group. It also happened when volunteers reported how long it took to learn how to use their entities' financial reporting software. Even though only 26% of the participants spent more than two months to perform such task, this group also included XBRL experts. Around 35% of the subjects wasted less than one month to understand how to use financial reporting software. About 43% of the participants use a third-party closed source software to elaborate XBRL financial reports, while 13% adopted third party open-source software. 30% of the volunteers apply other technologies to avoid using XBRL for financial reporting. It happens because some surveillance institutions, such as STN, also accept financial reports in different formats (e.g., comma-separated value). On the one hand, 21.7% of the volunteers spend less than one hour to elaborate on their financial reports. On the other hand, 39% waste about a week to perform this task. There were also cases in which it demanded more than a week to be accomplished. Some of the subjects also mentioned it was an automated task, and they just had to prepare the supply chain to obtain the XBRL financial report. The participants named some problems or difficulties that pop up while composing their entities' XBRL financial report. All of them related to taxonomy update, tagging decisions, data consistency, rework, third-part software update, supply chain preparation, the lake of financial reporting knowledge, and understanding error messages in the XBRL validation process. About 30% of the volunteers admitted to frequently or always have interrupted their regular tasks to work on XBRL financial reports. 22% of the subjects reported their financial reports frequently or always contained mistakes or inconsistencies, while 60% of them considered it a low-frequency event. The participants also shared the ways they deal with such problems. The most common solutions embraced certified software usage, manual and automated review processes, software implementation, and request the third-party software provider assistance. The volunteers mentioned what would ease the XBRL financial report elaboration task. As a result, the author identified 19 requirements related to technical matters and 21 ones related to HCI matters such as data entry usability, user-friendliness, clear error and feedback messages, financial reporting metadata, etc. The participants also stated an XBRL financial report software user interface should have intuitiveness, objectivity,

user-friendliness, accessibility, clear feedback, and easiness usage. Most of the subjects would agree to collaborate to develop the proposed solution and spend time to learn how to use the software. The quiz contained a Self-Assessment Manikin (SAM) card, a tri-dimensional (pleasure, arousal, and dominance) User eXperience (UX) capture to access volunteers' current experience with XBRL financial reporting tools. Regarding the "Correlations for SAM Ratings and the Relevant Semantic Differential Factor Score with each of the six Adjective Pairs Associated with the Pleasure, Arousal, and Dominance Dimensions" [15:55] presented, 47.82% of the volunteers felt in control, dominant or autonomous while elaborating XBRL financial reports, 21.75% of the subjects felt awed, cared for or guided performing this task, and 30.43% of them reported indifference to dominance matters (do not fell in control, but also not cared for) to accomplish the activity. The Arousal dimension evaluation showed about 52.17% of the volunteers felt neither frenzied nor sluggish while elaborating XBRL financial reports, 30.43% of the subjects felt relaxed, sluggish, or dull performing this task, and 17.4% of them reported feeling frenzied or jittery to accomplish the activity. The Pleasure dimension evaluation revealed about 43.49% of the volunteers felt neither satisfied nor unsatisfied while elaborating XBRL financial reports, 26.08% of the subjects felt unsatisfied, annoyed, or unhappy performing this task, and 30.43% of them reported feeling satisfied, pleased, or happy to accomplish the activity. The target audience depends on training sections for learning how to use the software. Even experts admit that training on financial reporting technologies is relevant. Despite the number of XBRL applications available, the basic demands of HCI design still go on. Although most specialists do not face difficulties in using financial reporting tools, XBRL expertise is not always able to mitigate the complexity and problems of the available platforms. Even though the results showed a variety of professionals are related to XBRL financial reporting, this research focused on the ones who must deal with it for e-Government purposes such as government surveillance. The results also showed the need for abstracting complexities inherent to XBRL technology and showed evidence of relocating employees. Completing financial reporting tasks should not cause other activities postposition or users to feel unhappy, annoyed, unsatisfied, despairing, bored, frenzied, jittery, cared for, awed, submissive, or guided. It reduces the efficiency and production of a professional's workday. The obtained answers expressed demands for a friendly interface, auxiliary documentation with metadata embedded, better usability in the process of instantiating reports, software feedback and control, accessibility, and extraction, transformation, and load tool (ETL). The financial reports generation area seems to lack the application of HCI design practices, which reinforces the relevance of the study in progress. Applying an online quiz to several volunteers from Brazil and around the World and performing a literature review allowed the authors to establish the research problem, which is the HCI design-related demands in the XBRL financial reporting area, which also seems to be a literature research gap. So, the authors aim to conduct a case study to verify the following hypotheses validity:

- H1: Providing financial reporting professionals a software whose design considered Human-Computer Interaction (HCI) matters is enough to increase the task efficiency
- H2: The adopted procedures to verify H1 are a valid methodology for similar studies to improve Business to Government (B2G) and Government to Government (G2G) Electronic-Government (e-Government) practices.

