PROJECT, DESIGN AND MANAGEMENT

https://www.mlsjournals.com/Project-Design-Management

ISSN: 2683-1597

How to cite this article:
Borges de Amorim, D. F. (2020). Softwares de aplicação livres: cenário e motivações de uso por pessoas e por empresas no Brasil. *Project, Design Management*, *5*(2), 78-99. doi: 10.35992/pdm.5vi2.

FREE APPLICATION SOFTWARES: SCENARIO AND MOTIVATIONS FOR USE BY PEOPLE AND COMPANIES IN BRAZIL

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Abstract. The use of business-oriented software is indispensable for companies and people to keep them competitive in an increasingly dynamic, fast and complex market. It happens that, many times, the acquisition and licensing of these programs can represent a relevant budget constraint, since these investments demand a considerable slice of capital resources. In this context, the objective of this research was to measure and justify the use of free application software by people and companies in Brazil, since these programs can be an alternative to proprietary software. For this, a descriptive survey was carried out, such as a survey, which applied a questionnaire to collect the data to be analyzed. Closed and open, quantitative and qualitative questions were addressed. The main results obtained were: the existence of positive correlations in the use of free applications between legal entities and individuals; factors such as cost-benefit and cost being the most related as motivating elements for the use of these applications by the target audience; and, gratuity is the element of deviation in the ratio of rational use / random use by legal entities, something that is not verified in the individual respondents.

Keywords: free application software, correlations, cost-benefit.

SOFTWARES DE APLICAÇÃO LIVRES: CENÁRIO E MOTIVAÇÕES DE USO POR PESSOAS E POR EMPRESAS NO BRASIL

Resumo. O uso de softwares orientados aos negócios é indispensável às empresas e às pessoas para mantê-las competitivas num mercado cada vez mais dinâmico, veloz e complexo. Ocorre que, muitas vezes, a aquisição e o licenciamento desses programas – em especial, software proprietário – podem representar uma restrição orçamentária para muitos empreendimentos e para pessoas físicas, uma vez que esses investimentos demandam uma considerável fatia de recursos capitais, nem sempre acessíveis. Nesse contexto, o objetivo da presente pesquisa foi medir e justificar o uso de softwares de aplicação livres por pessoas e por empresas no Brasil, visto que esses programas podem ser uma alternativa aos softwares proprietários. Para tanto, foi realizada uma pesquisa descritiva, tipo *survey*, a qual aplicou um questionário para colher os dados a serem analisados. Foram abordadas questões fechadas e abertas, quantitativas e qualitativas. Os principais resultados obtidos foram: a existência de correlações positivas no uso de aplicativos livres entre pessoas jurídicas e pessoas físicas; fatores como custo-benefício e custo sendo os mais relacionados como os elementos de motivação para o uso desses aplicativos pelo público-alvo; e, a gratuidade como sendo o elemento de desvio na relação uso racional/uso aleatório por pessoas jurídicas, algo que não é verificado nos respondentes pessoas físicas.

Palavras-chave: softwares de aplicação livres, correlações, custo-benefício.

SOFTWARE DE APLICACIÓN GRATUITA: ESCENARIO Y MOTIVACIONES PARA USO DE PERSONAS Y EMPRESAS EN BRASIL

Resumen. El uso de software orientado a los negocios es indispensable para que las empresas y las personas los mantengan competitivos en un mercado cada vez más dinámico, rápido y complejo. Ocurre que, muchas veces, la adquisición y licencia de estos programas, en particular, software propietario, puede representar una restricción presupuestaria para muchas empresas y para individuos, ya que estas inversiones demandan una porción considerable de recursos de capital, que no siempre son accesibles. En este contexto, el objetivo de esta investigación fue medir y justificar el uso de software de aplicación gratuita por parte de personas y empresas en Brasil, ya que estos programas pueden ser una alternativa al software propietario. Para esto, se realizó una encuesta descriptiva, como una encuesta, que aplicó un cuestionario para recolectar los datos a analizar. Se abordaron preguntas cerradas y abiertas, cuantitativas y cualitativas. Los principales resultados obtenidos fueron: la existencia de correlaciones positivas en el uso de aplicaciones gratuitas entre personas jurídicas y particulares; factores como el costo-beneficio y el costo son los más relacionados como elementos motivadores para el uso de estas aplicaciones por parte del público objetivo; y, la propina como elemento de desviación en la relación uso racional / uso aleatorio por parte de personas jurídicas, algo que no se verifica en los individuos encuestados.

Palabras clave: software de aplicación gratuito, correlaciones, costo-beneficio.

Introduction

It's not new to be reminded of the importance of technology in our personal and professional lives. Far beyond mere entertainment or leisure, it is geared towards facilitating the lives of citizens and companies, where it plays various roles, fulfilling a fundamental role that encompasses relational dynamics and management processes in the search for greater efficiency and effectiveness in the use of organizational resources (Amorim, 2015).

So far, nothing new. However, although the use of information and communication technologies (ICTs) has been extremely popular for some time, most recently in Brazilian homes (Andrade and Ramos, 2013), the complexity lies in knowing what this transformation actually requires and will require of people, companies and managers and how it can and will benefit them, in an evolutionary phase that we can call the information age (Drucker, 2010).

Another thing we know is the price of acquiring these technologies, which is generally very high. This is due to the market dynamics of expanding and modernizing these programs, combined with the low level of competition at the time, which could lead to a reduction in prices. This is typical of proprietary software, where there are multiple applications but high licensing and support costs (Garcia, Santos, Pereira and Rossi, 2010; Souza, Dias and Alfinito, 2014; Amorim, 2015).

An alternative to proprietary software is free software. This can be recognized as software that respects freedom and a sense of collaboration between users. In short, this means that users have the freedoms to run, copy, distribute, study, modify, improve and market the software, allowing them to control the program and what it does for them, not the other way around (Amorim, 2015; Free Software Foundation, 2018). In proprietary software, these freedoms cannot be fully achieved.

The reality is that most of the software on the market comes from intellectual property (IP). Although many of these programs are free, they are characterized as freeware or shareware, i.e. software that has some limitations in terms of use and scope (Souza, Dias and Alfinito, 2014; Amorim, 2015). This can be a problem, especially for companies, which have budget restrictions and at the same time need to align their strategies with their long-term business objectives.

In view of these points and knowing the numerous restrictions on access to paid technologies by individuals and companies due to the justifications explained, it becomes relevant to know: what are the main motivations for the use of free application software by individuals and institutions? The aim of this study is to identify and measure the use of free application software by both individuals (citizens) and legal entities (companies) in Brazil.

The purpose of this research is to achieve these justifications in a broader way, not being restricted to a specific audience in the ICT sector, for example. The development of the text will ratify the methodology adopted as pertinent to the questions perceived as essential in the possibility of elucidating the facts raised as substantial.

Theoretical Framework

The theoretical framework that will underpin this study will contain summaries of the emergence of free software - FS, the concepts of free software and free application software and the FS movement in the global environment.

The emergence of free software: time differences

To talk about the origins of free software is to relive a story from different perspectives. Some authors point to the period before the 1970s, when software was usually distributed along with its source code (Drake, 2017). From a commercial point of view, the technology suppliers of the time didn't see software as something separate from hardware, so it was common to deliver the software along with its source code, in order to make it possible to adapt, correct faults and add features to the program so that it would run properly on the non-standard computers of the time (Wikipedia, 2018).

The use of computers in this period was more restricted to academic and research users in business environments, who shared and encouraged collaborative software development (Drake, 2017). There are records dating back to the 1950s, when software began to be distributed along with its unrestricted source code in specific groups such as SHARE and DECUS. Another fact that points to the emergence of free software is the US government's decision to ban the AT&T company from entering the software trade in 1956, which later led it to distribute its Unix freely in 1969 (CCSL, 2012).

