

Software Development for Public Contract Inspectors: Experience Report

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ABSTRACT

The present work refers to an experience report lived by a master's student, from the Professional Master's Program in Technological Innovation at the Federal University of Triângulo Mineiro - UFTM (Uberaba-MG), about the development of software. This work aims to detail the steps taken when working in the

development of the technological product, using a free No Code platform, since the master's student graduated in Administration and does not have deep knowledge in the area of computing. Such a platform has grown exponentially for the development of technological products around the world. The software developed, called "Fiscalito Ti Conecta" is a customized technological tool to support the inspection of public contracts. A centralized management software guarantees better use of time, and interactivity, and expands the access of those involved in real-time, creating a collaborative environment, of greater production and acceleration in the transmission of knowledge. As a result of the validation of the developed product, positive comments were obtained from some university inspectors, who were invited to learn about the system. The developed software meets the search for technological acceleration in public management claimed by the federal government of Brazil.

Keywords: Software; Public Contracts; Inspectorial; Technology.

1 INTRODUCTION

To join the Professional Master's Program in Technological Innovation, within the research line "Innovation in the Public Service" of the Federal University of Triângulo Mineiro (Uberaba-MG), and considering the professional experience, of the main author, in a sector from the same university, a project was designed that aimed to create a technological product, which does not yet exist in federal public agencies, whose functionality is to support the routine inspection of public contracts through software. Such a product goes against the search for technological acceleration in the public service claimed by the Federal Government.

Technological innovation has gained momentum in the public sphere and the search for tools that innovate public management is increasingly perceived, as providing more efficiency, agility, interaction, and security. Technological innovation is nothing more than offering the market an execution technique or a technologically improved or new product. Technological Innovations in Products and Processes (TPP) comprise the implementation of technologically new products and processes or substantial technological improvements in products and processes (Oslo Manual, p. 54, 2018).

In the public sphere, innovation is defined as the "creation and implementation of new processes, products, services, and delivery methods, which result in significant improvements in efficiency, effectiveness or quality of results" (Mulgan & Albury, 2003, p. 3). In Public Administration, when promoting the materialization of needs for goods/services, a universe of procedural rites that are linked from the request of the good and/or service to its execution must be followed. The Administration will seek to release itself from the material performance of executive tasks, resorting, whenever possible, to indirect execution, by contract, provided that there is, in the area, a private initiative sufficiently developed and qualified to carry out the tasks of execution, according to Decree-law No. 200 of 1967 (BRASIL, 1967).

In this context, in the execution part of the contract, the so-called fiscal figure emerges, which is a servant appointed to assess the execution of the contract. As provided for in Normative Instruction No. 5, 2017 (BRASIL, 2017), in article 40, the types of inspectors are:

I - Management of Contract Execution: it is the coordination of activities related to technical, administrative, sectoral, and using public inspection, as well as preparatory acts for procedural instruction and forwarding of relevant documentation to the contract sector to formalize the procedures regarding the aspects that involve the extension, alteration, rebalancing, payment, the possible application of sanctions, termination of contracts, among others;

II - Technical Inspection: monitoring to evaluate the execution of the object in the contracted manner and, if applicable, assessing whether the quantity, quality, time, and mode of provision of services are compatible with the stipulated minimum performance level indicators in the calling activity, for payment according to the result, and may be assisted by the inspection referred to in item V of this article;

III - Administrative Inspection: is the follow-up of the administrative aspects of the execution of services in contracts with a regime of the exclusive dedication of labor in terms of social security, tax, and labor obligations, as well as in terms of timely measures in cases of default;

IV - Sectorial Inspection: is the follow-up of the performance of the contract in the technical or administrative aspects when the provision of services occurs concurrently in different sectors or decentralized units of the same body or entity; and

V - Inspection by the User Public: it is the monitoring of the contractual execution through a satisfaction survey with the user, intending to assess the results of the provision of services, the material resources, and the procedures used by the contractor, when applicable, or another determining factor for the evaluation of the qualitative aspects of the object.

