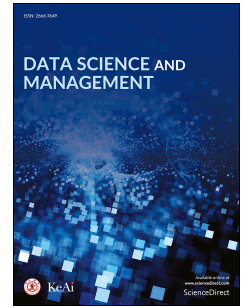# Journal Pre-proof

Trust and involvement of Cameroonian software developers in open-source projects

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Title: Trust and involvement of Cameroonian software developers in open-source projects

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Abstract

Although recent studies have examined collaboration within open-source software projects, the focus has primarily been on their motivations and governance. This study explores the complex dynamics of trust and involvement among Cameroonian software developers in open-source projects. In the context of a rapidly evolving software development landscape, these projects have emerged as a transformative force, redefining global collaboration standards. The qualitative methodological approach involved a survey of 22 participants in open-source software projects, including Cameroonian software developers, project governance actors, and open-source community members. Analyses revealed that the trust given to African software developers, including their effective integration into projects and consideration of their specificities and contributions, has a positive impact on their involvement in and ability to appropriate Information Technologies. By exploring the interaction between cultural, social, and technological factors, this study enhances our understanding of trust mechanisms within open-source communities, especially those involving remote developers.

Keywords: Software development, Trust, Developer involvement, Information technologies, Remote collaboration.

1. Introduction

The rapid evolution of software development has been marked by the emergence of open-source projects, redefining collaboration standards, and transcending geographical barriers (O'Reilly, 1999). The merger of collective intelligence and decentralized participation has propelled these projects to a global success. In this dynamic ecosystem, trust emerges as a cornerstone of effective collaboration within open-source initiatives (Price-Whelan et al., 2022). This study examined the complexity of trust in the context of open-source projects, focusing on the specific dynamics of Cameroonian software developers. Trust, which is multifaceted, plays a central role in determining the success and sustainability of initiatives (Weber, 2004). In the unique sociocultural context of Cameroon, which emerges in the field of software development; understanding trust dynamics is crucial for fostering meaningful contributions and ensuring the resilience of open-source communities (Sanguinetti-Toudoire et al., 2023). This study aimed to

reveal the challenges and opportunities related to trust in the collaboration patterns of Cameroonian developers engaged in open-source initiatives. By scrutinizing the complex interactions of cultural, social, and technological factors, we seek to offer insights that contribute to the improvement of local software development practices and a global understanding of trust mechanisms within open-source communities (Dangleterre and Powell, 2015). The underlying theoretical debate in this study is based on two essential research areas: organizational trust and the dynamics of involvement in projects with innovative business models (Budler et al., 2021). Dirks and Ferrin (2002) underscored the importance of trust as a crucial mediator of interpersonal relationships in organizations. Applying these principles to decentralized environments, such as open-source projects, provides a rich conceptual framework for exploring trust mechanisms beyond traditional organizational boundaries (Broekhuizen et al., 2021). Recent research on individual involvement in innovative projects, such as that of Deci and Ryan (2008) on self-determination theory, provides valuable insights into the motivational factors underlying engagement. In the context of open-source projects, where participation is often voluntary and self-directed and Cameroonian developers work remotely, how does trust influence their involvement in collaborative open-source projects?

The theoretical challenge of this study is to integrate these recent advances into an understanding of trust and involvement by applying them to the specific context of Cameroon. By exploring how trust, in an organizational context, intertwines with motivational mechanisms to influence developers' involvement and capacity to appropriate co-created value, we aspire to unveil a holistic perspective on the complex dynamics of open-source projects. To address this concern, we first analyzed the theoretical and conceptual framework of the study and then presented the methodological approach. Finally, we present the main results and discuss the scope of the study.

2. Literature review

To understand the concerns of our research, it is essential to understand the concept of trust. We first examine the different theoretical approaches to trust as well as the link between trust and developer involvement in open-source projects and communities.