From another perspective, other authors identify the emergence of free software from the work carried out by Richard Stallman in the 1980s and the founding of the FSF - Free Software Foundation - in 1985 by Stallman himself (Kuszka, 2013; Wikibooks, 2014). In 1983, Stallman created GNU - the project for a completely free operating system. There, he explains its principles and relates the emerging needs to create a new Unix and revive a global collaborative spirit of unrestricted freedom to visualize, edit and distribute software. Thus, the GNU project can be seen both as a response to the emergence of proprietary software and as a revival of the philosophy of collaboration and software development in free environments (CCSL, 2012, Drake, 2017).

Something important to note is that when technology companies understood that software should be separated from hardware for strategic reasons, around 1970, the trade in proprietary software licenses began (CCSL, 2012, Drake, 2017). One thing that many people end up forgetting about software development is how it should be licensed. The license determines how the source code can be accessed and distributed by end users, which impacts on the potential adoption of this or that technology. Most modern software is sold under a proprietary license that allows the publisher or creator to retain the intellectual property rights

of the software, which is seen as a restrictive factor in the potential growth dynamics of new technologies and innovations (Drake, 2017).

As you can see, the idea that users can view, edit and share the source code of programs without legal consequences is nothing new. Another point that should be noted concerns the so-called free software movement, also Stallman's idea (Drake, 2017). At the end of the 1980s, this movement gave rise to two philosophical strands called *free* and *open*. The first, based on the understanding of unrestricted freedom for users, but linked to the exclusive use of free software; the second, although it brings the original concept behind the free philosophy, understands that both free and proprietary models can coexist in harmony with the common goal of achieving the best possible quality from the openness of source codes (Evangelista, 2014).

The concept of free software: unrestricted freedom

When designing the free software label, Stallman did not foresee the conceptual confusion that would arise from the indiscriminate use of the concept for software that does not derive from the philosophy created by the FSF (Evangelista, 2014; Souza, Dias and Alfinito, 2014; Drake, 2017). The definition of free software includes four essential freedoms: (1) the unrestricted freedom to use the program as you see fit; (2) the freedom to study and edit the program, which presupposes access to the source code; (3) the freedom to redistribute copies, whether or not you charge; and (4) the freedom to distribute modified copies, whether or not you charge, which also presupposes access to the source code (Andrade and Ramos, 2013; Souza, Dias and Alfinito, 2014; Amorim, 2015; Drake, 2017; FSF, 2018).

In coining the term free, Stallman related the idea that users would be "free" to change and share the source code in any way they preferred (Drake, 2017). This is exactly what has caused confusion over the years about the relationship between freedom and gratuitousness, which are different things, although they can complement each other. These considerations allow us to recognize that free software is not synonymous with free or zero-cost (Amorim, 2015; FSF, 2018). As the FSF itself warns on this issue: when we talk about free software, it's best to avoid terms like "given away" or "for free", because these terms imply that the issue is price, not freedom (FSF, 2018).

The concept of free software is of great importance in the world of technology and computing, given the elements presented. Studies show that the largest companies around the world use free software because it is less susceptible to piracy (Garcia, Santos, Pereira and Rossi, 2010). A common paradigm in this market is how *open source* companies make money. The secret lies in its collaborative business model, where the software is created and approved by the community through testing, stability and support. This sells subscriptions, not licenses (Kuszka, 2013).

Authors such as Garcia, Santos, Pereira and Rossi (2010), Santos Jr (2010) and Souza, Dias and Alfinito (2014) point out that the use and development of free software has already reached both for-profit and non-profit companies, as well as large organizations in the ICT sector and governments. By opening up their internal boundaries to the outside world, these organizations that produce information technology are transforming proprietary software into free software by making the source code of these programs available (Santos Jr, 2010), making them available for the community to access, study, modify and redistribute, reflecting a series of disruptive innovations in structures and processes.

Free application software: it's not linux!

We know that for a computer to work, it needs an operating system - OS - that responds to its user's commands. It must interpret the actions and transform the data into

binary codes, which can then be processed by the machine. Also known as system software, it is an essential part of the computer's functional dynamics, either managing software or controlling hardware (Amorim, 2015; Vinhaes, 2015). Some examples of software that are characterized as system software include: OS (Linux, Windows, Mac OS), utility programs (for specific functions such as: disk scanning, backups, file compressors, antivirus, etc.), and middleware (acts in communication and data management for distributed applications such as: database, servers, messaging, web, transaction processing, etc.).

On the other hand, application software is a program that runs specific applications within the operating system, but is not linked to its operation. Examples of this type of software include Word, Excel, Paint, Notepad, and calculator. Other examples of application software include browsers, video games, databases and industrial automation systems (Amorim, 2015; Vinhaes, 2015). In other words, the function of application software is to help the user perform specific tasks, generally associated with processing data. This includes text, audio and video processing, where these tasks are dispensable for the operation of the machine, as they only depend on the user's voluntary decision to use or not use the application software.

The classification of software according to Vinhaes (2015) comprises: (1)proprietary systems: those that are paid for and whose source code is not freely available (Windows, Hp-ux, Mac Os); (2)free systems: those that are not paid for, but whose source code is also not freely accessible (Beos, various antivirus, Freeware); (3) *Open Source*systems: those whose source code is open (Unix), but cannot be modified; and, (4)free systems: those that are *Open Source*, and whose source code can be freely modified (GNU/Linux, Bsd). This reinforces the unrestricted access, modification and redistribution of free software, both systems and applications.

The free software movement: some peculiarities

The early 1980s were marked by the first standard structural projects in the direction of what was established, organizationally and conceptually, as free software. In the figure of Richard Stallman, credited as the founder of the free software movement, the GNU project began on September 27, 1983, with the aim of creating an operating program capable of running on any computer from a kernel with free and unrestricted access, which could be studied, replicated, modified, distributed and redistributed by physical and legal users. The first organized free software movement we know of was the founding of the FSF by Stallman on October 4, 1985 (CCSL, 2012; Wikipedia, 2018).

The term free software was coined by Stallman in 1984, through his open letter known as the GNU manifesto, which focused on presenting and defining the objectives of the GNU project and calling for the support and participation of the hacker community (CCSL, 2012; Wikipedia, 2018). A few years passed between the start of the project and its consolidation, which came with the construction of the first free kernel called Linux, created by Linus Torvalds and made available on December 21, 1991. The first stable version of the software was distributed in March 1994. The Linux kernel covered the lack of the GNU kernel and the first completely free operating system was finally ready: GNU/Linux (CCSL, 2012; Kuszka, 2013; Wikipedia, 2018).

Four years later, in 1998, a group led by Eric Raymond and Linus Torvalds, who were dissatisfied with the FSF's ideological stance - which was against the use of proprietary software - founded the *Open Source Initiative* - OSI. The OSI uses the term Open Source instead of Free Software to refer to the term free software, and has a less philosophical and more pragmatic ideological stance than the FSF, as it accepts the combination of proprietary software and free software as a source of innovation. In addition, they recreate the definition

of open source through 10 criteria that must be met to recognize software as open source (Kuszka, 2013; Wikipedia, 2018).

As far as most people are concerned, the difference in meaning between "free software" and "open source software" is insignificant and stems from a tiny difference in approach or philosophy. For the OSI, both terms mean the same thing and can be used and adapted in parallel in any context. For them, the difference in terminology is simply due to the need to update the concept and definitions surrounding the use of free software. However, for the FSF, the OSI does not fully convey the importance of the movement and the potential long-term ethical problems that can arise from the use of proprietary software, which restricts users' rights (Evangelista, 2014; Drake, 2017).