The authors also aim to provide a relevant academic contribution to the HCI area, which lacks B2G and G2G e-Government improvement practices. So, this paper presents the results of some partial goals to accomplish the

main ones: to perform exploratory researches to qualify the researcher for developing the proposed solution; to identify the problem context and determine the study object; to find a methodology to develop and re-design a financial reporting instantiation software for HCI usability and user experience evaluations and data collection in further research phases. This research originality and social relevance rely on mitigating the gaps and demands found in the literature and the XBRL financial reporting area. The remaining of this paper structures as follows. The Materials and Methods section presents the methodology to select the technologies to support the proposed solution development and the research conduction. The Results section brings the resulting methodological procedure to ensure hypothesis validation analysis. The Conclusion section brings the conclusions and future works related to the proposed project.

2. Materials and methods

This section aims to present the methodology to select the technologies to support the proposed solution development and the research conduction. The analysis favored free and open platforms and tools over proprietary systems to avoid unnecessary costs. The following subtopics present the choice process to adopt each required technology. However, all the volunteers do not use the same software platform to elaborate financial reports and had different technology dominance levels. So, it will be necessary to provide them the same work basis to attain comparability among the individual evaluation results. That is why the authors proposed the Open Financial Reporting (OFR) free open-code software, a tool for instantiating XBRL financial reports regarding a taxonomy. It shall assure functionalities implementation correctness, avoid software compatibility problems, to identify concise relations between evaluation results and source code, ease redesign processes due to the documentation generated in the earlier step. This research will deploy online interaction tools and channels, a software development method, a programming language, usability evaluation methods, and UX evaluation methods to verify the hypotheses' validity.

2.1. Online interaction tools choice

This study used online formularies to assemble the user profile and to gather users' feedback and emotional assessment data in future evaluation sections. It was necessary to adopt an online formulary builder that provides results spreadsheet download, question reuse, multiple answers types (e.g., text boxes, checkboxes, multiple-choice selections, and dropdown menus), and question multimedia insertion (images or videos) features to accomplish those tasks. The software could also not have respondents or question number limits. Among the form builders [16] tested, only Google Forms and Microsoft Forms have no respondents or question number limits for free users that have a Google or Microsoft free account. Both of them also provide all of the demanded features for free. As [16] article did not provide enough information to support further comparative analysis, this study adopted Google Forms because the author has an active Google free account. This study will demand a web conference software to provide interaction between the researcher and the volunteers during the evaluation sections, which demands screen sharing, webcam sharing, audio sharing, live whiteboard, compliance with a data protection regulation, and chat features. Recording meeting sessions were necessary for this research conduction. However, this feature was not a critical criterium for the choice process because the authors' operational system already had a screen recorder embedded application (Ultra Screen Recorder). All of

the software [17] analyzed support video conferences, screen sharing, and have tutorials to the visitors on their website. Linphone and Riot are the only ones that do not provide a recording's download feature. In BigBlueButton, it's only available for premium users. All of them provide webcam sharing features with some or none restrictions. Only BigBlueButton, OpenMeetings, and ezTalks match the desired features while compliant with the General Data Protection Regulation (a regulation law on data protection and privacy that also addresses the transfer of personal data). This criterium excluded the five remaining software from the selective process for the sake of volunteers' data protection. The OpenMeetings and ezTalks software demand users to download and install features on their devices while BigBlueButton does not. This study adopted the BigBlueButton software to avoid asking volunteers to download third-party software in their devices and dealing with installation or compatibility problems during the evaluation sections.

