



Open source software for micro businesses and its potential for micro business development and innovation

Open-source software for micro businesses and its potential for micro business development and innovation

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Abstract

Given the relevance of economic growth in the country and the participation of micro and small businesses, which represent 27% of the national GDP, they still face complex challenges that compromise their sustainability and growth, such as the scarcity of financial resources, together with the low level of technological maturity present in most of these businesses.

Many still rely on manual processes and outdated systems, putting them at a disadvantage in an increasingly digitized and competitive market. This combination of factors creates a challenging scenario, where the survival of small businesses depends on simultaneously overcoming multiple structural and operational challenges. This study investigates the Free Software landscape in Brazil, exploring the availability, functionality, and suitability of free and open-source software that meets the legal and operational management needs of these companies. The methodology used is applied, exploratory, and descriptive, evaluating criteria such as installation, usability, integration, functionality, support, and reporting in three open-source ERP systems: Axelor, Odoo, and Yetiforce. The results indicate that, although these tools offer robust functionality and potential for digitalizing and professionalizing management in microenterprises, the lack of specific modules for Brazilian tax compliance and the need for specialized technical support limit their widespread adoption.

Keywords – Free software, open source, micro businesses, technology

Abstract

Given the relevance of economic growth in the country and the participation of micro and small enterprises, accounting for 27% of Brazil's GDP, these businesses still face complex challenges that compromise their sustainability and growth. These include limited financial resources and a low level of technological maturity, which remains prevalent in most of these enterprises.

Many still rely on manual processes and outdated systems, placing them at a disadvantage in an increasingly digital and competitive market. This combination of factors creates a challenging scenario in which the survival of small businesses depends on overcoming multiple structural and operational difficulties simultaneously. This study investigates the landscape of Free and Open-Source Software in Brazil, exploring the availability, features, and suitability of free and open-source software to meet the legal and operational management needs of these companies. The methodology is applied with an exploratory and descriptive approach, evaluating criteria such as installation, usability, integration, functionality, support, and reporting across three open-source ERP systems: Axelor, Odoo, and Yetiforce. The results indicate that, although these tools offer robust features and potential to digitize and professionalize management in microenterprises, the lack of modules specific to Brazilian tax compliance and the need for specialized technical support limits its wider adoption.

Keywords – free software, open source, microenterprises, technology

1 INTRODUCTION

Micro and small businesses are relevant to the country's economic growth and represent 27% of the national GDP, they still face complex challenges that compromise its sustainability and growth, such as the scarcity of financial resources, along with the low level of technological maturity present in most of these businesses. Many still rely on manual processes and outdated systems, leaving disadvantage in an increasingly digitalized and competitive market. This combination of factors create a challenging scenario, where the survival of small businesses depends on simultaneous overcoming of multiple structural and operational difficulties (SEBRAE, 2023).

In this context, micro and small businesses can become potential users of Free Software (SL) to start a digital and technological transformation in your business. As Haf (2018) highlights, the *open source* movement has profoundly transformed the way we develop software, we collaborate and create value in the business world.

Furthermore, the robust growth of the information technology industry and communication (ICT), which includes software, services, hardware, cloud and consulting, highlights the central role that the sector plays in the Brazilian economy. According to a Brasscom report (2024), the ICT macro sector had revenues of R\$ 348.2 billion in 2023, representing approximately 6.5% of the national GDP. Of this total, the software segment contributed approximately R\$43.8 billion, reinforcing its importance within the digital ecosystem. This performance reflects not only the economic relevance of the software sector, but also indicates that collaborative models originated from SL and open source converged with market logic, supporting to integrated growth between community innovation and commercial expansion. According to Nagle, Zhou and Hoffmann (2024), the global economic value of SL is estimated at approximately 8.8 trillion dollars, indicating that without the existence of open source software, companies would have to invest about 3.5 times more in software development.

This study, by investigating the universe of SL, seeks to understand the situation of SL in Brazil, identifying available software that serves micro and small businesses who do not have, or need, to invest heavily in management software business to gain a technological advantage in the market.