2.1. Trust within open collaborative source projects: a polysemic notion

To understand subject of trust in the context of open-source projects and communities, it is crucial to analyze it using different definitions. There are diverse perceptions of the trust concept (Simon, 1976). This lack of consensus complicates the understanding of the role of

trust in developer involvement. Some authors consider trust as an instrument of coordination between economic agents in the context of their relationships (Granovetter, 1985; Weber, 2004). Trust in research is regarded as an alternative coordination method for market contracting. Thus, divergence persists regarding the role of trust in the context of project collaboration. Sociologically, Luhmann (1979) conceptualized trust as a subjective and generalized expectation of the reliability of a social system (Golembiewski, 1981). Generalized trust is the basis of social stability. In economics, Williamson (1979) proposes a transactional perspective in which trust lies in the predictability of partners' behaviors, reducing uncertainties, and allowing smoother transactions. According to Hunyadi (2023), trust involves a belief in the goodwill of the other party and an expectation of cooperative behavior. This psychosocial perspective emphasizes the importance of interpersonal interactions. However, Lewicki and Bunker (1995) suggested segmenting social perspectives on trust into three categories: personality theorists analyzing trust as a belief, sociologists focusing on social bonds, and psychosociologists defining trust as the expectation and consent of a third party engaged in cooperation. According to Giddens (1993b), trust requires the awareness of risk by all actors involved. This measured and assumed risk develops a competitive advantage through trust relationships. Therefore, it is important to understand the mechanisms of trust construction within open innovation ecosystems (Chesbrough, 2017).

Zucker (1986) proposes a conceptual framework to examine the relational dynamics in open innovation processes, emphasizing three forms of trust: intuitu personae, relational trust, and institutional trust. Intuitu Personae trust originates from personal characteristics and family, ethnic, or religious ties. It is based on affinities and moral contracts that foster commitment (Osborn and Marion, 2009). Relational trust develops over time through exchange and informal mechanisms. It is interpersonal and relies on the reciprocity of exchange, solidarity, and relational history (Martineau and Lulin, 2023). Institutional trust is systemic and independent of direct interactions between individuals. It manifests through norms, customs, traditions, and contracts (Williamson, 1979). Its effectiveness requires trusting guardians, such as certificates or labels, to ensure commitment and compliance. By combining the various definitions mentioned above, trust can be defined as the ability of each collaborative party to have faith in the involvement of the other party and respect its commitment (Porter and Kramer, 2011).

2.2. Different theoretical approaches to the involvement of software developers in open source communities

Understanding developer involvement in open-source communities has sparked several theoretical debates, reflecting diverse perspectives on the motivations and underlying dynamics of active participation in these innovative and collaborative projects. Intrinsic motivation theory, popularized by Deci and Ryan (2000), posits that developers' involvement stems from the satisfaction of fundamental psychological needs such as autonomy, competence, and social relatedness (Stewart and Gosain, 2006). Through Common's theory, Ostrom (1990) views open-source projects as common resources. Here, developer involvement is explained by perceived benefits such as access to skills, reputation, and the opportunity to use developed products (Conaldi et al., 2024). Applied to open-source communities, commons governance theory seeks to determine how governance rules impact the involvement and appropriation of value by developers (Mouakhar and Benkeltoum, 2020). Others, such as Lerner and Tirole (2002), adopted an economic approach by examining financial incentives that can influence engagement. Authors from the field of economic sociology, such as Mauss (1925), proposed, through the Gift against Gift theory, that involvement results from reciprocal exchange between developers and the community. In the case of open-source software projects, individual contributions are considered "gifts," and developers expect to receive in return, creating a balance in the community's dynamics (Lerner and Tirole, 2002).

The debate between proponents of the Gift-against-Gift theory and those of organizational commitment theory, developed by Meyer and Allen (1991), explores the nature of exchanges within open-source communities, highlighting the reasons for reciprocity or moral commitment. Dimensions, such as affective commitment (emotional attachment), continuance commitment (exit cost), and normative commitment (moral obligations), have been studied to understand developers' connections with communities (De-Laat, 2010). This commitment creates a social identity (Guoyin et al., 2021) and suggests that belonging to a community influences an individual's actions (Price-Whelan et al., 2022). Moreover, recent contributions, such as those of Dangleterre and Powell (2015), have explored the complex dynamics of trust within open-source communities, highlighting its central role in collaboration and project sustainability. This study emphasizes the importance of understanding trust mechanisms to foster meaningful contributions within these communities.

