

Social Aspects and How They Influence MSECO Developers

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Abstract— Mobile software ecosystem (MSECO) is a new software development paradigm for mobile technologies, having three main dimensions, namely: Technical, Business and Social. The literature has a considerable number of studies on technical and business dimensions, but only a few studies focus on the social aspects of MSECOs. However, the literature has enough to provide evidence that the actors involved, such as developers, are crucial to an MSECO. This study aims to complement earlier studies by describing new social factors that influence developers to work in a MSECO. We conducted a systematic literature review in order to identify these new factors, and a field study in which 20 developers were interviewed to understand how these factors can influence them to join or keep participating in a MSECO. We found that developer become more rigorous to continue participating then to adopt a MSECO.

Index Terms—Mobile Software Ecosystem, Social Aspects, Developer's Collaboration

I. INTRODUCTION

Bosch and Bosch-Sijtsema (2010) [1] define a Software Ecosystem (SECO) as a set of internal and external (from the platform) developers and a community of domain experts in service of a community of the users. These developers aim to, along side to users, propose relevant solutions to satisfy needs.

Mallinson (2015) [2] suggest that SECOs are a growing area in software business, involving more and more people and consequently impacting a larger group of users that generate, in turn, a higher income. In particular, the kind of SECO that have most recently attracted attention are precisely mobile SECOs (MSECOs), that is, those that are focused on developing solutions to users using mobile technologies [2]. As some example of MSECO, we have Android and iOS.

Given the importance of SECOs, there is a growing concern about their sustainability, i.e., whether a particular SECO will

remain active over time. In fact, Dhungana *et al.* (2010) [3] explain that the sustainability of a SECO depends mainly on two pillars: the first is its ability to adapt to new trends and technologies over the time, and the second is its ability to attract and keep new people. In other words, the *social* aspects of an SECO are important to its sustainability [4]. Overall, this suggests that it is necessary to study the influence of social aspects in the sustainability of SECOs. As a first step, in this paper we described an in-depth study of which social factors influence the developers to participate in a MSECO.

This study is organized as follows: Section 2 describes the theoretical foundations of our work. Section 3 presents the methodology we used in this research. Section 4 presents our results while Section 5 discusses the importance of our results. Section 6 lists the limitations of this study and Section 7 presents our conclusions and suggestions for future work.

II. BACKGROUND

Campbell and Ahmed (2010) [5] suggest that software ecosystems can be observed from three main dimensions: Technical, Business or Social. Furthermore, as they argue [5], each author who sought to define a SECO ends up focusing on one of these perspectives. For instance, Bosch (2009) [6] argues that a SECO "*consists of the set of software solutions that enable, support and automate the activities and transactions by the actors in the associated social or business ecosystem and the organizations that provide these solutions*", which indicates that this author has a greater focus on the technical perspective, or technical aspect.

In Jansen, Finkelstein and Brinkkemper (2009) [7]'s work, a SECO is defined as "*a set of businesses functioning as a unit and interacting with a shared market for software and*

services, together with the relationships among them”, which in turn demonstrates a greater focus on the business aspect.

Finally, for Manikas and Hansen (2013) [8] a SECO is “the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services”, which suggests a greater concern with the actors involved in the process, thus being a closer definition of the social aspect of a SECOs.

A specific subset of SECOs are the MSECOs, these focus on mobile technologies, such as designing applications for users to use on their mobile devices [9]. Fontão, Santos and Dias-Neto (2015) [9] identified that a MSECO is composed of 7 elements, four of which are related to social characteristics, as indicated next.

Platform (technical aspect)—Technological platform where the interactions of the actors of an SECO occur.

Application Store (business aspect)—Place where the applications are arranged by the developers to the end users.

Applications (technical or business aspect)—Software solution developed to attend end user demands.

Developers (social aspect)—Campbell & Ahmed (2010) [5] defined that a developer can be internal, it means, these that develop functionalities for the platform, or external that develop applications using that platform.

Users (social aspect)—The end users are considered fundamental because they invest the money that enables SECO to continue to function.