Whether a particular piece of software is free or open source depends on which license it uses and whether this is approved by the OSI, the FSF or both (Drake, 2017). The most widely used license is the General Public License - GPL, created by Stallman in 1989. The GPL has a rule that restricts the appropriation of modifications, so any changes made to the software become common among all those who share the program (CCSL, 2012; Kuszka, 2013; Evangelista, 2014). The concept of copyleft is based on compliance with the four freedoms stipulated by the FSF, which is the basis for the creation of the GPL. Copyleft says that anyone who distributes the software, with or without modifications, has to pass on the freedom to copy and modify the program again. It ensures that all users have freedom. In other words, if you have received a piece of software with a free license that includes copyleft clauses, and if you choose to redistribute it - modified or not, you will have to keep it under the same license with which you received it (Wikepedia, 2018).

Methodology

This research is of an applied nature, as it involves local truths and interests. Its aim is to identify and measure the use of free application software by both individuals (citizens) and legal entities (companies) in Brazil. It is descriptive in nature, as it seeks to observe, record, analyze, classify and interpret the occurrence of data without the interference of the researcher. Generally speaking, it uses a questionnaire to analyze the data collected. With regard to the procedures adopted, this study comprises: bibliographical research - materials that have already been published: books, technical and scientific articles, monographs, texts on the internet, etc.; documentary research - materials that have not been processed: newspaper reports, technical documents, research and business reports, statistical tables, etc.; and a sample survey - where, using statistical procedures, a sample has been selected that will be the subject of the investigation. (Prodanov and Freitas, 2013)

From the point of view of the approach, this empirical study comprises quantification and qualification, i.e. it encompasses quantitative and qualitative research to translate the data collected through the application of a questionnaire. Therefore, analysis tools from traditional statistics will be used - for questions 1 to 6 - and multilevel analysis tools, specifically Correspondence Analysis - for question 7. Correspondence Analysis (CA) is a technique used in contingency tables whose aim is to determine the degree of global association between its rows and columns, in order to identify how these variables are correlated. (Madeira, Lopes, Giampaoli and Silveira, 2011).

The aforementioned questionnaire was created using the free application known as Google Forms®, available on the virtual platform called G Suite®. As this is an integrated platform that can be accessed via a valid Gmail® account, the author logged in and created the questionnaire in his personal account, which was then sent to the respondents via a direct access link to the survey.

The sample comprised an estimated 1,423,786 potential respondents, including individuals and companies. The questionnaire was the data collection tool chosen to support this study, which was disseminated through the LinkedIn® and Facebook® social networks, as well as by sending a personalized email. Figure 1 summarizes the score achieved by applying the questionnaire and then disseminating the results.

Figure 1
Universe, sample, reliability and margin of error

		UNIVERSO			
		LinkedIn	**Facebook**	**e-mail**	**TOTAL**
	Conexões	3442	361	150	1423786
	Grupos	1294691	125142		
	Visualizações	208			216
	Compartilhamentos	2	6		
Confiabilidade (90%)	**SIMULAÇÃO/AMOSTRA**		**AMOSTRA**		
	Margem de erro	Necessária	Real	Efetiva	
	4%	426	119	113	113
	5%	273			
	6%	190			
	7%	139			
Confiabilidade (95%)			AMOSTRA: 113		
	4%	600	**Confiabilidade**	**Margem de erro**	
	5%	385	90%	7,76%	
	6%	267	95%	9,22%	
	7%	196	99%	12,13%	

Figure 1 gives a detailed reading of the conditions presented by this study, providing an adequate estimate by means of a simulation previously adjusted before the questionnaire was administered. The universe refers to the potential number of respondents and the sample refers to their effectiveness. It is also possible to identify two relevant points: (1) The number of views and shares of the questionnaire represent a mere 0.0152% of the sample universe, which means a low response rate in the study. (2)The actual sample and the effective sample have a deviation of 5% due to the inconsistencies identified by 6 questionnaires. These problematic questionnaires were excluded from the sample.

The reliability of the sample brings with it a probability of margin of error proportional to its weight (confidence level), as shown in Figure 1 in its lower right margin. This means that if we want to achieve a 90% confidence level from the actual sample taken, our margin of error will be 7.76p.p (percentage points). In this example, the percentage will vary between plus or minus 3.38p.p. Note that the margin of error increases according to the desired confidence level. If we want to obtain the maximum level of confidence supported by traditional statistics, i.e. 99%, this sample will reflect a margin of error of 12.13%. In other words, 5.57p.p more or less.

Moving on, we have Figure 2. The questionnaire was administered in two phases: (1) In the first, it was considered to leave it open for voluntary participation from 17/02/19 to 24/02/2019. During this period, the campaign to promote the survey was limited to the standard daily post on social networks and the sending of 50 emails. Only 47 respondents took part. (2)Due to the low participation in the survey, it was decided to reopen it for another 4 days, from 25/02/19 to 28/02/19. A more active campaign was carried out, with exclusive posts (no longer standardized) on social networks and via email. It was found that participation increased to 119, i.e. 53.2% more in half the time used in the first application period. In this case, the survey was open for 12 consecutive days.

Figure 2
Questionnaire application schedule

	DATA	Participação	TOTAL
1ª FASE	17/2/2019	6	47
	18/2/2019	5	
	19/2/2019	4	
	20/2/2019	2	
	21/2/2019	5	
	22/2/2019	8	
	23/2/2019	8	
	24/2/2019	9	
2ª FASE	25/2/2019	10	72
	26/2/2019	20	
	27/2/2019	25	
	28/2/2019	17	
			119

It is important to note that there was no pre-survey, i.e. no prior test to assess the reception and interpretation of the questions in the questionnaire by potential respondents. This is an important process for both traditional and virtual surveys, as it allows information to be gathered about the objectives, aspects covered, confidentiality; as well as the form's graphics, format, question wording, etc. (Freitas, Janissek-Muniz and Moscarola, 2004). This point became clear when it was realized that in the first phase of the questionnaire, 10.64% of the forms showed inconsistencies and were therefore excluded. In the second phase, only 1.39% of the questionnaires showed contradictions, which also led to their exclusion. However, the impact was much less when the two phases are compared. This substantial drop was the result of minor adjustments to the presentation and some of the questions in the questionnaire, as well as dissemination to more specific audiences, as will become clearer in the results of this survey.

Results

The questionnaire was made up of 7 quantitative and qualitative questions, with closed and open questions. For all the questions, traditional positivist statistics were used, except for question 7, which was subjected to multilevel analysis using the AC technique already described - for reasons of space and purpose, the technique itself will not be demonstrated, only the results and their corresponding analysis.

The questionnaire gave a brief introduction to the topic and objective proposed by this study, summarizing and exemplifying the concept of free software and reinforcing the importance of understanding it before answering the proposed questions. This was deemed necessary because the target audience was diverse, not restricted to the ICT sector - Information and Communication Technologies - but encompassing the whole world.

Although no pre-survey was adopted, care was taken to make the questions as clear and straightforward as possible so as to enable the lay public in particular to understand them better with less noise and interpretative distortions. As has already been pointed out, the second phase of implementing the research performed better than the first, precisely because of the continuous search to improve the text and the dissemination of the content.

The questionnaire resulted in 113 actual respondents - already described in Figure 1 - divided into 34 companies and 79 individuals, of different ages, professions and branches of

activity. Moving on to the analysis itself, it will be divided into two subchapters: (1) Subchapter 4.1 - which will deal with the analysis from the perspective of descriptive statistics; and (2) Subchapter 4.2 - which will deal with the analysis from the perspective of multilevel statistics.

Descriptive Statistical Analysis

Descriptive statistics will be used to analyze questions 1 to 6. It consists of traditional statistical methods based on positivist thinking of linearity (reductionism) and systematization (holistic) to organize, summarize and describe the important aspects of a set of data or compare them between two or more sets. These descriptive tools include various types of graphs, tables and summary measures such as percentages, indices and averages. (Reis and Reis, 2002; Mariotti, 2017)

Question 1: Are you (or do you represent)?

The first question aimed to identify the respondent, whether they were an individual or a legal entity. As a result, the proportionality between the participants in this study emerged as shown in Figure 3.