2.3. Developers in open source software projects

A contributor to an open-source project is an individual who makes an unpaid contribution outside their professional hours. Initially motivated by building and exchanging programs for personal needs, developers are influenced by financial considerations (Mouakhar and Benkeltoum, 2020). Developers' motivations distinguish between intrinsic (the intrinsic pleasure of contributing) and extrinsic (indirect) rewards. The categories of developers include altruistic activists, interested activists, and paid developers. Altruistic activists are motivated by strong social norms, whereas interested activists seek to profit from their engagement. Paid developers capitalize on their contributions to increasing skills and reputation (Lakhani and Wolf, 2006); Value capture in open source differs because even non-participants can capture it Mouakhar and Tellier, 2013). These actors include developers, foundations, software publishers, integrators, distributors, hardware builders, clients, and public authorities. Developer participation is justified by intrinsic and extrinsic motivations (Benkeltoum, 2016). Some act as rational homoeconomicus, investing time to gain benefits, particularly by building a reputation in the job market (Lerner and Tirole, 2002). Other developers are motivated by the desire for integration into community culture, solving technical problems, altruism, a culture of sharing, and creative enjoyment within an open-source environment (De-Laat, 2010). The community aspect involves adherence to implicit collective rules and norms (West and Bogers, 2014).

3. Research Methodology

This section presents the research and data collection protocols. We describe our sampling method and outline our data processing approach.

3.1. Research and data collection protocol

This was a longitudinal case study. This is justified by the complex and multidisciplinary nature of developer involvement in collaborative open-source projects. The case study method presented by Yin (2003) aimed to gain an in-depth understanding of the trust phenomenon and its impact on the level of involvement of African developers engaged in free software projects. We were accepted as nonparticipant observers by the OpenOffice project actors, allowing us to enrich our primary data, reconstruct the chronology of events (Leonard-Barton, 1990), and implement our desire for data triangulation (see Table 1). Our interview guide was designed based on readings related to the research issues. Its formalization was carried out with the

intention of focusing on the configuration of the thematic axes (Blanchet and Gotman, 2007). Emphasis was then placed on searching for elements to understand the topics addressed.

Table 1: Different data collected.

Nature of data collected	Descriptions
Semi-structured interviews (22 interviews lasting an average of 70 minutes)	- Verbatims from transcriptions (around 430 pages) - Semi-structured interview guide
Non-participating observations	- Workshop reports and monthly summary meetings - Note-taking at meetings, events and workshops
Secondary data	- Documentation and files related to the case study

3.2. Sampling methodology

Based on a unique case study, this research focuses on a community project in the open-source software sector, namely, the OpenOffice Project. OpenOffice is an open-source office software that competes with Microsoft Office. It is an open-source office suite initiated by OpenOffice.org in 1999 by American company Sun Microsystems. In 2011, Oracle transferred the project to the Apache Foundation and renamed it Apache OpenOffice. This project aims to provide free and powerful alternatives to common productivity software by offering comprehensive tools that are compatible with industry standards. The collaborative nature of the project is emphasized in its charter, which focuses on the integration of all users and contributors worldwide.

A sample of 22 interviewees was selected from the community surrounding the OpenOffice Project. The selection followed the principle of theoretical saturation (Corbin and Strauss, 2014), in which no new information was gathered after the twentieth interview. Interviews were conducted with African developers who had already contributed to open-office projects. To obtain a comprehensive view of the practices, governance leaders collaborating within the OpenOffice project were interviewed. Contacts were established via online discussion forums, bringing together OpenOffice developers and users using our personal network and following the snowball recommendation method. Table 2 summarizes the profiles of the interviewed individuals.

Table 2: Profiles of interviewed individuals.

Interviewed individuals	Involvement in the OpenOffice project	Professional status	Type	Length of time in the project (years)	Interview duration (min)
1	Software developer	Employee engineer	M	4	55
2	Software developer	Employee engineer	M	9	63
3	Software developer	Engineering student	M	4	54
4	Software developer	Job seeker	M	4	50
5	Software developer	Employee engineer	M	8	65
6	Software developer	Employee engineer	F	3	68
7	Software developer	Employee engineer	M	3	56
8	Software developer	Employee engineer	M	4	65
9	Software developer	Engineering student	M	3	58
10	Software developer	Engineering student	F	2	66
11	Software developer	Employee engineer	F	2	57
12	Software developer	Job seeker	M	4	65
13	Software developer	Job seeker	M	4	59
14	Software developer	Employee engineer	M	4	67
15	Software developer	Employee engineer	M	3	68
16	Software developer	Employee engineer	M	3	59
17	Software developer	Employee engineer	M	3	54
18	Community Manager	Employee engineer at OpenOffice	M	13	55
19	Member of the contribution moderation team	Employee engineer at OpenOffice	F	3	86
20	Member of the contribution moderation team	Employee engineer at OpenOffice	M	6	95
21	OpenOffice project quality manager	Employee engineer at OpenOffice	M	2	86
22	Community Manager	Volunteer in the OpenOffice project	M	4	85