Community (social aspect)—It is the set of actors around the platform, being composed of developers and users, and the interactions among them.

Evangelists (social aspect)—They are some developers or users who stand out for bringing innovation to their community.

According to the definition above, a MSECO depends immensely on the people interacting with its platform, since each person has a key function, and without these people, the MSECO would be doomed to decline and, consequently, die. In fact, De Souza *et al.* (2016) [4] demonstrate the importance of social aspects of MSECOs by focusing into developers’ motivation to join and keep participating in a SECO. In that study [4], 6 social factors are pointed out, namely:

(S1) Developers are often influenced by others (including friends, colleagues and co-workers).

(S2) Job Market attracts developers as they increase their perceptions about this market.

(S3) The high number of users attracts the developer.

(S4) The community (online or local) influences the developer.

(S5) Role and importance of end users to the developer.

(S6) Both intrinsic and extrinsic motivations influence the behavior of the developer to collaborate with a MSECO.

In sum, previous studies suggest that social aspects are important for the sustainability of any SECO, including MSECOs. Thus, our aim is to better understand which factors are considered relevant to motivate a developer to participate in a MSECO.

III. RESEARCH METHOD

This study was conducted in two phases. In the first phase, we conducted a literature review aiming to identify the social factors present in previous studies. The second phase consisted of a field study in which developers were invited to explain how each of the identified factors influenced them to join or keep participating in a MSECO.

Therefore, this research has two main research questions:

(RQ1) Which are the social factors, reported in the literature, that motivate a developer to participate in a MSECO?

(RQ2) How are developers influenced by these social factors to participate in MSECOs?

A. Systematic Literature Review

We conducted a systematic literature review (SLR), as recommended by Kitchenham *et al.* (2009) [10]. The set of studies identified through the SLR was supplemented by snowballing [11]. We present the process in Figure 1, following these steps: (a) Definition of research questions, (b) Definition of the research process, (c1) Execution of the inclusion and exclusion criteria, (c2) Complementary process of snowballing (d) Assessment of quality and criteria, (e) Data collection, (f) Data analysis, and (g) Reporting of results.

(a) Definition of research questions

The research questions of the systematic literature review are:

(SLR-RQ1) Which literature studies address social aspects in MSECOs?

(SLR-RQ2) Which social factors are presented in the MSECO literature?

(b) Definition of the research process

Kitchenham’s *et al.* (2009) Research process definition phase [10] involves the definition of the databases on which studies that portray a MSECO will be identified. The selected libraries were: ACM Digital Library, IEEEExplore Digital Library, SCOPUS, Science Direct, Springer Database, and Wiley Interscience.

The queries conducted in the libraries were composed of strings in the following format (containing in its title, abstract or keywords the following terms):

```
Title-Abstract-Keyword{
  MSECO OR [Mobile AND (Software Ecosystem OR
  SECO)] OR [smartphone AND (Software Ecosystem
  OR SECO)]
}
```

This resulted in 532 identified studies.

(c1) Inclusion and Exclusion criteria

The data selection phase was conducted by reading the title, keywords and abstract of the 532 identified studies and applying the inclusion and exclusion criteria in each study. The used inclusion criteria were the as follows:

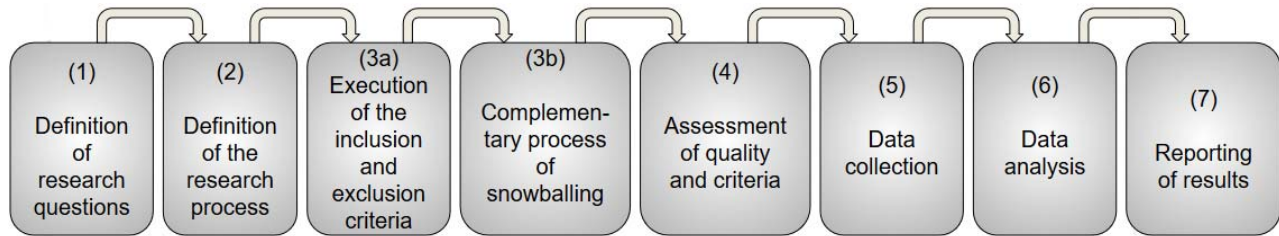


Figure 1. The Adopted Systematic Literature Review Process

(I1) Publications on SECOs that present any mobile characteristic in their title, keywords or abstract.