Figure 3
Representativeness of respondents

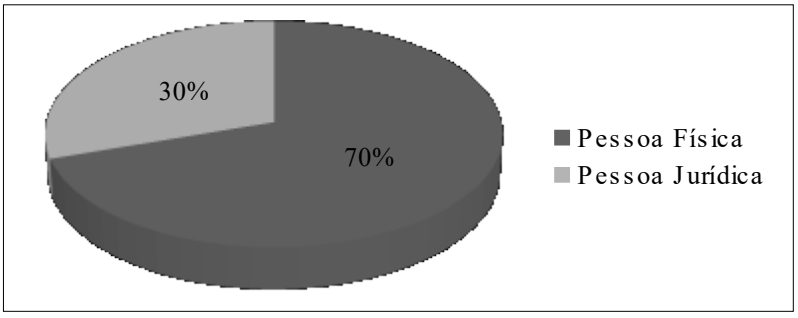


Figure 3 shows the following: 34 legal entities and 79 individuals took part, which quantitatively corresponds to 30.09% and 69.91% respectively.

Question 2: How old are you (If a company, how long have you been in business)?

The second question asked about the respondent's age - if an individual - or length of time in the market - if a legal entity - as shown in Figures 4 and 5 below.

Figure 4
Length of time in the Legal Entities (companies) market

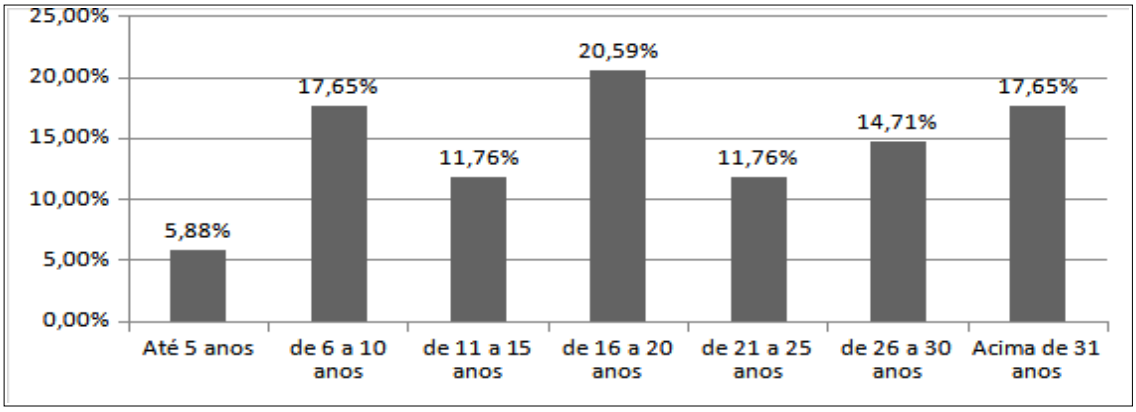


Figure 5
Age of Individuals (Citizens)

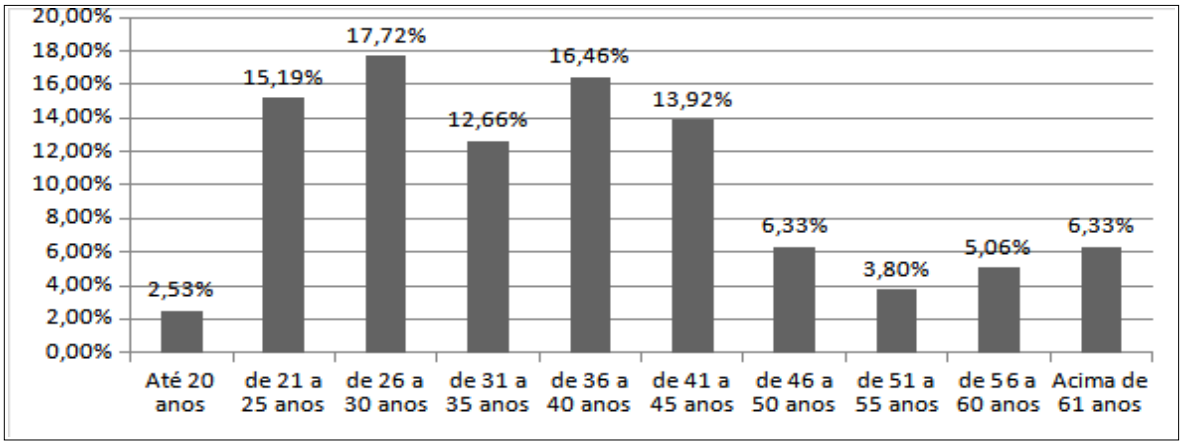


Figure 4 - corresponding to legal entities - shows that the majority of the companies interviewed have been operating in the market for over 6 years (94.12% or 32 companies), with the largest proportion concentrated in the 16 to 20 years range (20.59% or 7 companies).

According to recent technical reports by Sebrae[1] (2016) and IBGE[2] (2017), the first two to five years of business are a watershed between failure and survival for Brazilian companies in general. This reinforces the invaluable value of being able to count on respondents - legal entities - with such business experience, something that can bring greater support to the decision to use or disuse free application software.

Relating to Figure 5, we have individuals. It shows that the highest concentration of respondents is in the 26 to 30 age group (17.72% or 14 people). It can also be seen that the age groups between 21 and 45 account for 75.95% (or 60 people) of the total. In contrast, only 2.53% of respondents were up to 20 years old (or 2 people).

[1] According to the report, the survival rate of companies (excluding MEIs) is 58%, when considering the first two years of activity. For more information visit: https://datasebrae.com.br/wp-content/uploads/2017/04/ Survival of Companies in Brazil-2016-FINAL.pdf.

[2] This technical report found that, after 5 years, the survival rate of companies is 57.8% (workforce of up to 10 people) and 67.1% (workforce of over 10 people). For more information visit: https://biblioteca.ibge.gov.br/visualizacao/livros /liv101151.pdf.

Question 3: What is your profession (if you are an individual) or sector of activity (if you are a legal entity)?

The third question asked about profession - if an individual - or sector of activity - if a legal entity. The aim was to identify the scope - whether specific or diversified - of the use or disuse of free application software.