The research explores the variety of functionalities offered by the different software mainly evaluating its community regarding distribution, maintenance and software customization. Furthermore, it will address the low adoption of software, whether free or

owners, by micro and small business owners who meet their minimum needs and

legal aspects of the business.

By exploring these topics and presenting concrete evidence about SL offerings available on the market, and possible gaps, this research is expected to provide insight macro of the current situation of the SL scenario and its potential in the development and innovation of Brazilian market.

2 THEORETICAL FRAMEWORK

This section presents the scenario of micro-enterprises classified in the territory Brazilian; about open source software and its use in the management of micro-enterprises in Brazil.

2.1 Micro Enterprises in Brazil

As established by Complementary Law No. 123, of December 14, 2006, micro and small businesses include individual limited liability companies, simple companies, companies and entrepreneurs who carry out professional activities economic entities organized for the production of goods and services. In the case of microenterprises, gross annual income must be equal to or less than R\$ 360,000.00, while for small companies, this limit is up to R\$4,800,000.00 (BRAZIL, 2023).

According to data from Data SEBRAE (2020), these companies represent 89.93% of the total of companies in Brazil, contributing around 80% of the workforce and generating, in average, 78.4% of jobs created monthly. However, despite its significant participation in the labor market, they contribute only 20% of the Internal Product Gross (GDP). On average, they pay 1.8 minimum wages, and 40% of them do not exceed four years of existence.

The geographical distribution of micro and small businesses in Brazil is as follows: 27.9% in the state of São Paulo, 10.9% in the state of Minas Gerais and 9.5% in the state of Rio de Janeiro, these being the largest states with micro and small businesses. The sectors vary between: 45.7% from the services sector, 36.2% from the commerce sector, 22.0% from the industry sector and others civil construction and agricultural sectors (DATASEBRAE, 2020).

Santos, Silva and Neves (2011) highlight that, globally, these companies constitute a productive system that contributes to the diversification of the economy through thousands of enterprises. Specifically in the Brazilian context, the authors state that micro and



small businesses play a crucial socioeconomic role by generating income, provide jobs and strengthen the economy (RODRIGUES; BOAS, 2013).

2.2 Open Source Software

According to Laurent (2004), in the context of a "closed source" software model or "proprietary", the software vendor keeps the source code and sells, or licenses, only the object code to users. Under the terms of closed source licenses, users can execute the object code, but do not have access to the source code, which prevents them from modify the behavior of the program without consulting the software vendors. In this model, the source code can only be obtained through recompilation or reverse engineering, although these practices are often prohibited by closed source licenses. As a result, users are limited to what is provided by the software vendor, with possible modifications incorporated upon approval by the latter.

The closed source model remains predominant in most companies commercial software developers, and is also the most common model adopted by both by both the public and private sectors. On the other hand, open source software follows fundamentally different principles, offering users freedom significantly higher. Generally speaking, open source software distributes freely the source code, making it widely available to be used, copied, modified and redistributed by users or companies. Open source licenses generally impose different restrictions than those found in closed source software, often requiring users or companies distributing them, in their original form or modified, make the source code available openly (BARRA, 2023).

2.3 Free Software for Micro Enterprises

This topic becomes essential to introduce and justify the choice of using SL tools, whose purpose is to highlight the competitive advantages for micro businesses associated with the use of this type of software.

For micro and small businesses, obtaining benefits becomes a key factor for the survival of the business. Among the advantages of adopting SL, its cost can be highlighted social originating only from the production and distribution of software carried out by the community, becoming a public good for its users.



Also noteworthy is the initial cost, which is close to zero, because when you purchase an SL, an amount is paid to cover production costs, whether for installation media and printing manuals, which when compared to proprietary software, this value is a small fraction of what one would pay for a license. And when you take into account distribution digital, this additional production cost is zeroed, leaving only the costs for infrastructure that the system will depend on.

No person or institution holds the rights to free source software, any person or company can use the source code for distribution, customization and software updates. And even if a particular company stops providing application support, there is a community that can act as support or even as programmers, who with access to the code, can perform any maintenance on the applications (RAMASAMY; CHOWDHURY, 2020).

