



## Chapter 118

# Evaluation and Validation of a software for the inspection of public contracts

  10.56238/ffisdwv1-118

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### **ABSTRACT**

The search for acceleration and technological innovation in public administration services has gained more and more space. In this aspect, the objective of the present article was to develop and validate a customized support software for the inspection of public contracts, for a Federal University

of the State of Minas Gerais. This software, Fiscalito Ti Conecta, was developed using a No Code platform that does not require the presence of a computing professional. For the evaluation and validation of the software, with the local target audience, validation was carried out by local judges with usability tests of the developed software, as well as the application of a questionnaire, whose scale used was the Likert Scale. The software was developed to be used as a support tool in the fiscal routine, in the training of the server and also as a means of communication with the community regarding the outsourced services existing at the Universidade Federal do Triângulo Mineiro. During the evaluation of the usability of the software, the local judges pointed out changes to better adapt the software, which were accepted and carried out. After the modifications, the judges locally validated the software, which was registered at the same institution with the institution's Technological Innovation Center.

**Keywords:** Software; Public Contracts; Validation; Supervisor.

## **1 INTRODUCTION**

Technological resources have increasingly influenced people's daily lives, whether in a personal or professional universe, thus migrating from an industrial society to an information society. Such migration is not only anerrogable pr of the private sphere but also of the public sphere, which increasingly seeks to debureaucratize and technological acceleration of public management and as a consequence new models of organizations are emerging or being modified. It can be said that the transformation in the public sphere began through the 1995 State Appliance Reform Program, which replaces bureaucratic public administration with a management public administration that makes processes more flexible.

The information age has arrived bringing great changes and Information Technology (IT) has been the means used for the restructuring of corporations. Alecrim (2019), defines IT as the area of computing that produces, transmits and stores various information in various contexts, used by people and institutions to achieve a certain goal. According to Bezerra (2017), with the information system, it walks through the combination of people, processes, data, technology, communication networks that relate to support and improve the business process of a company related to the information it has.

Hardware devices such as desktop computers, notebooks, tablets and mobile phones act directly as a technological source, and the computer is one of the most widely used individuals in companies, industries and public agencies. As for the types of software there are programming software, games, system, tutorial, application, the latter being used for this project, because it performs several tasks and can be used individually or globally. According to Fuggetta (2000), software development is a collective, inventive and complicated work. Thus their quality is strongly conditioned to people, organizations and processes to create and make them available.

Increasingly, the path to digital governance has made public managers rethink the daily lives of public agencies through innovations that provide greater resource efficiency, transparency and controls in management. An executive information system is "a highly interactive system that provides executives and managers with flexible access to information for the purpose of monitoring the organization's results and general conditions" (ALTER, 1992, p. 136).

This study focused on the management of public procurement supervision, proceeded with searches in the database of the National Institute of Industrial Property (INPI), regarding the registration of tax management software for public contracts, with the keywords "supervision" and "contracts" and "public", "inspection" and "contracts" and "inspection", which in turn reported zero (0), one (1) and twenty-nine (29) results, respectively, but the theme of the results presented was not directly related to technological innovation in the fiscal management of public procurement, as (Figure 1).

Figure 1 - Search in the PTO database for the registration of public procurement surveillance software.

Keywords	Findings
"supervision" and "contracts" and "public"	0
"supervision" and "contracts"	1
"surveillance"	29

Source: Of The Authors, 2022.

Using your own tools for management is the first step in optimizing activities in a process. A centralized management software ensures better use of time, interactivity, expands the access of those involved in real time creating an environment of colaboração, greater production and acceleration in the transmission of knowledge.

For Sleight (2000, p.7):

No organization can afford to ignore the tool that vitalizes the modern world. All the tools that were built during the development of the history of organizations bring some kind of benefit to the production process, many that are not implemented in its entirety.

It can also be verified that a *software* enables its replicability to third parties that demand the same service, thus being able to disseminate to a whole population tools of technological innovation. For Mello & Burlton (2000, p.1) "Creating, storing, locating, acquiring, using knowledge and learning in a systematic and optimized way become essential activities for individuals, groups and companies." This time through the absence of *tax management softwares* as searched in the PTO database, as well as with some federal public agencies, randomly selected, proceeded with the creation and validation of a *support software* for the supervision of contracts of said University and, entitled *Fiscalito Ti Conecta*.