Figure 6
Profession - Individual

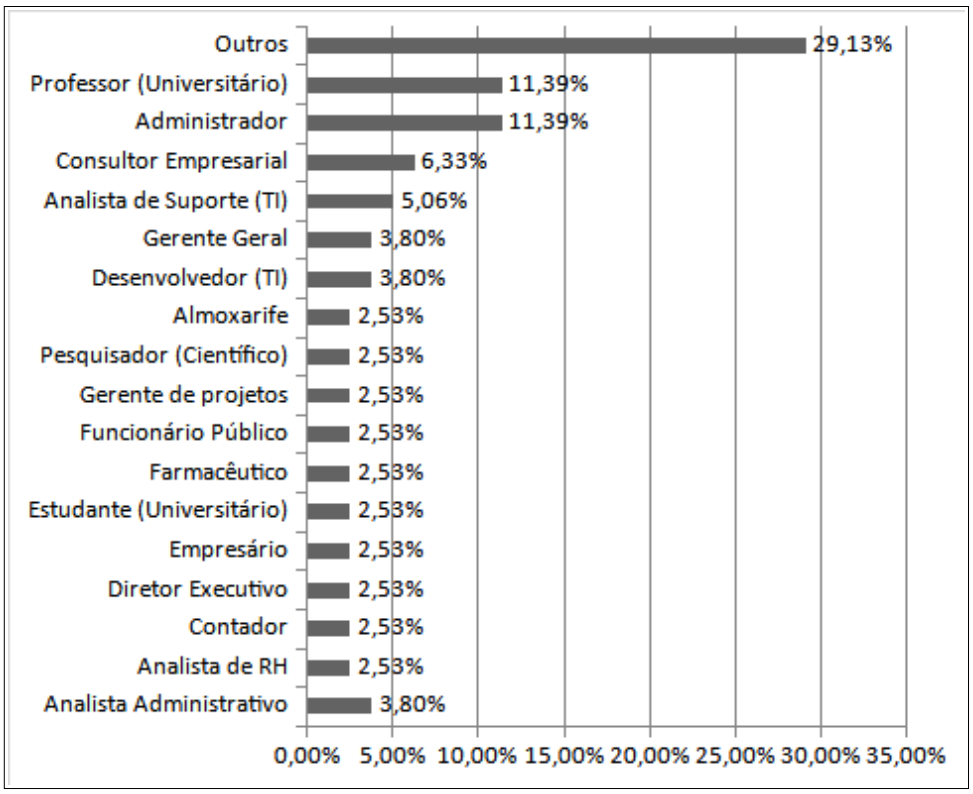


Figure 6 elucidates the diversity of the public served by this research, including knowledge workers and operational workers, as well as decision-makers (such as entrepreneurs, directors and administrators, for example). There are two major concentrations here: (a)Other, refers to those declared trades that amounted to only 1.27% of the total activities surveyed. Some of these are: international relations, musician, oil rig operator, editor, economist, office assistant, architect, etc. As they didn't reach 2.53% - the minimum percentage established - they were allocated to a single identifier; and, (b) University professors and administrators correspond to 22.78% (or 18 professionals) of the total, i.e. they concentrate the majority of the occupations declared.

Figure 7
Sector of activity - Legal entity

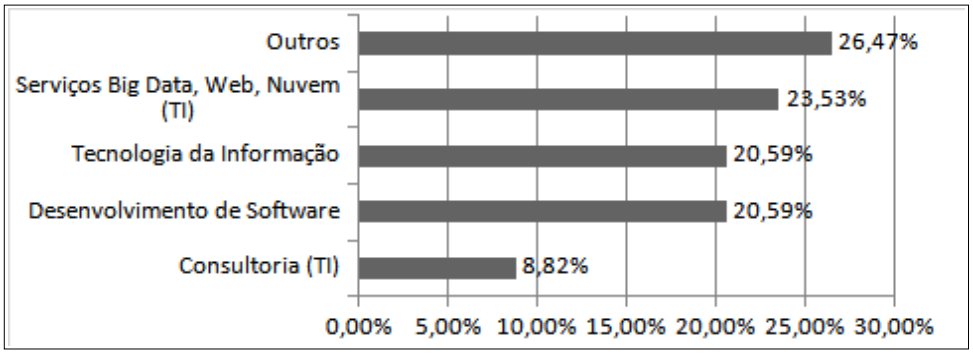


Figure 7, with reference to legal entities, shows a large concentration of respondents in the Information Technology (IT) sector - 73.53% or 25 companies. This reinforces the possibility that this survey will provide results that adhere to the reality of Brazilian business, given that the respondents from this sector are, in principle, more technical and have a higher level of experience in relation to the different technologies and their potential advantages and disadvantages in terms of their use.

Question 4: Do you or have you ever used free application software?

The fourth question looked at whether or not people and companies currently use free application software, as shown in Figure 8.

Figure 8
Use of free application software by legal entities

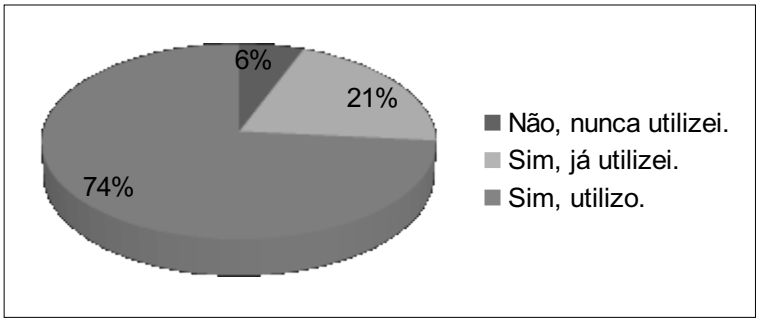


Figure 8 shows a large turnout of companies that said they currently use free software in their work activities (73.53% or 25 companies). The other companies said they had already used it at some point (20.59% or 7 companies) or had never used it in their routine activities (5.88% or 2 companies).

Figure 9
Use of free application software by individuals

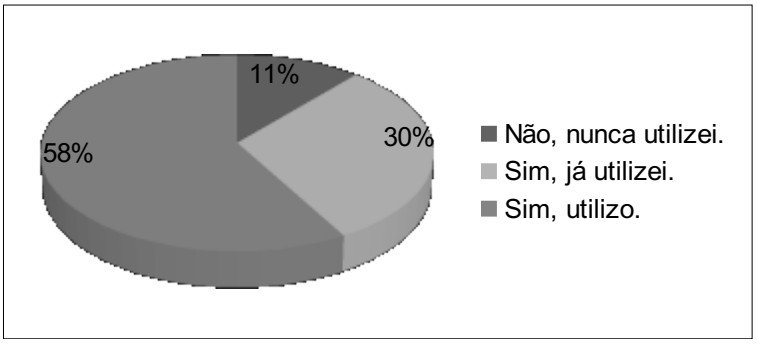


Figure 9, on the other hand, on the use of free application software by people, shows a clustering of those who said they used it routinely (58.23% or 46 people). On the other hand, 30.38% - or 24 people - said they had used it at some point, while 11.39% - or 9 people - said they had never used it.

At this point, two things should be highlighted: (a)When companies and individuals are compared, it can be seen that the former proportionally use free application software more (15.3% more use); and, (b)Similarly, when evaluating the disuse of these programs, companies appear more inclined to use them than individuals (5.51% less disuse).

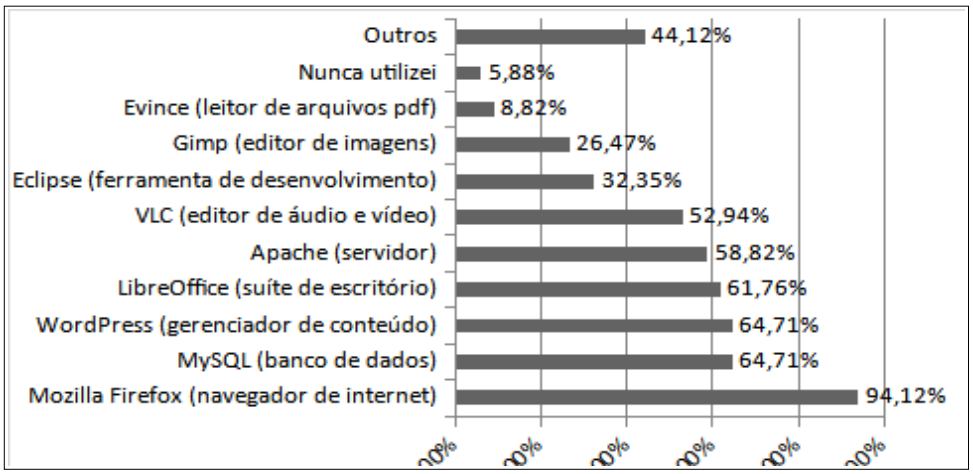
It is also important to note that the questionnaire contained a brief introduction justifying the purpose of the research, its objectives, its focus and its relevance. This presentation highlighted the concept of free application software, reinforcing the FSF (*Free Software Foundation*) concept cited by Amorim (2015) on the term and emphasizing that free software is not synonymous with free. This was necessary because the audience investigated, as already mentioned, was diverse and the possible difficulties in interpreting the proposed topic were taken into account.

Question 5: Which free software programs do you use or have you ever used?

The fifth question asked which free software program(s) companies and individuals use or have used, according to Figure 10. It's important to note that the question offered the respondent previous options to choose from, including productivity programs, file readers, audio and video editors, image editors, internet browsers, content managers, servers, databases and development tools. In addition to the "never used" and "other" options. It was possible for the respondent to select more than one choice.