By regulation, the server cannot refuse the function, recommended according to Law 14.133 of 2021 (BRASIL, 2021), in article 117 "The execution of the contract must be accompanied and supervised by 1 (one) or more contract inspectors, representatives of the Administration specially designated according to requirements established in art. 7 of this Law, or by the respective substitutes, the hiring of third parties to assist and subsidize them with information relevant to this attribution is permitted". Supervising contracts is to ensure the faithful fulfillment of the contract assumed between the contracting party and the contracted party for subsequent release of payment to the contracted party. The public power must have the corresponding prerogative to control its contracts and adapt them to the demands of the moment, supervising, accompanying, and inspecting their execution or intervening in it (Meirelles, 2012, p. 223). Servers are often not prepared for such an activity, thus requiring courses/tools to assist in the full and correct inspection of invested public expenditures, in addition to avoiding administrative liability for failures in the inspection.

Regarding the form of registration that public bodies must carry out, Law 8.666/1993 (BRASIL, 1993), governs in its § 1 of art. 67 that: The Administration representative will record in its record all occurrences related to the execution of the contract, determining what is necessary to regularize the observed faults or defects. At the researched university, the means of recording contract inspection were analyzed and most of these are controlled by electronic spreadsheets, as well as word processors created by the inspectors. Electronic spreadsheets often generate insecurity in the controls and management of processes, as they are more subject to errors, to be deleted, it takes a long time to insert information, and they transit through several versions, in addition to this medium not being integrated into electronic systems mostly.

In electronic spreadsheets, there may be hidden errors, human error when deleting data, and complex formulas, there may be a need for several spreadsheets to maintain management control, which can result in a lack of data control due to decentralized databases. Also, electronic spreadsheets are more susceptible to fraud, do not support high scalability, and require more time to complete (Orientec, 2019).

Because it is an extremely important and detailed job, inspection confronts contract, execution, and legislation, the inspector needs efficient, specific, safe, and agile tools to support his activity. Throughout the author's performance at the studied university, it was possible to observe flaws in the inspection process that could be avoided, minimized through a customized technological tool to support the fiscal routine, integrating functions such as standardized forms, training, and interaction between those involved with the contracted object.

A technological tool, such as centralized management software, guarantees better use of time, and interactivity, and expands the access of those involved in real-time, creating a collaborative environment, of greater production and acceleration in the transmission of knowledge and security. Creating, storing, locating, acquiring, using knowledge, and learning in a systematic and optimized way become essential activities for individuals, groups, and companies (Mello and Burlton, 2000, p.1). The information system flows the combination of people, processes, data, technology, and communication networks that interact intending to support and improve the business process of a company related to the information it has (Bezerra, 2017).

During the development of software according to the needs of the target audience, it is essential to evaluate and validate the system with those who will benefit from it. In this context, the evaluation and validation of a system during its implementation is paramount. The tests carried out, mainly by those who will use it in the future, pointing out the flaws and improvements to be made before its completion are promising for the success of the software's effectiveness.

According to Martiny (ALTUS, 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 perspective, and is exclusively focused on identifying nonconformities, and suggesting the best for the market. (...) the identification of

nonconformities in the development of the product can reduce the costs of its subsequent correction, in addition to improving its reliability.

With the advancement of technology around the world, optimizing processes, and accelerating results, without losing quality, have become paramount in the face of constant technological developments in software and hardware. With these new needs for maximization, a new type of development of applications, websites, and software, among other devices, arises through platforms called No Code and Low Code. These platforms do not require a computer programming developer since the respective platforms operate without programming and with low programming, respectively. In a traditional programming process, an initial interaction between the developer and the customer who demands the product is required, and later on, building the source code, front, and back, which can take more time and programmers. With the No Code and Low Code platforms, part of this process is eliminated and a team or the demanding customer himself begins to build a product without writing a code from the beginning, in a safe way, with high quality and with innovative elements (Duda, 2022).