[a]M- Male   *F- Female

3.3. Data processing

Following the transcription of our interviews, we initiated the process of analyzing our primary and secondary data using the thematic content analysis methodology. This analytical approach,

based on structured procedures, allowed us to assess the speaker of the discourse, the content of the message, and the target audience (Hlady-Rispal, 2015). From this perspective, all data underwent a coding process to enable thematic analysis. The validity of part of this coding was confirmed through double coding performed by a third-party researcher, thus minimizing bias and maintaining a level of rigor in accordance with the recommendations of Cole et al. (2011). Once the coding was completed, NVivo 12 software was used to continue the analysis. During this analytical phase, links were established between different categories and subcategories of themes to contextualize and better understand the verbatim content (see Table 3).

Table 3: Typology of themes used for thematic analysis

Level 1 code	Level 2 code
Trust Dynamics	Intuitu personae trust
	Relational trust
	Institutional trust
Involvement levels	Intrinsic motivations
	Extrinsic motivations
	Hybridization of militant and economic logics
Cultural and Social Interactions	Impact of cultural factors
	Influence of Cameroonian culture on involvement
	Social dynamics in open source projects
	Compliance with commitments

Subsequently, we identify the contextual elements in our data and structure them to highlight aspects related to Cameroonian developer involvement in open-source projects. To complement this data processing phase, we conducted frequency and co-occurrence calculations to identify the elements specific to our case study and those shared with other contexts.

Next, we identified the contextual elements in our data and structured them to identify aspects related to the involvement of Cameroonian developers in open-source projects. To complement this data processing phase, we conducted frequency and co-occurrence calculations to highlight the elements specific to our case study and those that are common.
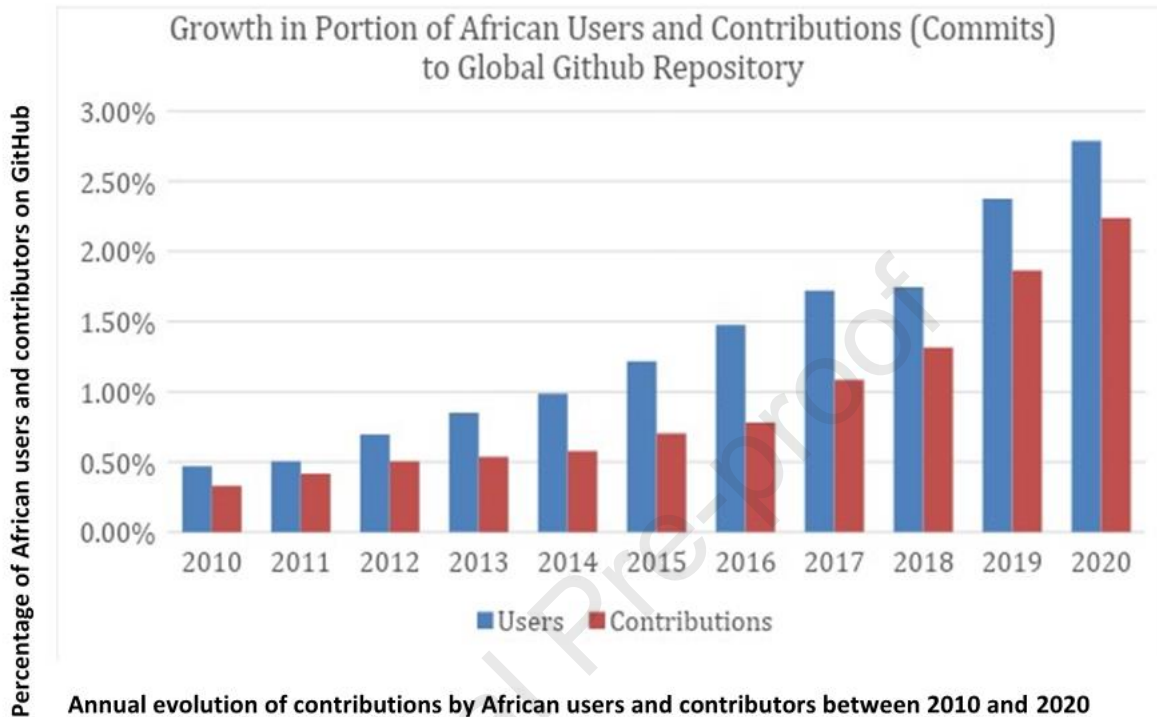
4. Results