Figure 10 - for legal entities - illustrates the enormous popularity of the Mozilla Firefox web browser (94.12% or 32 companies); the MySQL database and the WordPress content manager (64.71% for both or 22 companies); the LibreOffice office suite (61.76% or 21 companies); the Apache server (58.82% or 20 companies); and the VLC audio and video editor (52.94% or 18 companies).

Figure 10
Free software programs used by legal entities



Not so popular or common for the rest of the companies are the development tool Eclipse (32.35% or 11 companies); the image editor Gimp (26.47% or 9 companies); and the pdf file reader Evince (8.82% or 3 companies). Those who said they had not used any free application programs amounted to 5.88% (or 2 companies). Those that reported using other free application programs accounted for 44.12% (or 15 companies).

With regard to the latter, it was not considered relevant to list the other free software programs highlighted by the respondents, since these choices either do not correlate with the nomenclature or do not fit the definition of free application software because they are system software (in the latter case, the answers that did not fit the concept of free application software were not counted).

Figure 11
Free software programs used by individuals

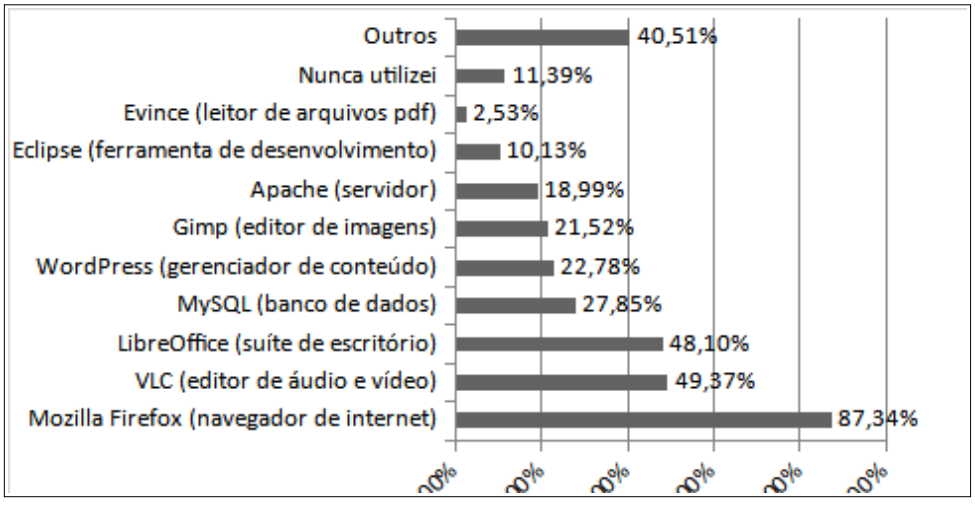


Figure 11 - for individuals - shows the most popular free software application programs to be: the Mozilla Firefox internet browser (87.34% or 69 people); the VLC audio and video editor (49.37% or 39 people); and the LibreOficce office suite (48.10% or 38

people). Compared to legal entities, even the most popular programs are used to a lesser extent by individuals.

Among the least popular or little used programs by individuals are: the MySQL database (27.85% or 22 people); the WordPress content manager (22.78% or 18 people); the Gimp image editor (21.52% or 17 people); the Apache server (18.99% or 15 people); the Eclipse development tool (10.13% or 8 people); and the Evince pdf file reader (2.53% or 2 people).

On the other hand, those who said they had never used a free application program amounted to 11.39% (or 9 people). Those who reported using other free application programs accounted for 40.51% (or 32 people). Likewise, we chose not to detail the other programs listed by respondents under the "other" option, since there were no significant number of programs with the same nomenclature registered. Likewise, programs that were not related to the concept of this study were excluded.

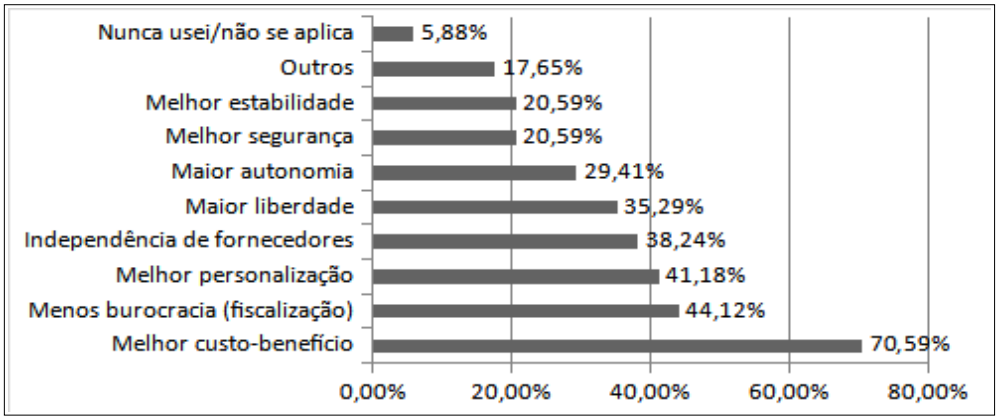
Question 6: Why do you use or have you used Free Application Software compared to Proprietary Application Software? (You can select more than one alternative)

The sixth question related the usefulness of free application software for both individuals and companies. Again, fixed propositions were established, in addition to the options "other" and "never used/not applicable". The choice of the list of pre-established "justifications" was built according to information sought from various sources on the internet about the use of free software, specifically discussion forums on blog pages and websites on topics related to this research.

Figure 12 illustrates the main reasons why companies choose to use free application software. The main explanation lies in its cost-effectiveness, something that reaffirms the consensus generated by experts and various publications on the proposed topic. What is interesting, both from the business point of view and from the citizen's point of view - see Figure 13 - is that this consensus is aligned with the understanding that free application software competes with proprietary software almost exclusively through acquisition and maintenance costs, something that can be seen in Figure 14.

Figure 12

Reasons for the use of free application software by Legal Entities



This understanding is corroborated by Melo and Carvalho (2013), when the authors state that free software has been incorporated into socio-educational inclusion projects for various reasons, the most superficial of which is related to economics, as maintenance costs

using this software are much lower when compared to proprietary software. Free software is compatible with machines that are considered obsolete, increasing their useful life cycle, reducing the costs of buying new equipment and reducing the amount of electronic waste to be disposed of, thus also acting on socio-environmental issues.

Another highlight of this choice is that the philosophical understanding of the concept of free software is exercised more by individuals than by legal entities. The latter associate the use of free application software with gratuitousness, something that has already been described as diverging from the concept of free software (Amorim 2015; Ansol, n.d.; FSF, 2018). This becomes clearer when comparing Figures 14 and 15.

In Figure 12, the rest of the choices follow the following order of preference: less bureaucracy (44.12% or 15 companies); better customization (41.18% or 14 companies); independence from suppliers (38.24% or 13 companies); greater freedom (35.29% or 12 companies); greater autonomy (29.41% or 10 companies); better security (20.59% or 7 companies); and, better stability (20.59% or 7 companies). Those companies that listed other various reasons accounted for 17.65% (or 6 companies) and those that said they had never used free application software accounted for 5.88% (or 2 companies).