2.2. Software development method choice

OFR development will concern Interaction Design (IxD) guidelines to consider the end-users' goals to be a supportive and suitable XBRL financial reporting solution for their jobs. So, this research adopted Prototyping over other software development methods available (e.g., Agile and Waterfall) because its procedures improve and increase users' design process participation. Once it requires users to interact with a prototype to provide better and more complete feedback and specifications, it matches IxD premises [18].

2.3. Programming language choice

Several programming languages are available to develop financial reporting instantiation applications. However, each one of them has particular aspects that make one better or worse than others for a specific end. The OFR must allow users to open, read, and create XBRL financial reports. As the report file size influences these tasks completion time, the file load time is a relevant characteristic to prevent time waste due to file or taxonomy load. To operate XML files can also demand high insensibility to exception treatment errors to avoid corrupt data. Analyzing the documentation about XML file manipulation available for each one of the programming languages, the Java platform showed to have the most extensive and consolidated documentation and XML processing libraries. Reference [19,20] special issues and OFR needs, Java programming language proved to be the most suitable one for the proposed application development.

2.4. Usability evaluation methods choice

Even though [21] research showed performance measurement, questionnaires, and user feedback as time-consuming and representative respondents demanding usability inquiry and testing methods, Reference [13] results highlighted only following literature and heuristic recommendations, without involving users in the project, does not allow truly attaining usability criteria. So, this research adopted performance measurement, questionnaires, and the System Usability Scale (SUS) method as a way to prevent OFR development incurs in the same HCI problems the awareness quiz revealed.

2.5. User eXperience evaluation methods choice

Emocards, PrEmo, and SAM showed to be the most suitable UX evaluation methods for this study among the ones listed by the All about UX community [22]. Emocards was the only method that provided qualitative data, had descriptive bibliographical references available, was suitable for online studies and functional prototypes of PC software, and allowed to gather UX information on how volunteers felt about the system after executing a task. PrEmo was the only method with the same classification that Emocards, but allowed to gather UX momentary experiences information while the participants were interacting with the system instead of after the experience. It also generated both qualitative and quantitative UX data. Geneva Emotion Wheel [23], Hedonic/Utilitarian scale [24], Human-Computer trust [25], Intrinsic Motivation Inventory [26], PAD scale [27], SAM, Software Usability Measurement Inventory [28], and Unified Theory of Acceptance and Use of Technology [29] UX evaluation methods satisfied the remaining demands criteria (the same classification that Emocards, but allowed to gather UX quantitative data instead of qualitative), so the author conducted a literature review to answer the following key search question: Which one of these methods currently applies to contexts similar to the OFR (Online UX assessment due to geographically distributed users)?

This literature review aimed to identify previous primary searches from 2019 related to the aforementioned search question. It performed in ACM and IEEE Xplore research database and the Brazilian Symposium on Human Factors. The search period was one year long because analyzing the selected methods' employment over the years was not a review scope. The exclusion criteria embraced duplicated papers (some papers showed up in the events' proceedings and the ACM Digital Library because some Brazilian HCI events publish papers via the ACM press), studies in other languages than Portuguese or English, studies not available for reading, studies not related to the search question, and nonprimary searches. The database choice regarded the author's accessibility and the amount of primary and secondary studies about innovative technologies available. The bibliographic search used the previously set search strings "{[(User eXperience) and (Online)] and (Geneva Emotion Wheel)}", "{[(User eXperience) and (Online)] and (Hedonic/Utilitarian scale)}", "{[(User eXperience) and (Online)] and (Human-Computer trust)}", "{[(User eXperience) and (Online)] and (Intrinsic Motivation Inventory)}", "{[(User eXperience) and (Online)] and (PAD scale)}", "{[(User eXperience) and (Online)] and (Self-Assessment Manikin)}", "{[(User eXperience) and (Online)] and (Software Usability Measurement Inventory)}", and "{[(User eXperience) and (Online)] and (Unified Theory of Acceptance and Use of Technology)}". Figure 4 chart shows the number of papers retrieved from the selected databases. Figure 5 chart shows the titles, UX method deployed, references, and citation count of the selected studies. Based on the review results, the currently used UX evaluation methods to perform online studies in which the researcher does not get in-person contact with the users are the Intrinsic Motivation Inventory, SAM, and Software Usability Measurement Inventory. Among those three methods, SAM showed a higher occurrence (three studies) and a greater applicability context variety (music mobile application, recommender systems, and crowdsourcing). Thus this research adopted SAM to gather UX quantitative data during the evaluation sections.