Among the advantages already mentioned, the greatest one can be considered to be the possibility customization. Customizing proprietary software is not always possible, some of software that allows some level of customization, the cost can be quite high and depending on the level of complexity of the demand, this cost may exceed the costs initial implementation of the system. Free software is already designed with a level of adaptation, which in many cases is done by the community itself, and it is enough to update the software or installation of modules or plugins for use.

3 METHODOLOGY

The methodology of this work is exploratory and descriptive, identifying the legal and tax obligations of microenterprises and searching for code software open source software that meets these demands. The selected software must be *open source*, free and viable to meet the needs of micro-enterprises.

For comparison purposes, the following aspects are analyzed, which underpin the discussion on the provision of open source software and its benefits for the micro-enterprise management: installation, usability, integration with other software, features, support, training and reporting.

In the installation analysis, the ease of installation, accessibility of hardware and technical requirements. In the usability analysis, the intuitive interface and the description of the features.

Many software programs offer integration between themselves to facilitate management, and can cover areas such as finance, inventory, and administration. In this integration, the information is shared to enable reporting and quick access to data, which constitutes one of the evaluation criteria.

The degree of complexity of the functionalities available in the software is evaluated to verify whether they can transform data into useful information for microenterprises. functionalities are analyzed together with the generated reports, considering cohesion and ease of reading in the distribution of information.

Finally, the level of training and support offered by companies is evaluated. developers to free users of these software.

Based on these analyses, a report is prepared that supports the discussion on the real dimension of productivity and ease provided to micro-enterprises by the adoption of these software in the day-to-day running of your business.

4 RESULTS

Based on previously established methodological criteria, this section presents the results obtained from the technical and functional analysis of three ERP systems of code open: *Axelor*, *Odoo*, and *Yetiforce*. The choice of these tools took into account their availability in public repositories, permissive licenses, active community and adherence to needs operational aspects of microenterprises, especially in the Brazilian context.

The assessment covers fundamental aspects for the adoption of these systems by small businesses, such as ease of installation, interface usability, capacity integration with other systems, set of features offered, quality of reports generated, technical and community support structure, in addition to the frequency of software updates and security. Each criterion was analyzed qualitatively, based on in official documentation, developer forums, technical articles, and GitHub repositories.

Below, the systems are described and evaluated individually in three subsections, highlighting its technical and practical characteristics in the context of business management in microenterprises. At the end, a comparative analysis between the solutions is presented, summarized through a comparison table, allowing you to clearly visualize the strengths and limitations of each ERP. This analysis helps to understand the potential for real use of free software as a viable alternative for the digital transformation of small businesses.

4.1 Axelor

Axelor , hosted on *GitHub* as *Axelor Open Platform* (GPLv3.0 license), presents an accessible technical installation process, based on *Java*, *Tomcat* and *PostgreSQL*. Their documentation and active forums on *GitHub* offer initial support, although setup depends on knowledge of the *Java stack*. The web interface, built with *Angular* and *Bootstrap*, allows customization via *low-code* in the Studio module and process modeling with BPMN, dispensing with advanced coding. This favors technical productivity and autonomy of micro-enterprises by adjusting workflows without IT intervention.

From a functional point of view, *Axelor* provides more than 30 modules covering finance, inventory, production, CRM, projects, and BPM. Its modular architecture allows for integration services through RESTful APIs, facilitating the exchange of data with other systems and the generation of dynamic reports linked to BPM models. The reports are robust, formatted and adaptable to processes, ensuring clarity in operational monitoring and strategic.

Technically, the Studio environment accelerates customizations at the data and interface levels. and logic, supported by an engaged community on *GitHub*, tutorial videos, and global partners. Updates occur frequently and technical support, although commercial, is backed up by the expertise of integrators. Finally, *Axelor* balances autonomy, technological modernity and ongoing support, making it a coherent option for small businesses with demands varied.