(I2) Publications indicating MSECO in their title, keywords or abstract.

The used exclusion criteria used were the following:

(E1) Duplicate studies.

(E2) Studies prior to 2007, because, according to the literature review on SECOs [8], this area started in 2007.

(E3) Conference abstract.

(E4) Studies that are not written in Portuguese or English¹.

(E5) Studies that do not address MSECOs.

At the end of the application of these criteria, 81 studies were accepted.

(c2) Complementary process of snowballing

The complementary snowballing process has two sub-processes, which are:

Forward–Given the initial set (81 studies), we used the Google Scholar Tool² to identify studies that have cited those, then, we applied the selection criteria (step c1), thus defining a new set of studies. We repeated the process on the new set, until no new studies emerged. This way, we identified 28 new studies, being 26 found in the first iteration and 2 in the second iteration.

Backward–Given the initial set (81 studies), we used the citations used in that studies, and we apply the selection criteria (step c1), thus defining a new set. This process was repeated over the new set until new studies did not appear. By doing so, we identified 46 new studies, being 42 found in the first iteration and 4 in the second iteration.

At the end of the snowballing process, we identified 74 (46+28) new studies. By adding these to the initial set (81 studied), we get a total of 155 studies on MSECOs.

(d) Assessment of quality and criteria

In possession of the 155 studies (145 in English and 10 in Portuguese), the process of assessment of quality and criteria was conducted by three researchers and verified by two senior researchers.

A more in-depth reading of the studies was conducted by the researchers, in search of studies that bring factors that influence developers in joining or keeping participating in

¹Authors first language.

²Google Scholar - <https://scholar.google.com.br/> - Accessed in 19/06/2018 - 16:20

Table I
STUDIES ON FACTORS THAT INFLUENCE THE DEVELOPER

ID	study	Citation
P1	Fontão, Dias-Neto and Santos (2017)	[12]
P2	Sadi, Dai and Yu (2015)	[13]
P3	Dobrica and Pietraru (2017)	[14]
P4	Ryu, Kim and Kim (2014)	[15]
P5	Kim, Kim and Lee (2016)	[16]
P6	Goldbach, Benlian and Buxmann (2017)	[17]
P7	Miranda <i>et al.</i> (2014)	[18]
P8	Koch and Kerschbaum (2014)	[19]
P9	Rieger and Majchrzak (2016)	[20]
P10	Koch and Gucer-Ucar (2017)	[21]
P11	Deniz and Kehoe (2013)	[22]
P12	Choi, Nam and Kim (2018)	[23]
P13	Ferreira (2016)	[24]
P14	Choi, Nam and Kim (2017)	[25]
P15	Goldbach and Benlian (2015)	[26]

SECOs. A total of 15 studies were selected (SLR-RQ1), see Table I. This process was also conducted by three researchers and double-checked by two senior researchers.

(e) Data collection

After selecting the 15 studies, we performed the extraction of factors through the detailed reading of each of the selected studies. With this, 167 candidate factors were extracted.

However, in these 167 there were still many duplicates, similar or not suited to the social context, so the analysis process described below aims to arrive at a suitable set to be able to collect the opinion of the developers.

(f) Data analysis

In order to enable grouping and synthesizing the factors, a strategy known as Card Sorting [27] was used. The adopted procedure was the Open Card Sorting [27], which consists in identifying the categories as a result of grouping them by similarities, i.e., we clustered the factors with similar content into a new factor. Therefore, in the table in which the factors were extracted to, the cells with the same factors or similar descriptions receive the same number, in order to identify which of these were relevant to a social study, resulting in a set of 11 factors, as will be presented in (step g). An example is presented in Table II.