3. Results

This section aims to present the pre-set guidelines to conduct this case study that follows the hypothetical-deductive logic approach and the monographic technical procedure, and whose conduction procedures also adopt action research guidelines and interactive cycles. This search adopted the Scientific Method as

methodological referential. The mental operations, processes, and techniques the author deployed stand from the hypothetical-deductive research logic approach method. Following an Action research approach, the OFR design will deploy Prototyping software development strategies. The first OFR's prototype will concern the essential requirements, functional criteria demands, ignore HCI matters, and the HCI issues reported in the awareness quiz results. It shall perform the role of a high fidelity prototype that will undergo HCI formative evaluations (prototype review), whose results will provide guidelines for redesigning the OFR under the HCI perspective (prototype enhancement).

Results	Brazilian IHC		ACM		IEEE	
Search string	Retrived	Selected	Retrived	Selected	Retrived	Selected
{[(User eXperience) and (Online)] and (Geneva Emotion Wheel)}	0	0	0	0	0	0
{[(User eXperience) and (Online)] and (Hedonic/Utilitarian scale)}	0	0	0	0	0	0
{[(User eXperience) and (Online)] and (Human-Computer trust)}	0	0	1	0	0	0
{[(User eXperience) and (Online)] and (Intrinsic Motivation Inventory)}	0	0	3	1	0	0
{[(User eXperience) and (Online)] and (PAD scale)}	0	0	0	0	0	0
{[(User eXperience) and (Online)] and (Self-Assessment Manikin)}	4	1	10	2	0	0
{[(User eXperience) and (Online)] and (Software Usability Measurement Inventory)}	0	0	3	1	0	0
{[(User eXperience) and (Online)] and (Unified Theory of Acceptance and Use of Technology)}	1	0	8	0	1	0

Figure 3: Papers retrieved from the databases, with each search string for the UX methods literature review.

Title	Reference	Method	Source	Citation Count
"Enable or Disable Gamification?" – Analyzing the Impact of Choice in a Gamified Image Tagging Task	[30]	Intrinsic Motivation Inventory	ACM	4
m-Motion: A mobile application for music recommendation that considers the desired emotion of the user	[31]	SAM	Brazilian HCI	0
How Can They Know That? A Study of Factors Afecting the Creepiness of Recommendations	[32]	SAM	ACM	2
Understanding Worker Moods and Reactions to Rejection in Crowdsourcing	[33]	SAM	ACM	2
Assessing the usability of the Saudi Digital Library from the perspective of Saudi scholarship students	[34]	Software Usability Measurement Inventory	ACM	0

Figure 4: The selected papers's data for the UX methods literature review.

In the new cycle, the OFR redesigned version shall undergo the conclusive HCI evaluation tests to provide data for hypotheses validation and future works guidelines. They aim to cover aspects such as learning easiness, remembering easiness, efficiency, usage safety, and UX. The collected data analysis will allow concluding about hypotheses validity. OFR evaluations shall perform under ISO9241-11 concernment. The Bigbluebutton© video conference environment and the GoogleForms© platform will support the online evaluation sections. They were tolls adopted to overcome users' and volunteers' geographical distribution. The HCI evaluation procedures will strictly follow the guidelines [35,36] provided. The conducted evaluations will concern the following main aspects: technological appropriation (task completion, task time demanded, committed errors, demand for training, demand for external help, user satisfaction, and other variables), future design ideas, and alternatives (task learning difficulty, error recovery support, and other variables), standard conformity, and