The validity of an instrument occurs when its creation and testing allow the measurement of what is intended to be measured, and if the content analyzes the requirements to measure the events to be investigated (BELLUCCI JÚNIOR & MATSUDA, 2012).

## 2 METHODOLOGY

The research was carried out at the Federal University of Triângulo Mineiro, in the State of Minas Gerais, through an exploratory qualitative questionnaire, an instrument focused on the evaluation of the *usability and validation of softwar and Fiscalito Ti Conecta*, registration number 014140202291 on 10/26/2022, to be applied to some invited inspectors.

According to Mattar (1999, p. 45), descriptive research" will answer questions such as: who, what, when and where". For Gil (2002, p. 42), "descriptive research is, together with exploratory ones, those that social researchers usually carry out concerned with practical performance".

This research was approved and authorized by the Research Ethics Committee - CEP of the Federal University of Triângulo Mineiro, according to opinion no. 4,682,672.

Initially, a survey of platforms of *the No Code type was made*, such type of platform dispenses, in the *creation of applications, websites and software*, the participation of a computer programming professional, such a measure was adopted considering the agility and low cost for the preparation of the *software*. After the survey, we opted for the form of Bubble.io, due to the features and configurations available in the free version.

Thus, with the chosen platform began the design of the structure of the *software*, as well as its development. According to Lucidchart (2022), the design of a *software* consists of five steps: having a clear understanding of its requirements, thinking about each component, dividing the architecture into slices, creating a prototype, and identifying and quantifying non-functional requirements. After the creation phase, the *software* was disponibilizado for the testing and evaluation of its functionalities with six inspectors, being manager, technical fiscal and public fiscal user, who after performing the tests answered a questionnaire focused on questions of the experience lived by them in the evaluation of *the software*.

The software was then validated. The evaluation and validation, in the development phase of a *software*, is extremely important, because it is in this phase that it is opportune for the developer to correct flaws and increase resources, identified from the perspective of the one who will use the *software* daily.

For Galdeano, Rossi & Pelegrino (2008, p.550), validating is "an act or effect of making something legitimate, that is, making something true, something whose authenticity is proven."

Corroborando the authors, for Martiny (2018):

Activities related to the validation process should preferably be carried out by a team that does not participate in product development, has a customer's eye and is exclusively focused on identifying non-conformities, suggesting the best for the market. (...) identifying nonconformities in product development can reduce the costs of your later fix and improve its reliability.

The evaluation of *a software by those* who will make its use is a necessity for the advancement and improvement of technology, thus allowing a real view of the use of such a created resource. The guarantee of *the excellence of a software*, and its possible necessary adaptations, verified with users, takes place in the evaluation phase of *the software*, this step being the most opportune time for corrections (RANGEL, ÉVORA, OLIVEIRA, 2012). Thus, in the validation phase, with notes, by the inspectors, with correction and or increment in *the software*, the products will be performed and presented to the software evaluators.

Thus, the software validation was performed using a software evaluation and validation questionnaire and the Likert scale. This scale was developed in 1932 by Rensis Likert and widely used to provide a series of answers categorized in agreement to a given question focusing on questions of perception, taste and opinion. Second (EDMONSON, 2005; HODGE; GILLESPIE, 2003), the Likert scale is one of the most used scales in research, due to its easy understanding, adaptation and application in the various themes of studies.

From the application of the software usability *questionnaire*, the most relevant data related to the registration and training of contract inspectors were extracted. As for the analysis of the collected data, a tabulation was made in a spreadsheet. All analyses were explained and analyzed using graphs. In view of the data collected, the methodology to be made for the development and validation of the software was carried out.

### 3 RESULTS AND DISCUSSIONS

The *software structure, Fiscalito Ti Conecta*, was designed considering the types of inspectors existing in the Federal University of Triângulo Mineiro, as well as most types of contracts in force existing in this institution, thus creating generic forms to be used by the tax authorities durante their inspection routines. However, the software can be used by any agency.

A training module was made for the inspectors including videos of explanations of the tax routine, existing legislation, free and paid courses on the subject, *links to access* to legal provisions regarding the supervision of public contracts. And also was made the module for the community of the University, the fiscal users, being a form of evaluation of the outsourced services existing in the institution.