Figure 13
Reasons for the use of free application software by individuals

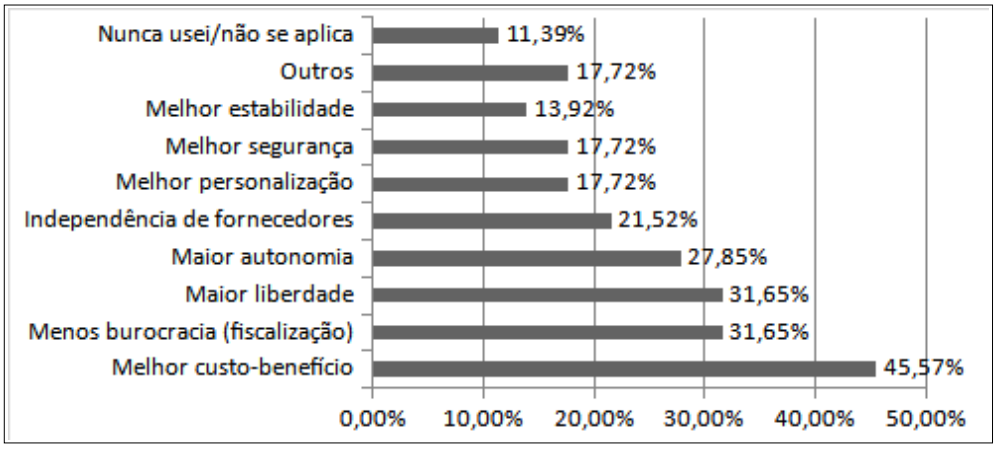


Figure 13, concerning the use of free application software by individuals, provides some similarities with Figure 12. The elements of better stability (13.92% or 11 people) and better security (17.72% or 14 people) are the least requested by both individual and corporate respondents - while the elements of better cost-benefit and less bureaucracy are the most requested by both.

Multilevel Statistical Analysis

Multilevel statistics will be used to analyze question 7. It is the basis of Morinian complex thinking, which is an alternative to positivism because it addresses totality, covering the complementarity and transactionality between linear (reductionist) and holistic (systemic) conceptions, which are the basis of positivist thinking in traditional science (Mariotti, 2017). Complex thinking has a much greater capacity than systems thinking to understand complex phenomena and processes (Dimitrov, 2018), and is deemed suitable for analyzing issue 7 as complex.

Question 7: Justify the previous question (give a little more detail on your choices)

The seventh question was actually a sequel to the previous question, as it asked the respondent - both individuals and companies - to justify all of their choices. As this is an open-ended, long-answer question, Quantitative Propositional Analysis (QPA) was used here, with Correspondence Analysis (CA) as the analytical technique - described in Chapter 3.

As already explained, the APQ and CA methods used to construct Figures 14 and 15 will not be detailed here, as they would be beyond the scope of this study, as well as going beyond the spatial limits of the text. However, it is possible to summarize the following path for measuring the explicit data shown in Figures 14 and 15: the texts (justifications) went through 3 processes - summarization, textual segmentation into propositions and grouping of propositions by theme. This data was tabulated and sorted in an Excel® spreadsheet, where the frequency of each theme (element) addressed was checked. This frequency generated a percentage scale which is illustrated in Figures 14 and 15.

Figure 14
Justifications for use or disuse of free application software by Legal Entities

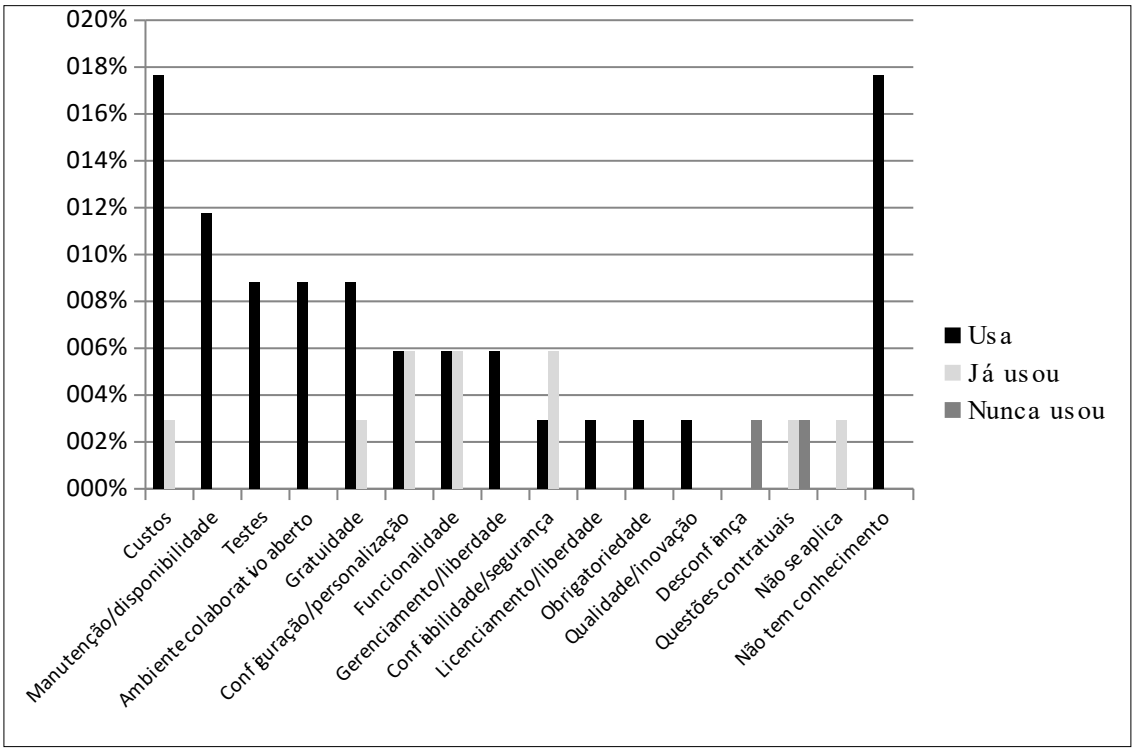


Figure 14 - concerning the justifications for the use or disuse of free application software by legal entities - shows something interesting: the alternatives "no in-depth knowledge" and "not applicable" represent 17.65% (or 6 companies) and 2.94% (or 1 company) respectively. If we relate this information to the data in Figures 8, 10 and 12 (where the information is identical for 5.88% or 2 companies), we can identify an imbalance with regard to the rational choice for the use or disuse of free software programs by companies. This is confirmed when we compare the alternatives "no in-depth knowledge" (17.65%) with "never used" (5.88%).

This means that some of the business respondents use free application software, unaware of its technical and/or philosophical potential. Perhaps this explains why "free" reached a significant level of 11.76% (or 4 companies). Comparing the choices, for

individuals - Figure 15 - this percentage reaches 3.80% (or 3 people), i.e. about 3 times less incidence.

Moving on to the business justifications for using free application software, we have: maintenance/availability (11.76% or 4 companies); testing (8.82% or 3 companies); open collaborative environment (8.82% or 3 companies); configuration/customization (11.76% or 4 companies); functionality (11.76% or 4 companies); management/freedom (5.88% or 2 companies); and; reliability/security (8.82% or 3 companies). The other justifications were not addressed by more than one company.

Among the reasons for companies not using free application software are those related to contractual issues (5.88% or 2 companies) and mistrust (2.88% or 1 company). With regard to the first alternative, the respondents reported having partnerships with proprietary software suppliers.