Thus, this article aims to explain the experience of a master's student, from the administration area, working in the technology area for the development of support software with the contract inspectors of a federal university in the state of Minas Gerais, using a No Code platform.

2 METODOLOGIA

This is a descriptive study, with a qualitative approach, of the experience report type (Pereira et al, 2018), which discusses the experience of developing a technological tool to support the fiscal routine of public contracts. A descriptive qualitative approach exposes the characteristics of a given population or phenomenon. It can also establish correlations between variables and define their nature. It is not committed to explaining the phenomena it describes, although it serves as the basis for such an explanation (Vergara 2004 p. 47).

For the development of the software, some stages of the innovation cycle inspired by the teachings of ENAP/GNOVA were fulfilled, namely:

- identification of the problem – the lack of a customized technological tool to support the fiscal routine of public contracts;
- generating ideas to solve the problem - developing software for the university's public procurement inspectors;
- implement the proposals - design modules with content for each type of inspector, training, and interaction with the university community regarding existing outsourced services;
- project evaluation - make the software available to a small group of inspectors to carry out tests and respond to a system evaluation questionnaire;

With the use of a Minimum Viable Product – MVP, it is possible to develop a product and thus evaluate acceptance and test with users, making adjustments to the solution to the problem (Cooper &

Vlaskovits, 2010). Thus, for the viability of the development of the Minimum Viable Product - MVP, being the software, the design of services focused on the user was used, and the contract inspectors, as the center of the service, to make it possible to deliver values and tests for the user in a first version.

Validation, as previously mentioned, in the software development phase is important, as it is at this time that the developer has the opportunity to correct flaws and increase resources, identified from the point of view of those who will use the system daily. According to Galdeano, Rossi, and Pelegrino (2008, p.550) to validate is "the act or effect of making something legitimate, that is, making something true, something whose authenticity is proven." Rangel; Évora; Oliveira (2012) mention that the quality assurance of software, as well as possible necessary modifications, verified with the users, takes place in the software evaluation phase, this phase being the most opportune moment for corrections.

Thus, prototyping to evaluate the software during its development took place on a small scale with six invited inspectors (managers, technical inspectors, and public user inspectors). At an opportune moment, the inspectors were invited, through their institutional e-mails, to participate in software tests. After acceptance, videos were made available that presented the system, as well as its navigation and usability, with subsequent release of access to the software for testing its functionality, usability, performance, and learning potential.

After the test phase on the system, through a virtual questionnaire on Google Forms, consisting of 13 closed multiple-choice questions and 1 open question, sent to the institutional email of the inspectors (managers and technicians), they were asked to proceed with a software evaluation. As for the user public inspectors, they were asked to send, by e-mail, a discursive evaluation referring to the customized module for them. When notes were taken by the inspectors involved, with corrections and/or improvements in the software, the acts were carried out and the new changes were presented through a video with the invited inspectors.

3 RESULTS AND DISCUSSION

3.1 RESEARCH & PREPARATION PHASE

To begin the approach of this subsection, it is first necessary to define the word software, which is a set of commands determined in a programming language that create actions, allowing activities to be carried out on a computer, cell phone, or device. There are programming, game, system, tutorial, and application software, the latter being the one used in this work, as it performs various tasks and can be used individually or globally. For (Prikladnicki; Willi; Milani, 2014) software is increasingly evolving and present in various activities, whether simple or complex.

For the development of the software entitled "Fiscalito Ti Conecta", a customized system to support public procurement inspectors at the university and with the potential to be replicated by other public bodies, a survey was carried out of the means available for developing programs for computers for those who do not have in-depth experience in the computational area. The methodology called No Code was

found, a new technological modality that has gained great prominence and has been growing exponentially since mid-2018. This methodology means free translation No Code and existing graphical interface tools ready for the user to develop a product without a programmer and faster and less costly. This visual tool is a technological and social aspect within reach in the development of web and mobile solutions without programming, without the need to write lines of code, in this way No Code allows developers who do not have programming knowledge to create their technological solutions (Souza, 2021).