4.2 Odoo

Odoo , *Community* version under LGPL v3, has an official repository and a large number of modules maintained by *the Odoo Community Association* (OCA). Their installation technique, based on *Python*, *PostgreSQL* and *JSON/XML-RPC*, is well documented, but Migrations between versions may require planning due to backward compatibility. tripartite architecture (presentation layers in *Owl/ QWeb*, logic in *Python* and persistence in *PostgreSQL*) offers robustness and flexibility in module development.

From a usability standpoint, the modern *frontend* is intuitive, with *dashboards*, reports and *drag & drop* processes in modules such as CRM and inventory. However, in complex scenarios, such as multi-store management, local tax accounting or updates, is specialized technical support or migration to the Enterprise version is required. The extensive

collection of modules covers sales, inventory, e-commerce, accounting, human resources and manufacturing.

Native integrations with e-commerce, payment gateways and APIs are supported by community modules, but require technical adjustments. The reports are complete, but reports advanced technologies must be developed or acquired externally. The community is large (OCA), however free official support is limited, many reports indicate the need for commercial consultancy. Regular updates are released, but migrations are frequent. require manual action and testing, generating additional costs and risks.

4.3 Yetiforce

Yetiforce is an open source ERP *initially available* on *GitHub* with open licensing, but in its version 7.0 it became partially private, generating uncertainties regarding independent evolution. Its technical installation in *PHP* and *MySQL* is less complex, but requires compatible infrastructure and knowledge of LAMP *stacks*. web interface is organized and functional, although technically less sophisticated than *Axelor* or *Odoo*, with fewer *low-code* features and complex flows.

Functionally, it offers modules for CRM, billing, inventory and *helpdesk*, meeting fundamental operational processes. Integration via APIs and routines based on import/export are sufficient, but require manual intervention for adjustments and extensions. Reports provide basic operational data, without dashboards or workflows. dynamic.

Technically and communally, the post-privatization scenario weakened transparency and collaboration: forums and repositories lost strength. Regular updates ceased, and customizations depend on commercial partners. Free community support has shrunk, limiting viability for microenterprises that value autonomy and technical transparency.

4.4 Comparison between Systems

Although *Axelor*, *Odoo* and *Yetiforce* share the same purpose, offering ERPs *open source* for small businesses, their technical and operational approaches diverge significantly. *Axelor* stands out for its *Java* architecture with *low-code* (Studio and BPM), strong process control, dynamic reporting and an active community, balancing autonomy and qualified support. *Odoo* offers the widest variety of modules and a modern interface, but requires external support for tax customizations and version updates, generating costs

hidden and technical challenges in migrations. *Yetiforce* is lightweight and simple to install, but lost technical strength after license changes, presenting limitations regarding evolution, community and update flow.

Table 1: Comparison between the analyzed software

Criterion	<i>Axelor</i>	<i>Odoo</i>	<i>Yetiforce</i>
Source code in GitHub	Yes, platform Java (GPL-3)	Yes, Community and OCA (LGPL-3)	Partially, limited public release
Technical installation	Java/Tomcat, PostgreSQL, low-code in Studio	Python, PostgreSQL, JSON/XML-RPC, complex migrations	PHP/MySQL, infrastructure Simple LAMP
Usability/ Modern Web Interface	(Angular), low-code BPM	Web with OWL/QWeb, dashboards, rich frontend	Functional but less refined interface
Integration	RESTful APIs, BPM web services	APIs, community modules (e-commerce/gateways)	Basic APIs; forum/manual integration
Features	ERP + CRM + BPM + production, >30 modules	Modular ERP, ~30 cores + thousands of OCA	CRM, inventory, helpdesk, basic features
Reports	Dynamic, adaptable via BPM, formatted	Robust, yet complex, restricted advanced reporting	Simple operational reports
Community/ documentation	Active on GitHub, tutorials and forum	Very active (OCA), tutorials, but paid support	Reduced community post-privatization
Frequent updates/security , low-code auto-deploy model		Regular migrations require technical adjustments	Irregular, uncertain post-release roadmap
Technical support	Community + partners; optional commercial support	Consulting and Odoo SA (Enterprise); light Community support	Reduced community; paid consulting predominates

Source: Authors.