The qualitative analysis allowed us to present certain results that highlight the role of trust in developers' involvement in open-source projects and communities. In this section, we describe the governance of the Apache OpenOffice project and the role of African developers. Subsequently, we address the motivations of African developers within the OpenOffice project, followed by the dynamics of trust and developer involvement in open-source projects.

4.1. Governance of the Apache OpenOffice project and the role of African developers

OpenOffice is a concurrent open-source version of Microsoft's commercial Office Suite. This project is distinguished by its community-driven nature, with steering and governance ensured by the Apache Foundation. A major shift occurred in this project approximately 15 years ago, with the departure (fork) of a significant part of its community to create an alternative project, LibreOffice. This separation was motivated by disagreements within the community regarding the direction of the project, particularly regarding governance and collaboration. In the context of our research, which focused on the trust and involvement of Cameroonian developers in open-source projects, we observed that despite the presence of decision-making bodies, no hierarchical formalism was established. Each project committee, following the Apache method, can create and implement its own decision-making methods. However, a voting standard exists. For a software code proposal made by a developer, it is necessary to obtain a simple majority of positive votes. Additionally, any voter who casts a negative vote must provide an explanation and propose alternatives. In this situation, the initial goal is to seek a consensus among the different alternatives. However, no African software developers were involved in these decision-making bodies. This situation leads to arbitrations that are not always favorable to African developers. This has resulted in the demotivation of African developers, further hindering the practice of open sources in Africa and calling for awareness. As shown in the figure below, the number of African developers of open-source projects is low. One of our interviewee's states: 'In Africa, the culture of free software is not yet widely spread; a sort of colonization by large global commercial software firms persists. It is necessary to inform the local computing community about the opportunities for free software, particularly as an alternative to Microsoft's office software.' This observation can be generalized to open-source software projects. As shown in the fig. 1, the contributions of all African developers were less than 3% of all contributors worldwide. In addition, Fig 1 here shows that between 2010 and 2020 the number of African users and contributors to Open Source projects has been growing steadily. However, there are many more users than contributors to these projects. Africans are

therefore much more consumers. This does not always allow for software that is adapted to the specificities of Africa.

Fig. 1: Contribution of African developers to open-source projects. (Source: Johnson, 2022)

Growth in Portion of African Users and Contributions (Commits) to Global Github Repository

Annual evolution of contributions by African users and contributors between 2010 and 2020

In the continuing to present the results of this study, we discuss the motivations and obstacles to Cameroonian developers' participation in open-source projects.

4.2. Motivations of central African developers to contribute to open-source projects

To address our research question, we collected information from our interviewees regarding their profiles (age, education, and role) and their motivations for participating in the OpenOffice project using an interview guide (see Table 4). We observed that most participants were young individuals aged between 17 and 45 years with primarily basic education in computer science. Their motivations stem from diverse sources. For one of our interviewees, it is intellectual curiosity: « *During our university training, we were told that open-source versions existed for most commercial software. Unfortunately, we did not have the chance to work on such projects. But since communities are open, I come to understand how it works and report bugs to someday become a contributor*» Another declared that he wants to gain recognition in open-source projects to enhance his CV and explore promising professional opportunities in terms of employment or selling training services. He asserts: «*I have often seen job offers where skills and knowledge in open-source projects were required. I am interested in joining the community*

to enhance my skills» Others, however, are interested in this open-source project for ideological reasons. They are outraged by the exorbitant costs of commercial licenses and the commodification of knowledge. They advocate the popularization of open projects in the business and education sectors.

Table 4: Profiles and motivations of African developers in open-source projects. Source: Our results.

Interviewee profiles	Descriptions
Ages	19 to 45 years old
Basic training	Computer science
Functions or activities	- Software developer
	- Director of information systems
	- IT intern
	- Computer science student
Types of contribution	- Testing source code additions
	- Plugin design
	- Identification and reporting of bugs
Motivations to contribute	- Intellectual curiosity: understanding how free software works
	- Prove yourself and enhance your CV
	- Obtain valuable skills through the sale of training services and the development of specific modules
	- Participate in a common project
	- Gain international recognition

However, the will and motivations of Central African developers to participate in open-source projects face several obstacles and challenges that are presented in the following sections.