interface interaction problems (accessibility, communicability, usability, and user experience). In the context of distributed users and volunteers, it will not be possible to perform HCI evaluations personally. This research adopted an online web conference platform, through which the volunteers will decide whether or not to share their webcam content, receive trining instructions, request interaction with the researcher, share their screen content, download the test section recording video, and provide feedback. All the evaluation procedures shall be pre-tested before being implemented. All subjects that engage the usability and user experience tests electronically shall sign an agreement term, and the author will ensure the data provided will not have other use than supporting the solution development. During each evaluation section, the researcher will explain the conduction procedures, share the supportive materials, and solve videoconference platform-related issues in the first minutes. Then, the volunteers will answer a pre-test questionary before sharing their computer screen and starting the training and the test activities. After the observation and data gathering procedures, the volunteers will answer a post-test questionary, which also embraced usability and user experience evaluations. The usability test will follow the [35] guidelines and adopt the performance measurement, SUS, questionary, and user feedback methods. The communicability evaluation will also perform under the procedures [35] presented. As the evaluations will have to perform sections with one user at a time, all the described procedures will undergo a pre-test with a volunteer XBRL specialist before the sections with the users. It shall allow estimating sections and task execution time and identifying minor problems with the support materials. The supportive material preparation for evaluation sections will encompass composing the users' activity instruction sheet and the online forms to access users' UX and usability, configuring the web videoconference platform, testing the weblinks for the online forms, testing and calibrating the stopwatches, and preparing notepads to gather information. The author will have to measure the success rate, the error rate, the number of times they need to backtrack or consult the support documentation through annotations during the evaluation sections. The percentage of time that users will follow an optimal navigation path and the task completion time shall demand two stopwatches. One of them will have to stop every time the user deviated from the task goal, while the other one will remain active until the end of the task. The researcher will not consider the interruption time due to volunteers' requests (e.g., rest time, toilet requests, snack time) in the overall results. The post-test questionary will contain a SUS questionary in the evaluation sections. The author will have to exchange the word "system" of every standard question for the OFR initials. The post-test questionary adopted for the first evaluation will have extra-questions regarding some specific features of the OFR prototype and documentation. After answering it, the volunteers will be free to provide any other feedback they think relevant while the researcher properly takes notes of their remarks before ending the section. In the communicability evaluation, the researcher will have to watch every user video recordings to identify and label failures in the communication process between the users and the system. This research will deploy tags adapted from [35]. After the labeling process, the author will analyze the frequency, the context, and the order each label appeared in each video to identify the reasons users: could not express what they intended to; adopted a wrong way to do what they intended to; could not understand the system's communication; grasped a wrong understanding about the system's communication, and could not perform a communication input. A researcher can achieve representative user testing results through a set of three main activities: "get representative users, ask them to perform representative tasks with the design, and shut up and let the users do the talking." [37]. The first one still poses an obstacle for most companies. However, adopting systematic recruiting programs can improve recruiting and

test results quality [37]. Based on [37]'s survey results, it is a common practice to provide monetary and non-monetary incentives to test participants. It is an attempt to reduce no-show rates, even though they are not controllable due to several events (weather, traffic, and personal situations). When providing incentives, the researcher must be aware they can "motivate people to exaggerate their qualifications when answering screening questions" or providing fake feedback [37]. Only actual users can provide valuable feedback to improve a solution's design. So, the researcher must "build up an understanding of the types of users, tasks, applications, and computer platforms." [37]. In the early stage of this research, the author adopted an awareness questionary to gather information about: how often users perform financial reporting tasks, the kind of knowledge, training, and experience required to compose an XBRL financial report, and the problems they are experiencing with their current systems. It was also quite extensive (31 questions) to provide the author with a more clear picture of the users' profile and context. The awareness quiz provided the background for determining the volunteer profile specifications for the HCI evaluation sections: professionals with a bachelor's or higher college degree, from 31 to 60 years old, that perform financial-reporting related tasks for two or more years, that have already dealt with an XBRL financial-reporting software, regardless of their XBRL knowledge degree, that are not comfortable or struggle with their currently adopted XBRL financial reporting tool. Even though significant statistical results demand a section with at least ten participants per condition, around eighty percent of the usability problems showed up after testing four users across several projects [37] surveyed. So, this study will consider conducting evaluation sections with five users with one backup for each category in the recruiting criteria description plus a pilot and a dry-run participant (both of them shall be the only reused volunteers for each research cycle). The author will have to offer training to ensure the volunteers achieve a minimum level of expertise and to "help participants new to usability feel more comfortable". The researcher will also have to avoid training "the users concerning relevant aspects for the main usability test" [37]. Across several projects, [37] surveyed, gifts were the most common non-monetary incentives. So, the volunteer recruiting process for the formative and the conclusive HCI evaluations shall offer a prize to a randomly chosen participant. The call for volunteers will consist of a recruiting brochure that will be made public through STN and Yahoogroups© user's platforms. Every subject will schedule its participation through the sign-up form with the participant consent form. One day before the evaluation section, the volunteers shall receive an event reminding message and a tutorial with the online web conference platform instructions. The sign-up form will contain a questionary based on the screen script, and the formulary introduction note will have information about: sections' procedures, requirements, training, forms, and incentives. After filling the aforementioned form, the volunteers will receive an invitational email or an excuse email based on their suitability for the study. The pre-test questionary shall incorporate the background questionary. The researcher will handle job seekers, competitors, technology spies, or incentive-only seekers according to the recommendations 215 and 216 [37] provided. Every volunteer that shows up will receive an email with a voucher for the prize draw that will take place at the end of each research cycle. At the end of the section, all of them will have to answer the email to ensure they want to join the prize draw. Before ending the section, the author also will ask the participants about referrals for future studies and adopt the voucher number as the users' identification code in the description of the results. The researcher will have to provide "repeated assurance that participant data shall be reported anonymously: during recruiting and screening, in participant forms, at the beginning of the study session, during the session, in the session wrap-up." [37]. The dry-run participant section will be longer than the planned ones to uncover