Overcoming the development of *the software*, the software was evaluated and validated. The evaluation and validation of a *software during* the cycle of its development provides the opportunity for adaptations, corrections and improvements from the look of those who will use the technology.

After building the first version of *the software*, for the evaluation we opted for validation by judges. In the validation by judges for qualitative and quantitative evaluations, as a rule, experts are invited, send the minimum number of five and maximum of ten judges (COLUCI; ALEXANDER; MILANI, 2015). Thus, they were invited to make up the committee of judges: four inspectors, including managers and technical inspectors and two fiscal users to know the tool, through videos that were recorded on the modules and how to *use the software* and perform usability tests, as well as *evaluation of the software* by answering a questionnaire with questions about performance, learning and usability of the *software*.

These judges were invited through their institutional e-mails from the Federal University of Triângulo Mineiro to participate in the evaluation and *validation of the software*, after acceptance, they signed a term of commitment of confidentiality and confidentiality in *decorrência of the registration of the software after* the validation of the same by the judges. The judges received in their emails the videos created that explain about the *software*, fulfilled the viewing of such videos. The participants' access link with respective *users* and passwords was sent to the participants' e-mail for each judge.

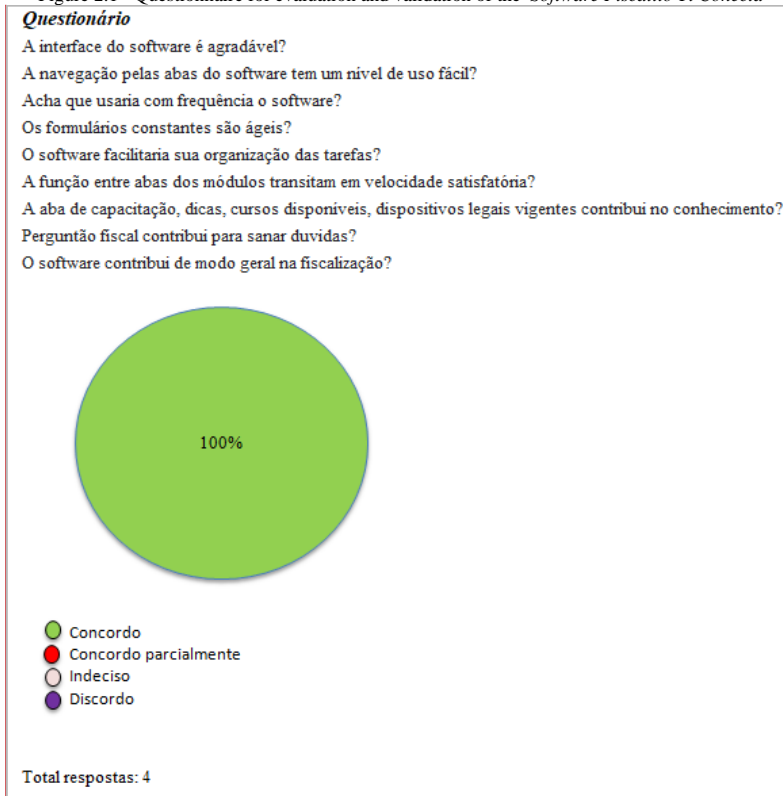
The *software* was available for twelve days for its usability and then a questionnaire was made available, through Google Forms, based on the Likert Scale, for the four tax management and technical tax, containing 13 closed questions and an open question (Figure 2.1 and 2.2), regarding the performance, functionality and learning potential of the *software*. For the two fiscal users, they were asked to send, by e-mail, a dissertation analysis regarding the *software module aimed* at the community of the University of evaluation of the outsourced services existing in the University.

The results of the questionnaire are shown in (Figure 2.1 and 2.2). Regarding the graphical interface of *the software* the judges agree that it is pleasant in its visualization and that navigation between the tabs of the *software* is easy. Three judges agree that the titles of the modules are intuitive, the same occurs with the clarity of organization of the information.

As for the question of whether the judges would *use* the software frequently, everyone agreed that yes. Three judges agreed that it was easy to locate *in* the software contract documents that they oversee. Asked if the inspection forms are easy to complete and understand, three judges agreed that yes. As for the forms being agile, all the judges agreed that they are.