4.3. Obstacles to the involvement of Central African developers in open-source projects.

Our study identified several obstacles:

4.3.1. Prejudices due to the situation and geographical origin of Cameroonian developers

To address our research question, we collected information from our interviewees regarding their profiles (age, education, and role) and their motivations for participating in the OpenOffice project using an interview guide. We observed that most participants were young individuals aged between 17 and 45 years with primarily basic education in computer science. Regarding their motivations, they come from various and diverse sources, as this interviewee asserts: « *If you submit a contribution mentioning that you reside in Africa, there is a high chance that it will not be accepted or will be ignored. Many African contributors to open-source projects, therefore, lie about their locations* ». There are also numerous obstacles faced by open-source African contributors. In addition to a lack of infrastructure and high-quality digital skills, the authors faced geographical bias in the evaluation of their contributions. The probability of accepting an open-source contribution increases by 19% when the submitter and integrator are from the same geographical location (Johnson, 2022). Other African developers residing in the West also contribute to projects under this label and are contingent on non-African developers. Thus, when a search is conducted on GitHub for contributors from or residing in Africa, it gives the impression that no African country contributes to the open-source LibreOffice productivity project (see Fig. 2).

Fig. 2: Search for the number of African contributors and contributions in the OpenOffice project (source: current research results)

This situation is detrimental to the development of an open-source community in Africa, because the positive experiences of African developers are not available, valued, or presented. This may compromise the creation of an emulation and growth of an open-source ecosystem in Black Africa.

4.3.2. Skill level of Cameroonian developers and the availability of technical infrastructure

Our study reveals that not all African countries are equal in terms of the dynamism of their local open-source ecosystems. The Maghreb and Anglophone Africa are ahead in terms of open-source practices (see Fig. 3). Central African countries must follow suit by providing local actors with the necessary infrastructure and support to align with this trend, which, as observed in the West, represents a source of jobs and strategies for technological independence.

We analyzed the general trends in open-source contributions from African developers between 2010 and 2020 and then between 2022 and 2023. We observed an overall increase in the share of GitHub contributors in Africa from less than 0.5% in 2010 to approximately 2.7% in 2020 (Johnson, 2022). The share of the actual total contributions from African authors also increased from 0.3% in 2010 to 2.3% in 2020. However, this increase was not observed in Central African countries, as they did not implement training programs for qualified programmers or encourage them to participate in open-source projects. Additionally, these countries do not promote the use of open-source software in their administration or universities. Fig 3 confirms this observation. Indeed, it can be seen that from 2010 to 2020, no Central African countries were among the main African contributors to open source projects listed on the GitHub platform. Initially, South Africa was the main one. However, in recent years, West African countries have followed suit with a growth of over 30% in contributions.

Fig. 3: Distribution of GitHub platform in Africa (source: Johnson, 2022)
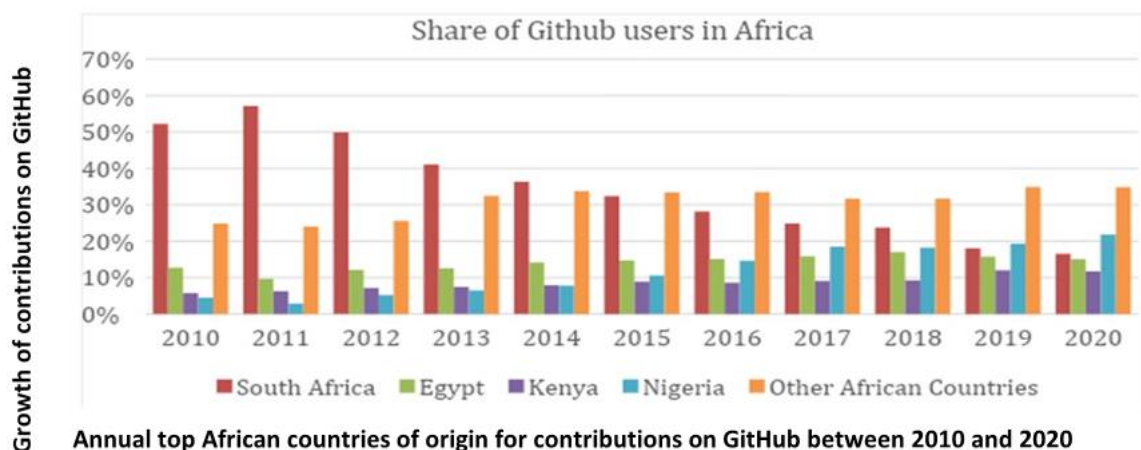
Annual top African countries of origin for contributions on GitHub between 2010 and 2020

