MASSIVE LABOR COOPERATION IN ANDROID DEVELOPMENT: A CHANGE OR AN EXPANSION OF CAPITALIST LABOR?

André Luis Marra do Amorim[1]
José Henrique de Faria[2]

ABSTRACT

The productive forces development in the capitalist production model demanded intensive uses of information and communication technologies. This condition promotes the formation of new ways of labor organization and collaborates for mass cooperation process emergence in the production of digital goods. The research object was the development of the Android project, led by Google. The research was conducted following the Critical Epistemology of Concrete - CEC and following the theoretical body of the Political Economy of Power. The descriptions of the CEC research method were the basis for treatment information collected by documentary analyses, nonparticipating observations, and applied interviews. The study indicated that the labor on massive cooperation does not surpass the generator labor of surplus-value appropriate by capital, even promoting significant changes in the Marxist category Cooperation. Also, the development of capitalism continues incorporating technological elements in the labor organization and masking fundamental aspects to ensure control over the work and the extraction of surplus-value, even if apparently the labor had become more "free". Finally, the research has shown that the classic Marxist categories are still contemporary and function to understand the reality moves in organizations.

[1] Doutor em Administração no PPGADM - UFPR. Participante do Grupo de Pesquisa - Economia Política do Poder e Estudos Organizacionais - EPPEO. Mestre em Administração pela Universidade Federal do Paraná - UFPR. Bacharel em Comunicação social - Relações Públicas pela Universidade do Estado da Bahia. ORCID: orcid.org/0000-0001-9976-071X.

[2] Doutorado em Administração pela Universidade de São Paulo- FEA/USP. Pós-doutorado em Labor Relations pelo Institute of Labor and Industrial Relations - ILIR - University of Michigan (2003). Professor Titular Sênior da UFPR, no Programa de Pós-Graduação em Administração - PPGADM. Professor Visitante da Universidade Federal Tecnológica do Paraná - Programa de Pós-graduação em Administração. ORCID: orcid.org/0000-0003-3971-7992. Pesquisador nas Áreas de Economia Política do Poder em Estudos Organizacionais e de Epistemologia Crítica do Concreto, Metodologia e Teoria. Líder do Grupo de Pesquisa Economia Política do Poder e Estudos Organizacionais - EPPEO, UFPR/CNPq (desde 2002).

COOPERACIÓN LABORAL MASIVA EN EL DESARROLLO DEL ANDROID: ¿CAMBIO O EXPANSIÓN DEL TRABAJO CAPITALISTA?

RESUMEN

El desarrollo de las fuerzas productivas en el modo de producción capitalista se caracteriza por el uso intensivo de las tecnologías de la información y la comunicación. Esta condición promueve la formación de nuevas formas de organización del trabajo y contribuye a la aparición del proceso de cooperación masiva en la producción de bienes digitales. El objeto de investigación fue el desarrollo del proyecto Android, liderado por Google. La investigación se llevó a cabo de acuerdo con la Epistemología Crítica del Hormigón - ECC y siguiendo el cuerpo teórico de la economía política del poder. Se realizaron análisis documentales, observaciones no participantes y entrevistas y el tratamiento de la información reunidas siguió las descripciones del método propuesto por la ECC. El análisis indicó que el trabajo de cooperación masiva no supera el trabajo generador de plusvalía apropiada por el capital, incluso promoviendo cambios significativos en la categoría marxista de cooperación. Por otra parte, el desarrollo del capitalismo sigue incorporando elementos tecnológicos en la organización del trabajo y enmascarando aspectos fundamentales para asegurar el control sobre el trabajo y la extracción de plusvalía, aunque aparentemente el trabajo se hubiera vuelto más "libre". Finalmente, la investigación mostró que las categorías marxistas clásicas son todavía contemporáneas, y trabajan en la comprensión de los movimientos de la realidad en las organizaciones.

COOPERAÇÃO MASSIVA DE TRABALHO NO DESENVOLVIMENTO DO ANDROID: MUDANÇA OU AMPLIAÇÃO DO TRABALHO CAPITALISTA?

RESUMO

O desenvolvimento das forças produtivas no modo de produção capitalista é marcado pelo uso intensivo das tecnologias de informação e comunicação. Esta condição promove a formação de novas formas de organização do trabalho e colabora para a emergência do processo de cooperação em massa na produção de bens digitais. O objeto de pesquisa foi o desenvolvimento do projeto Android, liderado pelo Google. A pesquisa foi conduzida de acordo com a Epistemologia Crítica do Concreto - ECC e seguindo o corpo teórico da economia política do poder. Análises documentais, observações não participantes e entrevistas foram realizadas e o tratamento das informações coletadas seguiu as descrições do método proposto pela ECC. A análise indicou que o trabalho de cooperação massiva não ultrapassa o trabalho gerador de valor excedente apropriado pelo capital, mesmo promovendo mudanças significativas na categoria marxista cooperação. Além disso, o desenvolvimento do capitalismo continua incorporando elementos tecnológicos na organização do trabalho e mascarando aspectos fundamentais para garantir o controle sobre o trabalho e a extração de valor excedente, mesmo

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que aparentemente o trabalho tivesse se tornado mais " livre ". Finalmente, a pesquisa mostrou que as categorias marxistas clássicas ainda são contemporâneas, e funcionam na compreensão dos movimentos da realidade nas organizações.