As there are currently several No Code tools, a survey of the eleven most used tools was carried out and a comparison of functions, performance, and costs offered by the tools was made. Subsequently, a choice was made for the development of the product which best platform meets the proposed system, considering database, storage, how many tabs it can open, as well as users, logged in at the same time, in a free plan, among other characteristics and these data are in table 1.

Table 1 - The 11 most used No Code tools

Requirements	Tools										
	Fabapp (BR)	Bubble	Glide	Aritable	Webflow	FlutterFlow	Squarespace	Zapier	Adalo	Xano	App Gyver
Free plan	não	sim	sim	sim	sim	sim	sim (14 dias)	sim (14 dias)	sim	sim	sim (para ME)
Data Lines	50 páginas	200 linhas	500 linhas	1.200 registros	duas páginas	-	-	100 linhas	50 linhas	1.000 registros	ilimitado
File and Image Storage	1GB	2GB	100MB	2GB	50GB	-	limited	-	-	-	ilimitado
User limitation	sim	não	sim	-	não	não	-	não	não	não	ilimitado
Batch actions	50 páginas	sim	não	não	não	sim	-	sim	sim	-	sim
Database Interaction	não	sim	sim	sim	não	sim	sim	sim	sim	sim	sim
Make Web app	sim	sim	não	sim	sim	não	sim	sim	sim	sim	sim
Make mobile app	não	sim	sim	sim	sim	sim	sim	sim	sim	sim	sim

Source: The Authors (2022)

3.2 LEARNING STAGE

Once the Bubble platform was chosen, being the most suitable for software development, a search was made for materials and videos that would teach how to work with the tool. Thus, 217 hours of training were provided through explanatory videos, as well as reading existing documents. Once the phase of searching for which tool to use was overcome, as well as learning how to use it, the product construction planning began.