All judges agreed that the *software would* facilitate the organization of their tasks with supervision, and also agreed that the speed of usability of the *software is* satisfactory. As for the training module for the inspectors all agreed that the module contributes to the training. In the discursive evaluation of the fiscal users, in general, *the software was approved* and praised as a means of communication between the community and the University.

Figure 2.1 - Questionnaire for evaluation and validation of the *Software Fiscalito Ti Conecta*

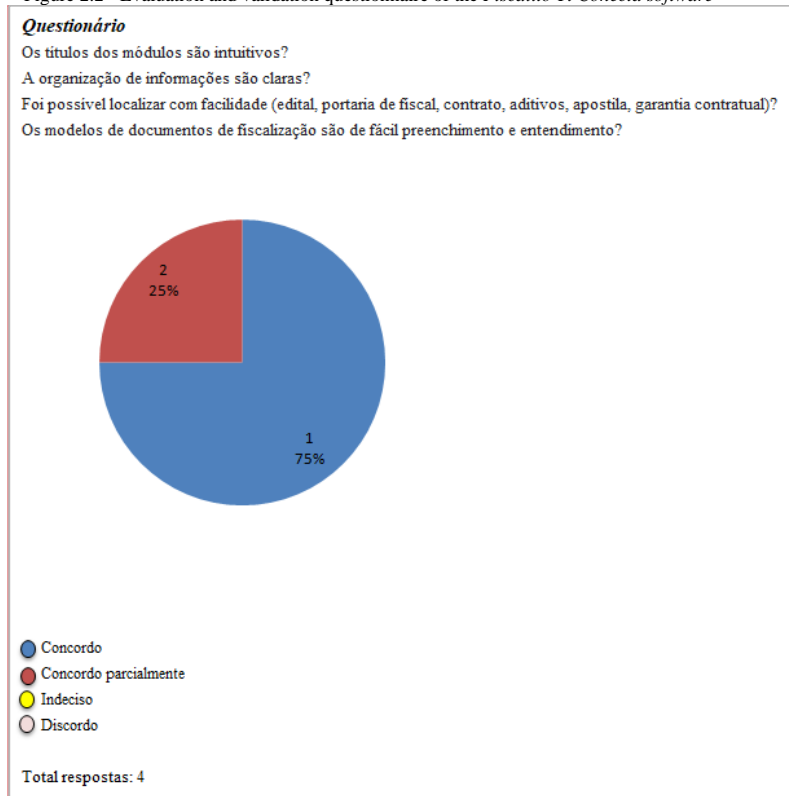


Source: From the authors, 2022.

**Comentado [IC1]:** Is the software interface nice?  
Is the navigation through the tabs of the software at a level of ease of use?  
Do you think you would often use the software?  
Are constant forms agile?  
Would the software make it easier for you to organize tasks?  
Does the function between the tabs of the modules transit at a satisfactory speed?  
Does the training tab, tips, available courses, current legal provisions contribute to knowledge?  
Does a tax question help to solve doubts?  
Does the software generally contribute to inspection?

I agree  
partially agree  
undecided  
I disagree

Figure 2.2 - Evaluation and validation questionnaire of the *Fiscalito Ti Conecta* software



Source: From the authors, 2022.

**Comentado [IC2]:** Are module titles intuitive?  
 Is the organization of information clear?  
 Was it possible to locate easily (edit, tax ordinance, contract, amendments, handout, contractual guarantee)?  
 Are the inspection document models easy to fill out and understand?

I agree  
 partially agree  
 undecided  
 I disagree

The technical and tax judges in the opportunity existing in the questionnaire for the open question that asks for manifestation as to suggestions of me, correction, compliments, etc., were pointed out some adaptations of the type: leave the header of the forms with data of suppliers with self-completion when entering the contract number, change the title of a document existing in *the software* and assign the grade in the evaluation of the chosen category in the evaluation form of the user public fiscal. All suggestions were accepted and modified in the *software* thus formalizing its validation. The amendments were presented to the judges by recorded video.

After the positive phase of evaluation and validation, *the software* desenvolvido *Fiscalito Ti Conecta* had its registration no. 014140202291 carried out with the Center for Technological Innovation of the University through the process Sei nº nº 23085.014140/2022-91, in September 2022, aiming at the protection of intellectual property dedicated in its development.