problems related to the script, protocol, and system interaction. The pilot participant section shall follow the planned time constraints and allowed checking tasks' feasibility and timing. The author will have to schedule and conduct all backup volunteer sections, regardless of the show rates, as an attempt to obtain more representative data. This research shall keep videotapes and other users' data for six months. Within that time, there will be no data sharing, no data handling under any circumstance. The author shall be the only person with access to the collected data to fulfill the research purposes and procedures described in the Methodology section. After that period, the researcher will deplete the users' data and videotapes. All the volunteers will be aware of this procedure through the sign-up form. This search deals with geographically spread users within different global time zones, so the UX evaluation will have to perform individually and via the internet, as in online studies. To verify the search hypothesis's validity and redesign the software, the researcher will have to collect qualitative and quantitative UX data in each research cycle. That is why the users will perform financial reporting related tasks with OFR high-fidelity functional prototypes (fist version and redesigned version) while providing momentary and post-task completion interacting experiences feedback. Concerning the All about UX community categorization for UX evaluation methods suitability, this research demands a method that is adequate for online studies, applicable to functional prototypes, allows gather information from one user at a time and generates qualitative and quantitative UX data gathered during the user's interaction and after the task conclusion. None of the eighty-six UX evaluation methods from the All about UX community list embraced all of the demanded characteristics. However, adopting three of them (Emocards, PrEmo, and SAM) shall be enough to solve it. The pre-test questionary will contain a PrEmo measurement instrument from the Delft Institute of Positive Design provides the offline PrEmo version for academic research under an Attribution-NonCommercial-NoDerivatives 4.0 International Creative Commons license (CC BY-NC-ND 4.0). It will access how volunteers expected to feel about the use of the OFR software. The users will also be provided a link to an online form with the same PrEmo measurement instrument to report how they felt after each accomplished activity. The post-test questionary will contain a SAM and an Emocards measurement instrument through which the users will express how they felt after the test. The author shall adopt the procedures described in this subsection for the evaluation sections.

4. Limitations of the study

This study has three main limitations. Firstly, the literature review considered three paper repositories due to the authors' accessibility. It is necessary to expand the research dimension (considering more repositories) to assume the literature gap found is a de facto problem and to measure its extent. Secondly, the quiz only had 23 respondents that did not receive any incentive for contributing to this research. So, conclusions based on its results would be more representative and coherent with more volunteers. Even though authors cannot control attending rates, offering some incentives to the respondents might increase participation in future studies. Finally, the supportive technologies selection process considered existing reviews about some of the available solutions for this research demands. The authors did not perform any comparative analysis concerning all existing technological solutions because it was out of the scope of this study. However, there might be better and unanalyzed tools to accomplish the established goals.

5. Conclusion

If the evaluation results from the second cycle do not attain better indicators than the first one, it means: providing financial reporting professionals a software, whose design considered HCI matters, is not enough to increase the task efficiency; and the adopted procedures are not a recommended methodology for similar studies that aim to improve B2G and G2G e-Government practices. The opposite is also true. The hypotheses validation heavily relies on the usability and UX evaluation results. In future work, the authors intend to follow the described methodology to draw further conclusions about hypotheses validation and present its findings to the academic community through future publications. Regardless of the validation results, this study is already a contribution to mitigating the research gap between XBRL financial reporting and HCI.

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