4.5 Current and Potential Situation of Free Software in Brazil

The digitalization of micro and small enterprises (MSEs) in Brazil is advancing at a rapid pace significant, although the adoption of SL solutions is still in its infancy. According to Sebrae (2025), 76% of entrepreneurs use computers to manage their businesses, and 47% already make use of some type of integrated digital application, such as management systems (ERP or CRM). However, despite the basic technological infrastructure being widely disseminated,

with 98% of companies having internet access, the presence of free solutions remains limited, largely due to a lack of technical knowledge and the absence of policies public policies that encourage the use of these tools (SEBRAE, 2025).

Data from research carried out by *iMasters* (2025) reveals that around 60% of small and medium-sized Brazilian companies are not even aware of open source solutions, and 68% claim to be unaware of what SL is. The low technological appropriation is reflected in the fact that 61% of SMEs still use spreadsheets or paper to do their accounting (PEGN, 2019). This scenario is aggravated when considering the aspect of legal and fiscal compliance: even Robust ERPs, which have broad functional coverage, still require customizations to meet Brazilian obligations, such as issuing Electronic Invoices (NF-e), SPED Fiscal, and specific rules of the Simples Nacional. The absence of these ready-made modules in the community versions represent a technical and economic obstacle to adoption by micro-enterprises with low customization capacity or access to specialized support.

According to a survey by ABDI (2022), 38% of SMEs that invest in digital transformation report active use of *web services*, automated backups and solutions personalized, practices that directly align with the principles of SL and collaborative. Open source platforms allow the company itself or local partners to carry out specific adjustments, reducing dependence on large suppliers and increasing autonomy technological. This model can stimulate the creation of regional support ecosystems and technical training, especially if supported by universities, cooperatives and public policies to encourage open innovation.

Thus, the current situation of free software in Brazil can be characterized by a wide range of tools and platforms, such as *GitHub*, but practical adoption is still lacking restricted in micro-enterprises. For this scenario to change, it is necessary to encourage technical knowledge, develop modules adapted to Brazilian tax legislation and strengthen the support network for digital transformation. SL therefore presents itself not only as a economic alternative, but as a strategic instrument for local development and digital inclusion for small businesses.

5 CONCLUSION

The analysis of *Axelor*, *Odoo* and *Yetiforce* tools allows us to state that the software open source code does indeed represent a technically viable alternative for managing



microenterprises in Brazil. However, its effective adoption still faces several challenges. Despite delivering robust functionality and consistent technical structures, especially in the case of *Axelor* and *Odoo*, these tools still need adaptations native to Brazilian tax requirements, such as issuing NF-e, generating SPED and compliance with the Simples Nacional tax regimes. In general, these obligations may be fulfilled through customizations, but these require technical knowledge or investment in consultancies, which can limit access for entrepreneurs without support internal technician.

From a management and operational point of view, the analyzed ERPs demonstrate potential to professionalize and structure small business processes, offering control of inventory, financial flow, CRM, and reporting. However, the lack of interfaces completely intuitive and the lack of institutionalized technical support (especially in the versions free) make it difficult for entrepreneurs with little familiarity with them to fully adopt them. technologies. Thus, although they are complete solutions, the introduction of these tools in everyday business requires some level of technical training or external support, which limits its immediate applicability in more informal and decentralized businesses, profile predominant among Brazilian microenterprises, as indicated by SEBRAE data.

For the future, it is recommended that public initiatives, such as development agencies, universities and incubators, promote training programs in free software management and encourage the development of specific modules for the fiscal reality Brazilian. Supporting these solutions can not only reduce the operational costs of small business, but also foster technological sovereignty and stimulate the local ecosystem of innovation. Additionally, partnerships with technology cooperatives or developer groups can enable the gradual adoption of these tools by entrepreneurs who currently depend on of manual controls, contributing to the country's basic digital transformation.

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