Figure 15

Justification for use or disuse of free application software by Individuals

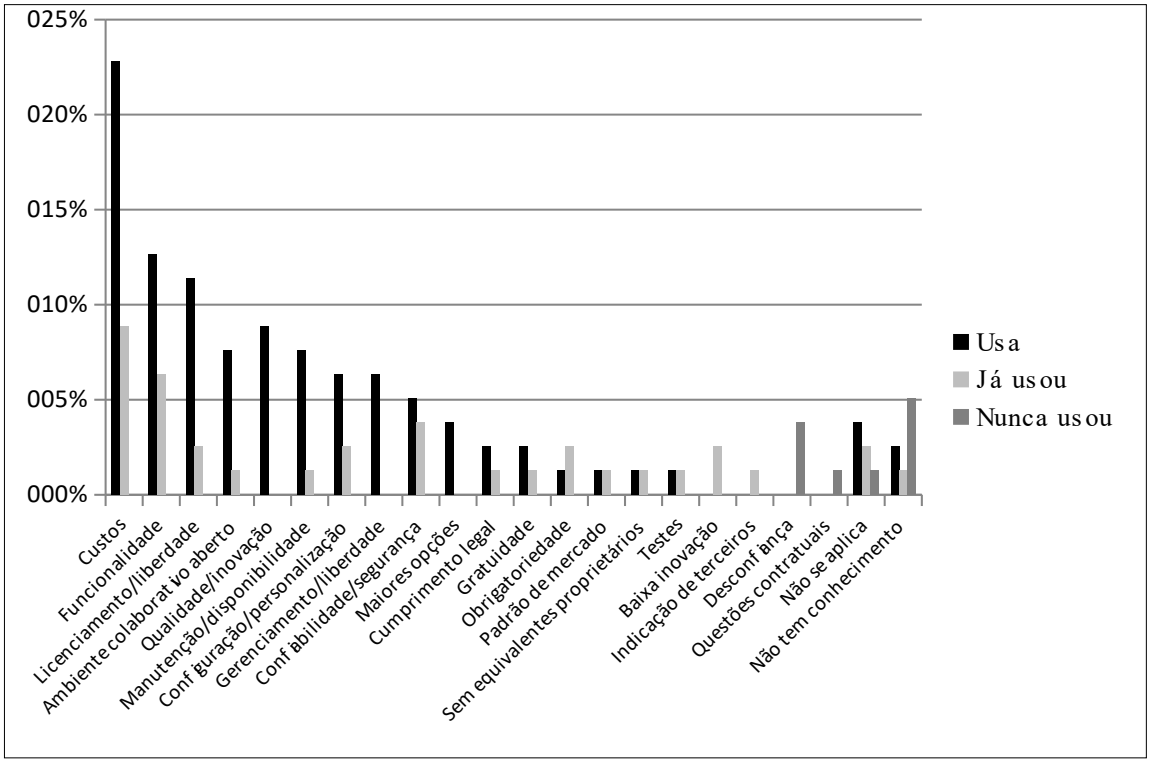


Figure 15 - on the motivations for individuals to use or disuse free application software - shows the following: the alternatives "no in-depth knowledge" and "not applicable" represent 8.86% (or 7 people) and 7.59% (or 6 people). Likewise, by relating this information to the data in Figures 9, 11 and 13 (where the information is identical for 11.39% or 9 people), we can identify a more rational choice process regarding the use or disuse of free software programs by people. This is confirmed when we compare the alternatives "no in-depth knowledge" (8.86%) with "never used" (11.39%).

Following the analysis in Figure 15 we have: functionality (18.99% or 15 people); licensing/freedom (13.92% or 11 people); open collaborative environment (8.86% or 7 people); quality/innovation (8.86% or 7 people); maintenance/availability (8.86% or 7 people); configuration/customization (8.86% or 7 people); management/freedom (6.33% or 5 people); reliability/security (8.86% or 7 people); greater options (3.80% or 3 people); legal

compliance (3.80% or 3 people); and, obligation (3.80% or 3 people); The other justifications were not suggested by more than 2 people.

The reasons for not using free application software were: distrust (3.80% or 3 people) and contractual issues (1.27% or 1 person). With regard to the first alternative, respondents stated that, when compared to proprietary software, most equivalent free software is inferior in technical and functional terms, as well as having poor or non-existent documentation.

Discussion and conclusions

The use of new technologies by companies and individuals is more than a trend and is already meeting the most emerging needs for efficiency and effectiveness, in other words, we are increasingly seeking to do more with less. And this is exactly what technologies can offer, in a market that is evolving in dynamics, speed and complexity and where people need to make critical decisions on an even shorter time scale. For companies in particular, reducing costs without jeopardizing their long-term growth can be a decisive factor in remaining competitive, just as much as the budget can be a limiting factor in the reality of many businesses.

Knowing that the acquisition and maintenance of proprietary software can be a costly investment for many companies of various sizes and sectors, free software can be an excellent alternative to enable business continuity based on a free technology that offers freedom as its main sustainable characteristic. It has been widely discussed in this study that free software is not synonymous with free (Garcia, Santos, Pereira and Rossi, 2010; Andrade and Ramos, 2013; Evangelista, 2014; Souza, Dias and Alfinito, 2014; Amorim, 2015; Drake, 2017; FSF, 2018). In addition, it was found that in order for software to be called free, it must comply with four basic freedoms: study, modify, distribute and redistribute. Therefore, open source is an essential requirement and the license of use must comply with the copyleft terms.

Given this context, the aim of this research was to identify and measure the use of free application software by both individuals and companies in Brazil. A descriptive survey was carried out using an electronic questionnaire. Thirty-four companies and 79 people of various occupations, industries and ages took part in the survey. The data collected was processed using descriptive and multilevel statistics. The sample was drawn from social networks such as LinkedIn® and Facebook®, as well as emails. The participation of respondents reached a level of 7.76% to 12.13% margin of error for a reliability that varied, respectively, from 90% to 99%.

The questionnaire was administered in two phases: (1) In the first, the response rate was 47 respondents in 8 days; in the second, there was a significant increase in participation to 72 respondents in 4 days. In other words, there was an increase of 53.2% compared to the number of respondents in the first phase. Taking the two phases together, 119 respondents participated voluntarily, but due to inconsistencies in the answers to some questionnaires, it was decided to exclude 6 of them. Therefore, the real count was 113 questionnaires actually answered.

Moving on to the results of the survey, the following was identified: (a)7 out of 10 respondents were individuals; (b)94.12% of the companies had been operating for more than 6 years, with 64.71% having been in business for more than 16 years; 75.95% of the people were aged between 21 and 45, with 64.56% aged 31 or over; (c)73.53% of the companies were in the IT sector, and 22.78% of the people were university professors or bachelors in business administration; (d)73.53% of the companies and 58.23% of the people said they used free software in their daily work and leisure; (e)the Mozilla Firefox internet browser was the free application software most remembered by 94.12% of the companies and 87.34% of the

people; (f) the cost-benefit ratio when using free application software was the factor identified most by 70.59% of companies and 45.57% of people, while the term stability was only mentioned by 20.59% of companies and 13.92% of people; (g) with regard to the justification for the choices made, cost was the predominant factor for 20.59% of companies and 31.65% of people, and with regard to testing free software, 8.82% of companies said they tried it, while only 2.53% of people did so; (h) the free element was a decisive factor for 11.76% of companies and 3.8% of people; and, (i) there is a counterpoint between the rational use and random use of free software by individuals which is not identified by legal entities. The justification "no knowledge" is 11.78% higher than the motivation "not applicable or never used".

The results of this survey lead to the conclusion that free application software is part of the routine of the vast majority of companies and individuals interviewed; that both know and use the best-known and most popular free application programs; that the cost-benefit and cost elements are the most related as justifications for the use of free application software by legal entities and individuals; and that gratuitousness is the deviating element in the rational use/random use relationship for legal entities, something that is not verified in the individual respondents.

This survey achieved its objective by illustrating and measuring the use of free application software by companies and individuals, characterizing them and detailing their preferences and motivations for using these programs. In addition, it showed positive correlations in the use of free applications by companies and individuals, especially with regard to the factor that determines their use. It also identified that the preference for free application software encompasses a diversity of solutions in application programs for the most varied uses and specific needs, such as an office suite, file reader, audio and video editor, image editor, internet browser, content manager, server, database, development tools, among others.

Therefore, this study has made it possible to recognize the importance of free application software for companies and people, highlighting its relevance in everyday work and leisure life. Future research could focus on issues related to the philosophy and politics of free software movements and their relationship to use by companies and individuals, for example. This would be extremely important if we were to understand whether and to what degree people choose this software because of some political/philosophical link.

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Date received: 13/07/2023
Revision date: 03/08/2023
Date of acceptance: 03/08/2023
Date of acceptance: