REVIEW ARTICLE

CREATION, DEVELOPMENT AND VALIDATION OF CLOUD SOLUTION HERGOS: QUALITY OF LIFE OF THE COLLABORATOR

Criação, desenvolvimento e validação da solução na nuvem HERGOS: qualidade de vida do colaborador

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ABSTRACT

The utilization of easy access-to-web devices - such as online systems and applications - is revolutionizing the contemporaneous society life. Following the trends of those new technologies, it has had been verified the need for developing facilitation mechanisms and risk predictors for the collaborator's health integrity facing a labor environment. The objective of this study consisted in accomplish a systematic review over the process for softwares construction and validation. Therefore, a systematic literature review (January 2005 – January 2015) was done across the databases: OneFile; Scopus; MedLine/PubMed; SciVerse; ScienceDirect, upon these descriptors: instrument validation; instrument construction; online questionnaire. There were selected 11 articles for full reading once those attended the inclusion criteria, even though one had been withdrawn from the analysis due disaccordance to its own methodology. Regarding softwares management procedures, the studies clearly conduct it either in a simplified way or out of methodological patterns. Concerning tests, those are mentioned in all of the studies, implying them "quality". Nevertheless, no studies were identified based upon utilization of software verification and validation for electronic questionnaires related to the collaborator's health and quality of life.

Keywords: System Validation; Instrument Construction; Questionnaire.

RESUMO

A utilização de dispositivos de fácil acesso à web, tais como: sistemas online e aplicativos, têm revolucionado a vida da sociedade contemporânea. Seguindo a tendência dessas novas tecnologias, verificou-se a necessidade em se desenvolver mecanismos facilitadores e preditores de riscos, a integridade da saúde do colaborador diante do ambiente laboral. O objetivo deste estudo foi realizar uma revisão sistemática sobre o processo de construção e validação de softwares. Para tanto, realizou-se uma revisão sistemática de literatura (janeiro de 2005 a janeiro de 2015), na base de dados da CAPES, nas diferentes bases de dados, a saber: OneFile; Scopus; MedLine/PubMed; SciVerse, ScienceDirect, utilizando-se dos descritores: instrument validation, instrument construction and on line questionnaire. Sendo assim, foram selecionados 11 artigos para leitura integral, por atenderem aos critérios de inclusão, entretanto um artigo foi retirado da análise, por não estar de acordo com a metodologia estabelecida. Em relação aos procedimentos de gestão, ficou evidente que os estudos realizam a gestão de seus softwares, porém de forma simplificada, e ou, fora dos padrões metodológicos. Quanto aos testes, estes são mencionados por todos os estudos; o que confere ˝qualidade˝ aos mesmos. Entretanto, não foram identificados estudos, que tenham utilizado o D V de software para questionários eletrônicos; relacionados a Saúde e a Qualidade de Vida do Colaborador.

Palavras-Chave: validação de sistema; construção de instrumento e questionário.

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INTRODUÇÃO

The creation and validation of a software system compound a refined and judicious process. Such a process characterizes itself as an execution block aiming to deliver a software product (SOMMERVILLE, LOCK, STORER, DOBSON[1]).

The process of a software might be considered as a cluster of contingencies, activities, methods, tools and practices utilized for the construction of a software product.

It is important conducting a follow up over all the creation and maintenance phase, once from those a greater reliability and quality of programming system must come up.

Humprey[2] presents the validation of the phases to be followed due to minimize or avoid projects development problems.

The validation of a system or software enables participants to more efficiently conduct through the creation phases, providing the project manager a better planning and faster results achievement. Therefore, this research regards a web (World Wide Web – WWW – a web connecting computers worldwide) system Development Validation (D V) for the "Collaborator's Health and Quality of Life" – HERGOS.

It has been made a choice for a systematic review

intending to discuss and study the cutting edge information technologies, knowledge virtualization, interactivity and accessibility for a software system validation, due to analyze if those developing a software also follow the steps to its validation.

This study had the objective of conducting a systematic review regarding softwares DV process.

METHODS

Articles selection criteria

This systematic review has been conducted accordingly The Cochrane[3] Collaboration methodological procedures. The electronic search was based in the following descriptors into English language: instrument validation; instrument construction; on line questionnaire. The Boolean Operators "AND" and "OR" were applied.

Three items were considered for the inclusion criteria: 1. The articles show mention at least two of the descriptors on their titles; 2. The articles had to provide full text access; 3. The abstracts had to hold the research type.

For exclusion: 1. Articles published longer than ten years; 2. Articles with no abstract; 3. Editorials and Letters to the editor, monographs, dissertations, theses, abstracts, review articles, books, books chapters; 4. Articles into French, German, Mandarin among others due to the elevated translation costs.

Databases and research strategies

The systematic review resorted CAPES database for the last ten years (2005-2015) due to its indexed journals, highly regarded on several knowledge fields.

During first phase, there were selected articles holding at least two descriptors in their titles, when 4,200 publishments were found, as follows (Figure 1): OneFile (n=1598); Scopus (n=1543); MedLine/PubMed (n= 465); SciVerse, ScienceDirect (n=594). After careful reading of the titles, 3.978 of those were excluded, once they were not related to the interest topic of this study.

In the second phase, the remaining 222 articles abstracts were read. From those, 211 were withdrawn for being literature reviews, monographs, theses, dissertations or books chapters.

Finally, 11 articles were selected for full reading, attending inclusion criteria. However, one of those had to be withdrawn for not matching the established methodology. After that, the relevant references pointed in the texts (n=3 articles) were read and incorporated to the study.
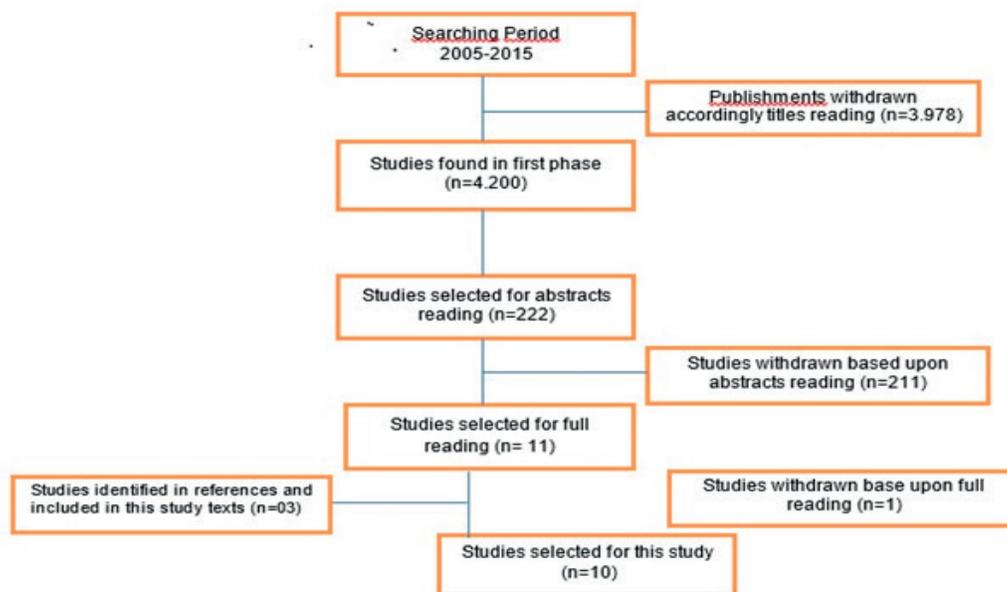
The articles selection was carried over two researches evaluation, independently. At the end of each phases, they deliberated regarding articles inclusion or withdrawn. Those items in agreement were accepted in the review process. In cases of disagreement concerning acceptance of withdrawn of an articles, a third researcher were asked to participate the selection process and full read the text. The decision was taken considering two votes of a kind.

Methodological quality assessment and data extraction.

For methodological quality assessment and data extraction, it has been prepared a synoptic table

including informations of: 1. The authors; 2. Publishing year; 3. Validated instrument. Phases 4 and 5 were not mention due to their great extension. This way, they were only analyzed and commented at Discussion.

Phases 4 and 5 regard: 4.Which of the 6 classic phases for validation were utilized (Research; Project Specification; Development; Project Management; Application Test; Solution Validation); 5.Software procedures or validation protocols.

Table 1 – Ten selected articles and their validating methodologies

AUTHORS	YEAR	VALIDATED INSTRUMENT
ASADI, et al	2014	Validation algorithm of referential models for custom-made softwares development processes.
GRAMATICA, P., et al.	2013	QSARINS – Software for development, analysis and validation of QSAR MLR models (Linear Regression Models for the Quantitative structure-Activity Ratio through minimum squares method and the genetic algorithm for selecting variables.
FERNANDEZ, A., ABRAHÃO, S., INSFRAN, E.	2013	WUEP – Web Usability Evaluation Process. Consists in a process proposal that might be integrated to other developing processes focused on web (internet) use, assessing efficiency, efficacy, perceived easiness of use and perceived satisfaction while utilizing web application.
SANTAMARÍA, D., et al.	2012	UAS – Helicopter Navigation Software, simulation and flight control for helicopter.
HARVEGO, E.A., SCHULTZ, R.R., CRANE, R.L.	2011	Practice and procedures to be utilized for validating patterns of the application.
PATIL, M.V., & NAGESWARA YOGI, A.M.	2011	Importance of the data quality and validating development processes for systematic softwares. There are several items proposed to avoid under or overestimating time and size of a development process, considering the estimates over engaged efforts shall be divided into three categories: 1 – Magnitude Order or Ballpark Order, estimates a developing process cost may reach twice or thrice the predictions when those are done in the initial stages of the process. 2 – Rough Category, estimates 50%-100% of the costs could be precisely predicted from well known cases with familiar applications to the analysts. 3 – Fair Category, estimates 25%-50% of the costs can be well defined when the analysts are aware of the process demands and have already done something similar previously.
FERREIRA, B.; MOITA, G.F.;	2010	VProcInsp. Processes Validating for Inspection.
POUPKOU, A.	2010	BEM (Biogenic Emission Model).
OLAGUE, H. M.	2007	Rhino version 14R3
BAX, Leon	2006	MIX – meta-analysis, with explanatory interactions.

RESULTS

From ten of the articles selected for this review, only four (36.3%) neither present nor follow a single instruments validation method. Such a fact may be consequence from the lack of synergy among developers and validating processes, being that a *sine qua non* condition in the scientific community, what several times do not happen outside the academic community.

Literature presents several softwares developing processes (GOTTSCHALK F. et al.[4], ROSEMANN, VAN DER AALST[5]) with diverse characteristics, attending countless development areas.

However, those processes do not prove to be enough, but complex (ASADI, et al.[6]; GRAMATICA[7], FERNANDEZ, ABRAHÃO, INSFRAN[8]; HARVEGO, SCHULTZ, CRANE[9]; PATIL & NAGESWARA YOGI[10]; FERREIRA, et al.[11]). In this regard, Asadi et al.[6], Bax et al.[12] and Poupkou[13] studies do not present the software management stage. It is to be supposed that has been done, but probably in a empiric way, leaning on its own environment.

The development practices are different among institutions, forcing them to improve those already known. However, to assure a process efficiency and accuracy, it must be necessarily tested and validated. As a result from that, several processes have been created, optimized and/or improved to attend project team demands, accordingly Ferreira, et al.[11]. This study had as objective validating a process model utilizing a Software Inspection technique, based upon DV concepts.

Therefore, from ten articles, only six (54.5%) mentioned a methodological approach, presenting development stage. However, that approach is done differently, as it is possible to observe in Asadi et al.[6]; Fernandez, Abrahão, Insfran[8], Ferreira, et al.[11]; Poupkou[13], Santamaria[14]; Olague[15]. Asadi et al.[6] present a 14 steps methodology: 1. Flowchart of the process of identification of the derived vertices connections in convergence or divergence of different types, and configuration of possible hops between convergences. 2. Modeling of structured business process by identifying the single input paths and one output for connection

predecessors and successors, and removal of possible exit points. 3. Integration of inclusive and exclusive relationships in the formula for the existing model. 4. Identify the relative order of execution between two activities. 5. Identification of weak links in a sequence of non-competing shares. 6. Model mapping including: configuration, customization, identification of inconsistencies in the process. 7. Permission for executions combinations in various orders. 8. Identification of strong inconsistencies. 9. Identifying potential inconsistencies. 10. Definition of the required path after analysis of inconsistencies. 11. Including the chain of connections defined by the obligatory path. 12 – Inconsistencies ranking. 13. Integration of inconsistencies. 14. Base of knowledge for comparison.