#### 4 CONCLUSION

Transforming a public organization is a complex task that requires the involvement of multiple agents. The challenge of this work was to provide the public procurement *inspectors with a support software* in the fiscal routine, in their training, as well as means of communication between the community and the University. The use of a *No Code platform allowed agility and autonomy for software development*, as well as the same agility to implement the suggestions of the judges who *evaluated the Software Fiscalito Ti Conecta*. Evaluating and validating software, aimed at the supervision of public contracts, with a group of people who are directly associated with *the functionality of the software* is paramount to achieve accurate results. The validation results through the usability tests presented in this first version demonstrated that the *software is* suitable for its usability in the tax routine. The *software* does not replace other sources of resources and knowledge related to the theme, but provides greater agility, security, interaction and efficiency in the tax routine of public contracts with those who deal daily with the supervision of public contracts.



## REFERENCES

- Alecrim, E., 2019. O que é Tecnologia da Informação (TI)?. Infowester. Disponível em: <https://www.infowester.com/ti.php>. Acesso em 28 out. de 2022.
- Alter, S. Information Systems: a management perspective. The Benjamin / Cummings Publishing Co., Menlo Park, CA, 1992.
- Bellucci Júnior, J. A.; Matsuda, L. M. Construção e validação de instrumento para avaliação do Acolhimento com Classificação de Risco. Rev Bras Enferm, Brasília, v. 65, n. 5, p. 751-757, 2012.
- Bezerra, E. Princípios de Análise e Projeto de Sistema com UML. 3a ed. Rio de Janeiro: Elsevier Brasil, 2017.
- Coluci, M. Z. O.; Alexandre, N. M. C.; Milani, D.. Construção de instrumentos de medida na área da saúde. Ciência & Saúde Coletiva. v. 20, n. 3, 2015.
- Edmonson, D. R. Likert scale: A history. Retrieved from CHARM database, 2005.
- Fuggetta, A., 2000, "Software Process: A Roadmap". In: FINKELSTEIN, A. (ed.), Galdeano, L. E.; Rossi, L. A.; Pelegrino, F. M. Validação de conteúdo de diagnóstico de enfermagem conhecimento deficiente. Acta Paulista Enfermagem, São Paulo, v. 21, n. 4, p. 549-555, 2008. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_pdf&pid=S0103-21002008000400003&Ing=en&nrm=iso&tIng=pt](http://www.scielo.br/scielo.php?script=sci_pdf&pid=S0103-21002008000400003&Ing=en&nrm=iso&tIng=pt). Acesso em 12 jul. 2022.
- Gil, A. C.. Como elaborar projetos de pesquisa. 4. ed. São Paulo: Atlas, 2002.
- Hodge, D. R.; Gillespie, D. Phrase completions: An alternative to Likert scales. Social Work Research, v. 27, n. 1, p. 45-55, 2003.
- Lucidchart. 2022 . Como desenhar arquitetura de software: dicas e práticas recomendadas. Disponível em: <https://www.lucidchart.com/blog/pt/como-desenhar-arquitetura-de-software>. Acesso em 7 de set 2022.
- Martiny, R. A importância da validação no desenvolvimento de produtos. Autus, São Leopoldo – RS, 14 jun. 2018. Disponível em: Disponível em: <https://www.altus.com.br/post/151/a-importancia-da-validacao-no-desenvolvimento-de-produtos>. Acesso em: 13 ago. 2022.
- Mattar, F. N. Pesquisa de marketing: metodologia, planejamento. 5. ed. São Paulo: Atlas, 1999. 1 v.
- Mello, A.M.V., Burlton, R. Gestão do Conhecimento na Perspectiva de Negócios. Disponível em: <<http://www.ubq.org.br>>. Acesso em: 17 jul. 2022.
- Rangel, A. L.; Évora, Y.D.M, Oliveira M.M.B.O processo de avaliação do software de geração automática de escala de trabalho da enfermagem e da escala por ele gerada. Journal Of Health Informatics: 2012. Disponível em: <file:///C:/Users/hanay/Downloads/208-934-1-PB.pdf> .Acesso em: 07 set.. 2022.
- Sleight, S. Como usar a tecnologia de informação. 2. ed. São Paulo: Publifolha, 2000.