(g) Reporting of results

To answer SLR-RQ2 of this literature review, we identified

Table II
EXAMPLE OF FACTOR GROUPING

ID	Factor	Citation
1	Creation of a reputation in the development community	[14]
...		
2	Fun experienced through the development process	[19]
...		
2	Experiencing fun during software development	[13]
...		
1	Creation of reputation in the development community	[19]
...		

11 social factors that influence the developers, and they are presented in the Section IV.

B. Field study

To conduct the Field study on the social factors identified, 20 developers were invited to express how the following factors influenced them both to begin and to keep collaborating with a MSECO.

Singer, Sim and Lethbridge (2008) [28] explain that a field study is a kind of study in which the objective is to investigate practitioners of some activity, and through some technique to identify how they deal with this practice or how to solve some problems within their respective contexts. Therefore, through a field study, it is possible to capture empirical evidence for our study.

Following Singer, Sim and Lethbridge's (2008) [28] recommendations, we invited developers with experience on mobile technology development. More specifically, we focused on the MSECO Android or MSECO iOS since they are the largest ones in the market. These developers were residents of the state of Rio Grande do Sul, Brazil. The characterization of the developers is arranged in Table III.

Interviews lasted an average of 30 minutes, and their results are presented in Section 4. In the interviews, we delivered to each developer 11 cards containing each one a factor with its description according to the literature. Then, we asked the developers the following questions, for each social factor:

- Do you feel that this factor influenced you to start developing for a MSECO?
- Do you feel that this factor influences you to continue developing for a MSECO?
- How does this factor influence you to participate in a MSECO?

Thus, asking these questions, it was possible to identify how each factor is important when starting, continuing and how the developer feels affected by these factors, that means, how these factors improve MSECOS sustainability.

Table III
CHARACTERIZATION OF DEVELOPERS

ID	Company Size	Development Experience	MSECO	
			Android	iOS
D1	Small	5 Years	X	X
D2	Large	7 Years	X	X
D3	Medium	7 Years	X	
D4	Small	9 Years	X	
D5	Small	3 Years	X	X
D6	Small	4 Years	X	
D7	Medium	6 Years	X	X
D8	Medium	3 Years	X	X
D9	Medium	3 Years		X
D10	Medium	1 Year	X	X
D11	Medium	4 Years		X
D12	Large	3 Years	X	X
D13	Small	1 Year	X	
D14	Large	2 Years	X	X
D15	Small	4 Years		X
D16	Large	5 Years	X	X
D17	Small	2 Years		X
D18	Small	2 Years		X
D19	Small	2 Years	X	
D20	Medium	2 Years	X	

Table IV
RQ1. SOCIAL FACTORS IDENTIFIED

ID	Factor
(F1)	Contribution to something new
(F2)	Fun during the development process
(F3)	Competition as an intellectual stimulus
(F4)	Learning and improvement skills
(F5)	Gain reputation in the developers community
(F6)	Identification and commitment to the development community
(F7)	Satisfaction of developers with their MSECO
(F8)	Knowledge exchange among developers
(F9)	Developer self-management
(F10)	Advantages of using this MSECO
(F11)	Size and quality of the developer community

IV. RESULTS

The answer to our first research question (Which are the social factors, reported in the literature, that motivate a developer to participate in a MSECO?) is presented in Table IV. As mentioned in the previous section, we used these factors to interview software developers and answer our second research question (How are developers influenced by these social factors?). In the following section, each of the social factors is presented alongside with some quotes from the interviewed developers, explaining the importance of this factor.

(F1) Contribution to something new

This factor is regarded as important both to start (16 participants agreed) and to keep (17 participants agreed), participating, as exemplified:

Innovation: *"For me technology is always linked with innovation, doing something new that is already in humanity for a long time"* (D9).

Get out of the comfort zone: *"Something new is interesting and leads to an idea of exploring reality. It is more of a feeling of adventure, the challenge is very cool"* (D18).