Palavras-chave: Cooperação Massiva; Organização do Trabalho; Relações de Trabalho.

1. INTRODUCTION

The current social context consolidated as the standard of world society, historically, began to develop with the expansion of bourgeois activities, constituting a

"society who believed that economic growth was a result of free competitive private initiative [...] An economy on that based should [...] not only create a world of broad material distribution but also of increasing happiness, opportunities, humanity, and the rationality, advancement of science and the arts, in a word, a world of accelerating and continuous of material progress and morality" (Hobsbawm 1977, p. 17).

Galeano (2010) and Hobsbawm (1977) conducted distinct historical research and demonstrate that those original intentions, although stimulants, had not turned into reality in the contemporary period. Today, the social context is profoundly antagonistic and shows sharp extremes of human development. On one side, there are misery and poverty, and on the other, there are well-being and wealth (Faria 2004b). The human development report published by the United Nations in 2016 clearly states: "1% of the richest in the world population holds 46% of the world's wealth" (United Nations Development Programme 2016, 7), that is, 99% of the world's population get the other 54% of the world's wealth. In this context, the consolidation effects of the productive restructuration and the economic globalization, combined with the heavy use of communications technology, create the conditions to investigate, by apparent or hidden perspectives, transformations in labor, new control forms, and power conditions into organizations (Faria 2004a).

The research problem that will pursuit answered in this article is how the transformations of the microelectronic and informational base technology modify aspects linked to the labor organization, are changing the defining condition of productive capitalist

labor? This research uses concepts related to labor organization practices, analyzing the pursuit of obtaining the "voluntary cooperation" (with effort and goodwill) on production as a common management practice in organizations.

More specifically, the analysis of labor organization at Android operating system development, led by Google, identifies that the massive labor assumes differentiated work processes characteristics that could be considered more "freer". However, the work carried out massively just cannot overcome the labor that creates surplus-value appropriate for the worldwide predominant productive mode, developing a pedagogy specific to make the worker get used to changes and current demands (Kuenzer 1985; Faria 2004b).

This paper considers the reality studied as the most developed historical reality, observed as a time process that brings the elements of itself trajectory traveled in the essential. The article content to respond to the research problem presents the following structure: the current stage of capitalist production, cooperation as a fundamental characteristic of the capitalist work, methodological procedures, analysis of Android development, and final considerations rather than a conclusion.

2. THEORETICAL FUNDAMENTALS

2.1. The current stage of capitalist production

The historical development of the productive forces coordinated by the current capitalist state could express a process of totalization of world society but manifests as a specific project that seeks to create breeding conditions of capitalist production in all possible geographical locations (Chesnais 1996). In the literature review of the administrative-economic area, this last stage is called globalism and has some basic features: (i) microelectronic information technologies remodel the material base of the society; (ii) companies in world economic and political interdependence; (iii) productive restructure in capitalism replace the Taylor-Fordist base for the lean production; (iv) the digital communication system integrates global texts, sounds, and images (Faria 2004b).

The globalism also affects the worker: (i) extends the knowledge linked to instrumental knowledge (linked to the tasks) and reduces the knowledge linked to occupation knowledge (connected to the professional craft), while (ii) moves from the specific partial knowledge (concentrated in a few repetitive tasks) for integrated knowledge in multitasks activities collective and cooperative (Kuenzer 1985). Despite recent historical changes, the work as a theoretical category – more specifically like the productive work – is still fundamental to understand the organizational reality movements.

Productive work is that produces some value. However, productive work to capitalism is that it adds surplus value to the capital. In detail, the workforce bought like goods enter capitalist production and generate the value required to pay yourself, and the surplus-value is unpaid to the employee, but it has been appropriate by the capitalist (Marx 1996). Nevertheless, to deal with the work concept in the capitalist system, following Marx(1996), it is necessary to consider the work in your abstract aspect. That assumes that besides the concrete aspect attached to each specific labor activity, a portion of work is common to all existing labor activities. In neither way, this abstract labor is imaginary; it is related to a general aspect (conceptual) presents in any labor. Therefore, this conceptual level signals that the production of surplus-value disregards labor activities' specific features.

To show in detail all aspects of the labor and labor process in the capitalist historical stages does not constitute the fundamental interest of this article. In short, Faria (2009, p. 51) clearly shows that the shape of the process and the labor organization change with "the changes of the technical basis that identifies each capitalism historical stage". Nevertheless, to answer the research problem is essential to characterize the current capitalism stage, lean production. It begins after 1970 when the changes at labor control and labor process by the growing insertion of microelectronic technologies have started, consolidating the pull production in real-time (just in time), with minimum stock levels, that only begins with the done sale. In this step, the productive work teams and the production cells organized in networks or productive chains were also settlement combined with the heavy use of physical

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technologies, machinery and computers, and management technologies, forms of labor organization and control increase labor productivity and surplus-value.