Santamaria et al.[14] approach the classic stages for its conception: design, development, test and validation. However, Olague[15] approaches the Time Box methodology: requirements analysis, implementation, test and deliverance. Ferreira, et al.[11] adopt the checklist methodology: planning; author; analysis and comparison; collection; discrimination; re-work.

Nevertheless, Fernandez; Abrahão, Insfran8 randomly utilize evaluation and usability methods (WUEP and HE). Poupkou[13] utilizes a methodology based upon two authors: Guenther[16] for calculation matters, and Symeonidis[17] for isoprene synthesis emitting calculation – depending on temperature and light – and monoterpenes and other volatile organic compounds – depending on temperature only.

Humphrey[2], Patil, Nageswara Yogi[10] and Ferreira, et al.[11] propose steps that must be followed due to minimize problems or failures in a process, mainly the validating one.

The processes validation assesses to answer the management inquires besides guiding steps of headlines to be followed, avoiding errors and/or bureaucracies that might disturb or derail the software creation development, accordingly Ferreira, et al.[11].

Harvego, Schultz, Crane[9] say it is interesting noticing that a validation process developed for certain knowledge area might be applicable in similar areas, and the work quantification in systematic softwares development could be inferred through the evaluation of the quality of the data and from different categories of issues experienced by analysts involved in the process, even though there will always be intangible variables such as one´s ego above the professional commitment (PATIL, NAGESWARA YOGI[10]).

Regardless those intangible variables, Asadi et al.[6], utilized softwares line of production principles as well as logic-descriptive formalism to develop a complex algorithm for customized processes referential models validation on softwares development, based upon decisions taking comparable to those found in Process -Aware Information Systems (PAIS) and Software Product Lines (SPL). The algorithm is proven to be able to identify inconsistencies in the process and define a pattern route to be followed for the customized software development which validation is desired.

The efficacy in the interaction with the users is assessed by methods under evolution. In terms of final client attendance, the validated softwares for web application usability has also been widely studied and meets a permanent development baseline (FERNANDEZ, ABRAHÃO, INSFRAN[8]).

In this way, it was possible to verify that all the articles report some validating method, respecting software validating procedures and/or protocols.

Regarding tests focusing the softwares quality, we could find they were done in all of the studies. Those tests are important as they imply larger quality to the product before it is made available to the final customer.

There might be countless tests activities, based on intuition or formal definition approaches (BEIZER, BLACK-BOX[18]; MYERS[19]; HETZEL[20]). However, despite statements are either intuitive or formal ones, authors conceptually generalize the software testing idea as a methodology utilized to monitor the software execution, ensuring it runs as planned.

We could verify the techniques for software validation processes are many and they might be applied in clusters or separately, and the validation process starts right at its conception (FERREIRA, et al.[11]).

CONCLUSION

The lack of studies regarding Softwares DV exposes even more how important are those softwares supporting the Collaborator´s Health and Quality of Life.

Even and despite most of the studies analyzed in this review (six articles) suggest an adequate methodology is followed, a methodological mix is practiced for the DV stages.

Concerning management procedures, the studies clearly simplify their softwares management or do it out of the recommended methodological patterns.

Regarding tests for checking the software functionality, those are mentioned in all of the studies, what implies them "quality".

However, no studies were identified containing also software DV for electronic questionnaires related to the Collaborator's Health and Quality of Life.

Softwares DV containing electronic questionnaires is important due to presenting validity and reproducibility evidence, besides offering advantages over printed instruments: their application time is reduced, becoming more attractive to the participant, less compelling than human action, leaving one at will mainly concerning the time for forms filling, which might adequate to individuals available schedule, besides providing interaction between instrument and participant.

Besides that, data can be easily treated in a database, where it is possible to store those in a structured way with less redundancy as possible, and be utilized for several different programs and users. Unexpected and intangible issues shall be considered, such as human behavioral action that might interfere in such processes progress.

This study make possible to conclude that softwares development and validation present as a trend to abandon processes similar cases studies and become a designed product based upon mathematics and statistics, ensuring broader stringency and reliability.

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CONFLICT OF INTERESTS: none