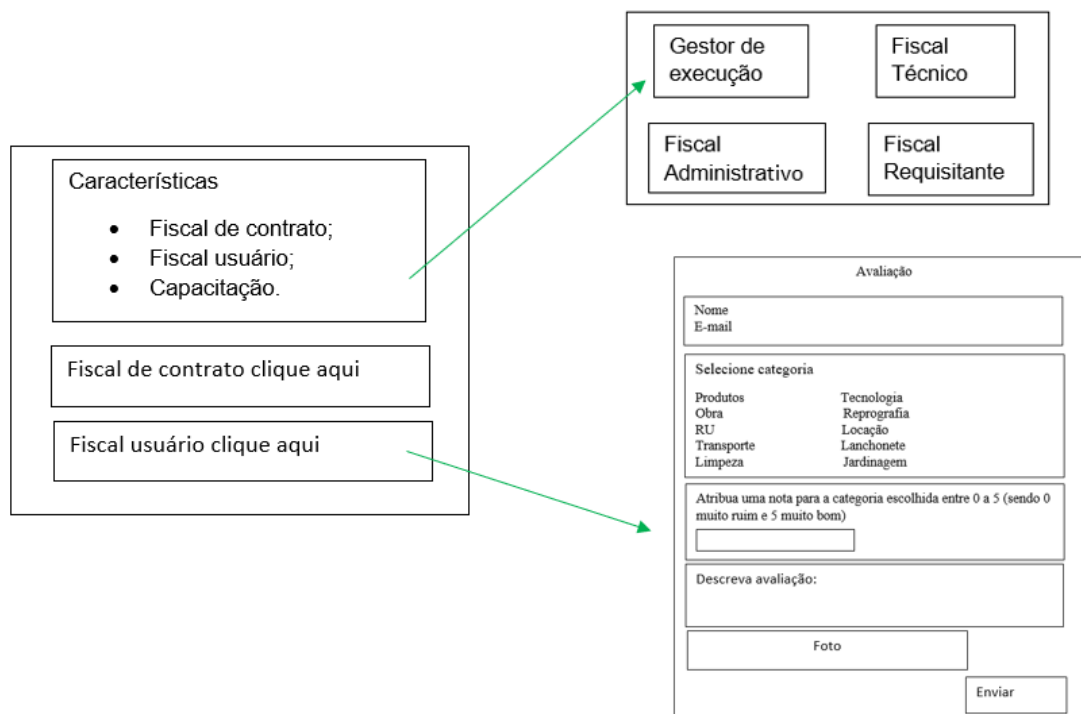
3.3 EXECUTION STAGE

As contract supervisors are the target audience for the software, the operational routine forms of competence for each type of supervisor were outlined, which are shown in figure 1. The software consists of an initial screen with a general presentation and a login button for the use of the software, and a specific

button for the university community called fiscal users. As the university has more than 100 (one hundred) active contracts for services and various goods, generic forms were formalized to cover the largest possible number of operational inspection routines, which are shown in figure 2.

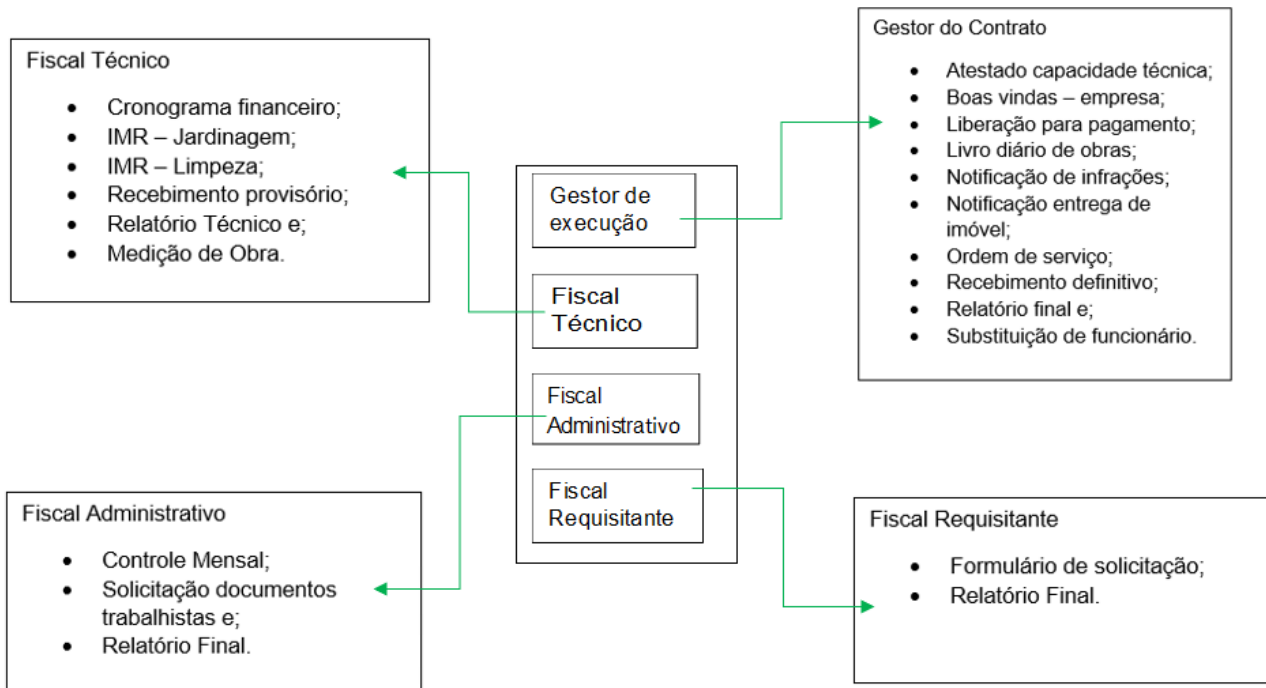
In the contract inspection module, there are specific modules for each type of inspector containing a series of forms that he will have available to fill out, namely, the contract manager who is responsible for coordinating/managing contract inspection activities, as well as forwarding of documents for other sectors, the technical inspector who is responsible for monitoring the daily technical execution of the contract, administrative inspector responsible for monitoring the execution of labor contracts with the exclusive dedication of labor and requesting inspector responsible for monitoring the execution of technology contracts.