4.3.3. Decision-making processes within open-source projects as a barrier to involvement: African developers facing relational dynamics within open-source projects

Although virtual or remote collaboration is advocated and established as a rule in the world of open sources, meetings and conferences are regularly held in person where key players meet and consolidate trust relationships. However, African developers face challenges regarding mobility and financial resources. One of our interviewees stated, '*We rarely have the opportunity to attend conferences and congresses organized in the world of open source. Yet, during these events, we meet project leaders, those who grant access to the core of the project and the opportunity to contribute at the same level as Western developers. You know, it's true that it's virtual, but when we meet in person, it accelerates and reinforces trust. We need financial resources and consular visa facilities'* .

We noticed a decrease in the motivation and involvement of African volunteer developers, as a growing imbalance in terms of contributions emerged between them and other paid European actors, mostly companies participating in the project. In these projects, to obtain the status of a 'committer' and thus be able to modify the main core of the project without 'censorship', one must have proven oneself through relevant and significant contributions. One interviewee adds: « *In this game, contributors paid to contribute full-time to an open-source project will always have an edge over volunteers who participate in their free time* ». However, as the various theoretical works we have mobilized have shown, communities rely on individuals whose primary motivation is to prove themselves and contribute to the construction of a project or a common ideal. Thus, the goal was to face commercial software giants such as Microsoft and IBM, and development was driven by an ideological movement whose founder was Richard Stallman. Indeed, today, the industrialization of open-source activities has relegated itself to background volunteer activists, especially Africans. Thus, the status of volunteer contributors evolved. Nowadays, most 'volunteer' individuals in projects do so on behalf of certain companies. The Table 5 summarizes the elements presented above.

Table 5 : Obstacles to the involvement of Cameroonian developers

Postman	Description	Impact
Geographic biases	Discrimination against African contributions	Decreased motivation, lies about geographic origin
Skills and infrastructure	Lack of training and infrastructure	Technological delay compared to other African countries
Decisional process	Exclusion of African developers from decision-making bodies	Lack of confidence and involvement; difficulties in appropriating the co-created value
Finance and mobility	Difficulties encountered in open-source events	Exclusion from decision-making networks

4.4. Dynamics of trust and involvement of developers in open-source projects

Our study shows that software developers' trust in the governance bodies involved in collaborative projects reinforces intrinsic and extrinsic motivations. Thus, the results show that developers were intrinsically motivated by the pleasure of contributing to and accomplishing stimulatory tasks. Creativity was identified as an essential driver of developer involvement in open-source projects. Some contributions were guided by extrinsic motivations, including seeking benefits, such as access to skills, reputation, and the opportunity to use the products developed. Previous studies have also emphasized the importance of reputation in extrinsic motivation. For this to be effective, there must be trust in the reciprocity between actors and in their ability to respect the rules of the game. In this regard, one of our interviewees states: « *The hybridization of militant and economic logics must emerge as a crucial component of our involvement. The challenge here is related to satisfying commitments while juggling between militant and economic motivations* ». Cameroonian developers show a strong correlation between intrinsic motivations such as the pleasure of contributing, level of involvement in open-source projects, and ability to appropriate value. Community trust plays a crucial role in strengthening motivation. The community aspect must be valued, but it also imposes rules and norms with which individuals must comply. The problem for Cameroonian developers is the difficulty they face in being integrated into projects, proving themselves, and, thus, being subject to peer judgment. This lack of reciprocity, inspired by the theory of gift exchange and moral commitment according to the theory of organizational commitment, compromises the

mutual trust between developers, and community trust is essential for maintaining involvement. The Table 6 summarizes the elements presented above.