Market Opportunities: *"We need to develop applications to solve daily problems, this is the principal value of the applications, or at least automate some tasks that emerges from user daily needs"* (D6).

(F2) Fun during the development process

Considered important both to get started (14 participants) and to keep (17 participants) developing for an MSECO, however, the concept of fun can be interpreted in several ways:

Fun as a form of engagement: *"You have to get involved and engage in the project, and so have fun too"* (D2).

Fun as a personal motivation: *"I have always needed not only to be there for the money, but to be for the love of the things I do. Also, I always wanted to meet and have some kind of love for what I am doing and not only for what I am going to receive at the end of the month"* (D10).

Some dislike the relation between fun and job: *"As i always say, sometimes you will like your job and sometimes you will not, but i do not believe that they need fun to develop, they only need to feel comfortable with their job"* (D8).

(F3) Competition as an intellectual stimulus

Competition is best seen to keep (16 participants) developing than to start to develop (11 participants). It happens because when it is a personal competition, it means, one is looking to improve oneself, it is well seen, but developers often do not like to compete against each other.

Personal competition: *"If you do not have this healthy competitiveness, you do not try to evolve a lot, and you end up stagnating"* (D19).

Competition between developers: *"I really like this idea of improving, but I have always had a lot of aversion to competition and I do not like to lose"* (D18).

(F4) Learning and improvement skills

Learning and improvement is well seen both to get started (16 participants), and to keep (17 participants) developing for a MSECO. This factor is usually seen from two perspectives by developers:

Get better at staying in the market: *"This is what will cause me to have several opportunities, get a better job, grow my career, be promoted, or maybe open my own business"* (D10).

Demotivates depending on the learning curve: *"Sometimes I have been worried about taking a lot of time learning some*

new tool, because you always want to learn quickly, but that is not often. Sometimes it will take you a long time to learn something, and you can demotivate" (D3).

(F5) Gain reputation in the developers community

Reputation is not considered as essential, to begin with (3 participants), but it become important to continue (11 participants). Some developers do not feel the need to earn a reputation, but some developers believe it is a good way to get a job.

Developer does not feel this need: *"I do not develop things and study programming for people to look at me, i do because i feel good doing it"* (D16).

Employment Opportunities: *"There is always someone who helps the community a lot. And this guy is certainly easier to get a job, to be called for interviews"* (D5).

Disseminate the knowledge in their enterprises: *"Today, everyone appreciate when you write a good code and apply your techniques and good practices about development in the enterprise that you work"* (D8).

Sometimes the developer does not know their community: *"Only today I realize that I can become as the people who help me when I begin to develop for mobile. That can make you known by your community"* (D9).

(F6) Identification and commitment to the development community

Initially (9 participants) the developer does not see as much importance. As time passes by, it becomes important to continue (14 participants agree) collaborating. However, the community is important for the dissemination of information, depending on the project the developer can, with this, help their community, although few do.

At beginning, some developers does not care: *"In beginning, I only wanted to make my applications works, now I become more aware and mature, and feel the necessity to contribute with the community, repaying all the help I get for free from this community"* (D9).

Restricted Projects: *"We can not be sharing much information, for confidentiality, so the level of interaction was not high with the community"* (D2).

Most contribute little: *"I always found it important to have content available, in the community there are forums, but I confess that I never collaborated too much, never had an experience of myself collaborating with it"* (D10).

(F7) Satisfaction of developers with their MSECO

This factor is considered important by developers, both to get started (13 participants) and to keep (15 participants) collaborating. Satisfaction with a MSECO usually assists the developer, especially when the MSECO is designed to automate some tasks.

Programming for all MSECO than possible: *"If you want to achieve the greatest amount of users, you will need to develop to more than one MSECO"* (D12).

Difficulty to changing MSECO: "The more you identify with the ecosystem, the more you make sure and the harder it gets for you to get out of it" (D4).

Preferences for iOS: "In the case of Apple they do many things to please the developers" (D18).