Figure 1 – Software Home Screen



Source: The Authors (2022)

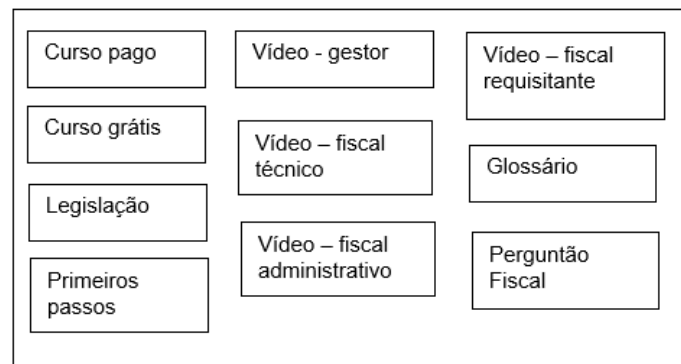
Figure 2 - Contract Supervision Modules



Source: The Authors (2022)

In the training module (Figure 3), the inspector will have available a range of means of acquiring knowledge, including current legislation, videos of explanations and instructions, paid and free courses, a glossary of terminologies, and tax questions.

Figure 3 - Modules for the Training of Fiscal Agents



Source: The Authors (2022)

In the module aimed at the public inspector, constant use on the initial screen of the software, we have the evaluation form for outsourced services existing at the university. For Bresser-Pereira (1998 apud Slomski et al., 2010) in Managerial Public Administration, the emphasis is on the citizen and on the results that intimate the public manager to efficiency, transparency, and quality in the provision of his service, as well as in the exercise of his functions.

In this form, the university community can express its point of view regarding the quality, efficiency, and use of existing services, it will select the category, assign a grade, describe its evaluation, as well as

having the possibility to insert images of the object in question if it's necessary. Such evaluation will be directed to the contract manager for knowledge and data collection (Figure 4).

Figure 4 - User Tax Evaluation Modules

Avaliação

Nome
E-mail

Selecione categoria

Produtos	Tecnologia
Obra	Reprografia
RU	Locação
Transporte	Lanchonete
Limpeza	Jardinagem

Atribua uma nota para a categoria escolhida entre 0 a 5 (sendo 0 muito ruim e 5 muito bom)

Descreva avaliação:

Foto

Source: The Authors (2022)

3.4 ASSESSMENT PHASE

With all the software modules finalized, the target public of this project was evaluated. As stated in this methodology, six inspectors were invited, including managers, technical inspectors, and user public inspector, to be introduced to the software, as well as to proceed with its use. With the acceptance of participation by all, videos were made available, and registered with Ancine, which explains the software. After overcoming the knowledge phase of the system, the software was made available for them to proceed with tests and, in the end, answer a questionnaire that deals with their experiences with the usability of the system. The results of this step are shown in table 2.

Table 2 - Software Usability Questionnaire (Manager and Technical Inspectors)

Question	Agree	Partially Agree	Undecided	Disagree
Is the software's interface pleasant?	4			
Percentage	100%			
Does the navigation through the software's tabs have a user-friendly level?	4			
Percentage	100%			

Are the module headings intuitive?	3	1
Percentage	75%	25%
Is the information organization clear?	3	1
Percentage	75%	25%
Do you think you would use the software frequently?	4	
Percentage	100%	
Was it possible to easily locate (edital, fiscal ordinance, contract, additives, apostille, contractual guarantee)?	3	1
Percentage	75%	25%
Are the templates for inspection documents easy to fill out and understand?	3	1
Percentage	75%	25%
Are the constant forms agile?	4	
Percentage	100%	
Would the software make it easier for you to organize your tasks?	4	
Percentage	100%	
Does the function between module tabs move at a satisfactory speed?	4	
Percentage	100%	
Do the training tab, tips, courses available, and legal provisions in force contribute to knowledge?	4	
Percentage	100%	
Does the tax question help to clarify doubts?	4	
Percentage	100%	
O <i>software</i> contribui de modo geral na fiscalização?	4	
Percentage	100%	