Table 6 : Dynamics of trust and involvement

Motivation	Description	Impact
Intrinsic	Contribution pleasure, creativity	Strong involvement
Extrinsic	skills, reputation, products	moderated involvement
Trust	Reciprocity, respect for the rules	Strengthening motivations

With a solidly established theoretical foundation, we now discuss the application of these concepts in the context of our study. The theoretical elements addressed provide the necessary framework for interpreting our results and engaging in a thorough discussion of the concrete impact of these principles on the specific domains that we are exploring.

5. Discussions

This study makes a significant contribution to the literature by highlighting the need to create, provoke, or preserve an environment that is conducive to the trust and involvement of French-speaking African software developers in open collaborative projects. Establishing mutual trust secures stakeholders, encouraging them to respect their commitment and invest fully in the project. This aligns with the findings of Mouakhar and Benkeltoum (2020), who highlighted the trends of actors deviating from values and not respecting initial commitments.

Our research highlights the importance of cultivating reciprocal relationships based on trust and respect for commitments, in line with the works of Martineau and Lulin (2023) and Porter and Kramer (2011) on the vision of '*shared value.*' We advocate the early definition of clear objectives, establishment of performance standards, and periodicity of interim evaluations to ensure commitment adherence. The implementation of conflict resolution tools, sanction devices, and the definition of clear commitments are essential for deterring non-trusting behaviors (Dangleterre and Powell, 2015).

These observations converge with Deci and Ryan's (2002) ideas about the need for strong socialization to limit opportunistic behaviors. We support the proposal to develop a high degree of socialization, increase the cost of betrayals, and ensure the optimality of regulation by giving.

These practices can deter value misappropriation (Belketoum, 2016) and balance the relationships between actors (Deci and Ryan, 2008).

In addition to network coordination, some suggest intertwining market and hierarchy coordination mechanisms suggestion, our research emphasizes that trust and the precedence of commitments should not exclude the need to formalize commitments (Sanguinetti-Toudoire et al., 2023). Governance devices, informal adjustments, and contractual clauses (Price-Whelan et al., 2022) are necessary to ensure fair exchange and prevent unforeseen events.

Our study demonstrates that reciprocity of exchanges promotes a climate of trust between actors, which aligns with Stewart and Gosain's (2006) findings regarding trust in distant networks. Our results reinforce the co-construction approach to value between stakeholders, emphasizing the importance of different trust dimensions (Zucker, 1986) in this process. These conclusions complement the work of Demazière et al. (2013) on the combinations of trust and formal framing.

However, despite the importance of the initial motivations of volunteer actors, our study reveals that the industrialization of open-source activities relegates African volunteer activists to the background, highlighting a paradigm shift (Budler et al., 2021). In future research, it would be interesting to replicate this type of study in different and similar cases to deepen our understanding of trust and involvement dynamics in various contexts (Granovetter, 1985).

From a managerial perspective, these results underscore the importance of cultivating an environment that encourages mutual trust and honors commitment (Broekhuizen, 2021). Businesses and public organizations can leverage these findings to formulate policies and practices to strengthen open collaboration and value creation.

The hope conveyed through This study aims to lay a solid foundation for contemplating the reciprocal relationship between trust and commitment honoring within open collaborative ecosystems (Conaldi et al., 2024). This nuanced understanding can guide policymakers and researchers in promoting practices and policies conducive to the success of collaborative projects, particularly in the development of an open-source developer community.

6. Conclusion

Our study examined the role of trust in the involvement of Cameroonian developers in open-source projects. The results showed that trust in the community and governance bodies is a

crucial factor for developer motivation and involvement. This work highlights that in some circumstances, trust stems from the respect for commitments by stakeholders, while in others, it is the respect for commitments that results from trust, emphasizing the importance of reciprocity of actions in these interactions. Intrinsic motivations such as the pleasure of contributing and creativity strengthen African software developers' involvement in and appropriation of information technologies. Extrinsic motivations such as the search for skills and reputation also play a role, but to a lesser extent. Several obstacles hinder the involvement of Cameroonian developers, including geographical prejudices, a lack of skills and infrastructure, and exclusion from decision-making bodies. The hybridization of militant and economic logic has been proposed as a solution to overcome these obstacles and promote the involvement of Cameroonian developers.

As a future research avenue, our study suggests further exploration of specific mechanisms that promote the development of trust and commitment in open collaborative environments and their impact on the appropriation of information technologies in the African context.

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Declaration of interests

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I have not competing interests for this work