(F8) Knowledge exchange among developers

Although important to start (14 participants), it becomes essential to continue (20 participants) collaborating with a MSECO. Initially the developer does not exchange information, he learns from the community, but the advantages of this exchange are essential.

A great opportunity to learn: The best way to you achieve this knowledge is being close of someone that can teach you and give you some of their knowledge (D17).

At first, the developer learns: "At first you have the feeling of not having much to contribute, it is not a good exchange, it is another gain in the beginning, because you have nothing to offer" (D9)

The advantages are diverse: "The community is very active in the ecosystems and this is important, to see the developers participating, creating training, posting in forums solutions" (D4).

(F9) Developer self-management

In the beginning (12 participants) it was unimportant for developers because they argue that they do not have maturity to handle self-management, but it becomes important for the developer to continue (17 participants) collaborating.

Initially: "At first the developer is not too worried about self-management or anything of the sort, but after he maybe goes through a difficulty initially, he begins to realize" (D9).

Someone to help: "Where I have developed, I really feel that I could have a better development performance, but I remained stagnant sometimes, and loose the motivation sometimes, I believe that someone can make I interest in keep developing" (D5).

Developer Freedom: "I think the developer has to have the freedom to manage their way of development" (D6).

(F10) Advantages of using this MSECO

A factor considered reasonably important both to get started (13 participants), and to continue (13 participants) collaborating are the advantages that each MSECO presents to their developers. As the top two are Android and iOS, developers explain why they collaborate with each of these.

Developers think it is very important: "According to the MSECO I use, it can help me to develop in less time, or at least improve the way i develop" (D6).

Android: "I have always had a lot of advantage in working with Android, having a large community, has a lot of market. The developer is well paid" (D3).

iOS: "iOS has many abstractions for the developer, and this makes many things that are very complex, in other MSECO in very simple things" (D9).

Both: "When you develop for mobile today, you almost have to develop for both Android and iOS at least, because if not you will lose half the market" (D10).

(F11) Size and quality of the developer community

Although not as well considered when the developer starts (12 participants), it is given more attention for when continuing to collaborate (18 participants). It represents to developers the ease of finding answers and still has many opportunities for better jobs.

Can define how much time they will survive: "The community size helps the developer, and increases the credibility of these MSECO. How much more developers, much you know that that MSECO receives support constantly, and probably will not die soon" (D5).

Search for answers: "The larger the community, the easier it will be to work when you encounter a problem, to find a problem resolution" (D8).

Difficult to find advanced information: "As I am doing more complex things, i am facing problems that become hard to find solutions easily."

Employment Opportunities: "Size is good if you still have space in the market. At least iOS and Android i know has plenty of space in the market yet" (D15).

V. DISCUSSION

De Souza *et al.* (2016) [4] presented in their study 6 social factors that influence the developers to collaborate with a SECO. In our study, we sought to complement their previous work, asking whether the literature had additional factors than the initial 6 indicated by them. In this study we identified 11 different factors.

Forms of influence

Ryan & Deci (2000) [29] conceptualize the difference between intrinsic motivations (i.e., someone who performs an activity for personal satisfaction, such as for fun or challenge and not for external pressures and challenges) and extrinsic (i.e., someone who performs an activity to achieve a result, often for their instrumental value or reward).

Following Ryan's and Deci (2000) [29] definitions, we identified that intrinsic factors are one of those proposed by De Souza *et al.* (2016) [4] and six identified by this study, these being: (S6) Both intrinsic and extrinsic motivations influence the behavior of the developer to collaborate with a MSECO; (F1) Contribution to something new; (F2) Fun during the development process; (F4) Learning and improvement skills; (F6) Identification and commitment to the development community; (F7) Satisfaction of developers with their MSECO; (F9) Developer self-management.