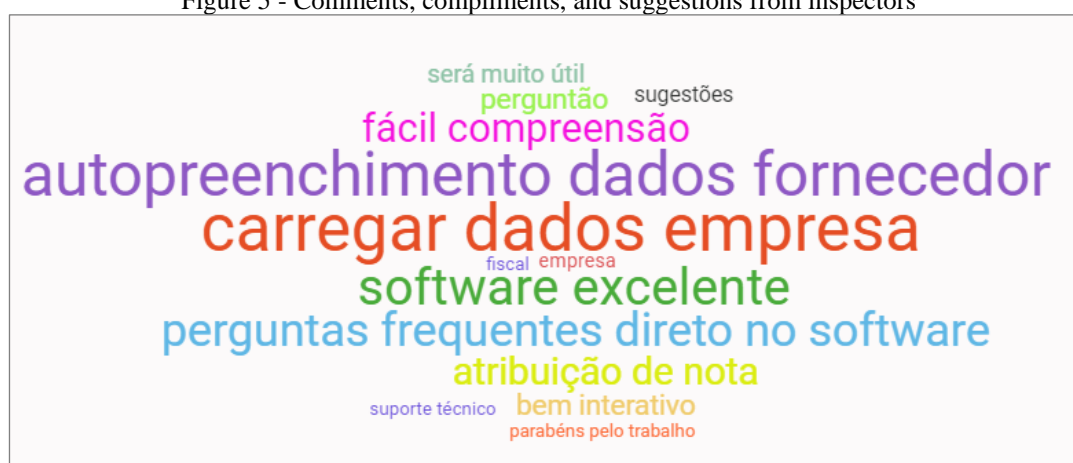
Source: The Authors (2022)

Also in the questionnaire made available to the inspectors, a discursive field was inserted for them to discuss corrections, improvements, praise, or criticism of the software. This request was also sent out to public user inspectors, whose manifestations were coded using a word chart (Figure 5), which was built in TagCloud, a program available on the web for free. A word cloud is a tool in a digital graph format that shows the degree of frequency of words in a text. The more the word is used, the more striking the

representation of that word in the graphic. Words can appear in a variety of sizes, fonts, and colors. This differentiation helps to visualize more and less relevant aspects in the context (Golinhaki, 2019).

Among the words highlighted, the suggestions for complementing the software were that in the header of the forms, in which it is suggested that the data referring to the company load automatically when typing the contract number. It was suggested that the button "Question tax" be renamed to frequently asked questions and that such questions be within the software and no longer in a pdf file. It was also suggested that the user inspector's assessment form should include a field for attributing a grade for the selected category so that such a grade would facilitate the tabulation of data, by the inspectors, along with the assessment made.

Figure 5 - Comments, compliments, and suggestions from inspectors



Source: The Authors (2022)

All proposed suggestions were accepted and implemented in the software and, through a recorded video, such adaptations were disclosed to the invited inspectors. The developed software "Fiscalito Ti Conecta" had its registration nº 014140202291 carried out with the Technological Innovation Center of UFTM through the process Sei nº 23085.014140/2022-91, in September 2022, aiming at the protection of the intellectual property dedicated to its development.

4 CONCLUSION

Contract inspection is a very complex activity, of great responsibility with a direct impact on the functioning of public management. Having a customized technological tool for such an activity provides much more focus, interaction, efficiency, productivity, organization, and transparency. As demonstrated by the inspectors invited to test the developed software, they demonstrate satisfaction and acceptability with the proposed system to support their activities focused on the inspection of public contracts. As a future goal, it is intended to plead with the competent authorities of the UFTM for the use of the developed software. Efficient management of public resources is a basic principle to achieve the interests of society and the good use of taxes paid by it.

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