Similarly, according to the definitions of Ryan and Deci (2000) [29], the other factors pointed out by De Souza *et al.* (2016) [4] and for this study are extrinsic motivations: (S1) Developers are often influenced by others (including friends, undergraduate colleagues and co-workers); (S2) Job Market attracts developers as they increase their perceptions about this market; (S3) The high number of users attracts the

developer; (S4) The community (online or local) influences the developer; (S5) Role and importance of end users to the developer; (S6) Both intrinsic and extrinsic motivations influence the behavior of the developer to collaborate with a MSECO; (F3) Competition as an intellectual stimulus; (F5) Gain reputation in the developers community; (F8) Knowledge exchange among developers; (F10) Advantages of using this MSECO; (F11) Size and quality of the developer community.

Factors to start collaborating

When developers starting their collaborations with a MSECO, they little know about MSECO and its operation or rules, being driven mainly by intrinsic motivations and observing only a smaller set of factors.

The factors that the developers considered most important to start were respectively: (F1) Contribution to something new; (F4) Learning and improvement skills; (F2) Fun during the development process; and, (F8) Knowledge exchange among developers. This implies that initially the developer wants to have new experiences, learning new paradigms, languages and techniques, having fun and learning from the most experienced developers, making everything new and attract their attention.

Factors to continue collaborating

In order to keep collaborating after a certain amount of experience, the developer will be a little more critical with the choice of which MSECO to collaborate and what he expects of a MSECO. Its intrinsic motivations are still present, but the importance of some extrinsic motivations emerges in order for it to be engaged.

The factors that the developers considered most important to start were respectively: (F8) Knowledge exchange among developers; (F11) Size and quality of the developer community; (F1) Contribution to something new; (F2) Fun during the development process; (F4) Learning and improvement skills; and, (F9) Developer self-management. In addition, developers are also concerned, albeit in less intensity, with the following factors: (F3) Competition as an intellectual stimulus; (F7) Satisfaction of developers with their MSECO; and, (F6) Identification and commitment to the development community.

This is because, the developer better understands the business in which he is involved, his community and the elements that surround him, causing him to develop a more technical profile, such as when he observes the size of the development community, and a more when it considers points such as competition and identification with the MSECO.

Factors that initially made the developer concern about are still important, but he realizes the need to have a greater view of his MSECO. In addition, sometimes the routine can become exhausting for the developer, and the extrinsic motivations may influence him or her to remain as a reward for the progress he or she makes, or even for liking the MSECO values or colleagues who work on the same projects, thus confirming the importance of the community and the end user regarding the developer, as pointed out in the study by De Souza *et al.* (2016) [4].

VI. LIMITATIONS AND FUTURE WORK

This study had some limitations in its execution, however, the work was conducted with the maximum possible rigor, respecting the methodological processes used, as described by these authors [10], [11].

The first limitation of this work is to have observed the motivation factors only within the context of MSECO, not having searched in related areas to verify applicability of other factors that may not be present in the literature of MSECO.

The second limitation of this study was the sampling of developers selected for the field study to be restricted to a geo-locality, so that some kind of bias of the local community may form somehow, however much to it has been sought avoid these biases.

As future work, it is intended to increase the sampling of developers within the identified factors and to search in correlated literature for more social factors that may influence developers in other contexts, and to see if they can apply to MSECO.

However, despite the limitations presented in this study, the evidences identified represent new directions for future studies on the social aspects of a MSECO, for example, besides observing the motivations of the developers, to study the motivation of the users when buying solutions in these MSECO.

VII. CONCLUSION

This study appeared as an opportunity to complement the literature of MSECO, which has only a few studies about its social aspects compared to other aspects (Technical and Business). Identifying the social factors that influence developers helps not only to improve the professional routine of these professionals but also to maintain the sustainability of MSECO as a whole [3], [4].

Developers have demonstrated that as their vision of MSECO deepens, they often need more social factors to motivate them to continue collaborating, it means, social factors are fundamental for the developer to continue developing, and with that, helping maintain the sustainability of MSECO in which it is inserted.

In addition, developers tend to be receptive, and the most successful MSECO are those who have heard the demands of their developers better and have worked hard to facilitate the processes they must carry out on the platform, so many of them demonstrate contentment with Android or iOS MSECOs.

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