Contemporary management applies technologies intensively, basically, to achieve two goals: (i) extend the control over labor process in general, and especially in your conception; (ii) make more diffuse and branched the immediate labor control, changing the managerial function to transfer the immediate labor control to the worker (Faria 2004a). So, the division of labor and the consequent parceling of activities are the fundamental mechanisms used by the dominant production logic to submit work and worker at your intentions (Kuenzer 1985).

In the current stage of capitalist production, the control over labor processes becomes increasingly subtle and diffuse. The advancement of information and communication technologies and international rules that standardize the production processes allows the labor control to focus more on delivering results than in the production line. Also, the widespread use of technologies based on the internet creates the possibility that the control forms occur in places/spaces increasingly distant from where the industrial activities occur. Antunes (2000) and Mészáros (2011) highlight that the productive capitalist system has its tendency to expand. This expansion happens through different simultaneous processes involving different categories studied by Marx (1996) and several contemporary researchers (Franco and Ferraz, 2019; André, Silva and Nascimento, 2019; Vianna, Moura and Calderari, 2018). Following an expanded sense, capitalist expansion goes beyond the cognitive and explanatory limits of critical theoretical developments. However, it repeatedly tends to remove the meaning of work, to establish new forms of control through technological and managerial innovations, finally, to find new ways of exploiting the workforce (Franco and Ferraz, 2019).

In the current stage, we are experiencing a time when the application of technologies changes the way workers relate to employers. In this sense, at the same time that this relationship is increasingly individualized, reaching the personal level, it also becomes increasingly undifferentiated, addressing the work performed precisely as a massive workforce. It is already common to address the term "uberization" to address these new work

models in many studies. However, the Android development goes beyond and within this context were analyzed the massive cooperation processes.

2.2. Cooperation as a fundamental characteristic of capitalist labor

In general, any kind of activity with a specific purpose (for example, reproduce material conditions of existence) in which more than one person is involved in the process already constitutes the necessary minimum conditions for cooperation manifests itself specifically. Therefore, "in the same way as the human subject does not live in isolation [but in social groups] and in so far as an activity cannot be accomplished by a single subject [the subjects may cooperate]" (Faria 2009, 63).

The cooperation also implies a division of labor, including more superficial and more complex ways. So, cooperation is a natural characteristic of a collectively human action to produce their material conditions of existence. In this way, cooperation is an element that forms and, at the same time, is each historical period result with the respective mode of production. Thereby, Marx (1996, 451) states that "the cooperation remains the basic shape of the capitalist mode of production, although your simple figure appears as particular alongside their more advanced forms.

The capitalist mode of production is specifically, as defined by Marx:

"[The moment that] the activity of a larger number of workers, at the same time, in the same place (or, if you want, in the same work field), for produce the same kind of goods, under the command of the same capitalist, is historically and conceptually the starting point of capitalist production". Marx (1996, p. 439).

Following the evolution of capitalism, the cooperation, in the first stage, occurs basically in two ways: on the one hand, it is the result of combination by the unilateral juxtaposition of different artisans needed to produce a single commodity; on the other hand, is a result of the application of same nature artisans, that intensify the decomposition of the same labor activity in different smaller operations until each operation have only a single

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worker responsible (Marx 1996). Thus, this passage features two aspects that define cooperation in this period: the physical proximity between the workers and the division/organization of labor.

Besides these characteristics, Marx (1996, 439) says that in cooperation, "the mass of surplus-value produced by a particular capital is equal to the added value provided by an individual worker, multiplied by the number of employees simultaneously occupied". However, he says that ensuring the same labor conditions, the employment of 12 workers simultaneously, in coordinated collaboration or not, almost certainly will produce a mass of value more significant than the employment of 12 workers in 2 groups at a time. So then, the employment of large numbers of workers made a revolution on the conditions of labor processes because "the value of productive means collectives and massively concentrated does not grow on proportion in your volume and your effectiveness" (Marx 1996, 441). That is, the value resulting from the collective application of productive means is greater than the amount consumed during the labor process, transferring a portion "smaller than your value to the individual product (...) because the overall value transferred is shared simultaneously by a larger mass of products" (Marx 1996, 441).

In some cases, the collective labor result may not be reproduced by individual labor, even if applied for extended working shifts. So, "this is not just an increase in individual productive strength through cooperation but creates a productive force that has to be in itself and for itself, a mass force" (Marx 1996, 442-443). This mass force can perform activities faster and has "to some extent, the gift of ubiquity" (Marx 1996, 444). Two more aspects that characterize the cooperation may be expressed: consumption of labor and productive means proportionally lesser by goods, and the mass workforce performs activities in minor work periods.

After this brief explanation, can be presented the Marxist concept of cooperation: "the planned way in which many work side by side and together, in the same production process or different production processes, but related, it is called cooperation" (Marx 1996, 442). In

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short, about the cooperation category can be pointed three dimensions that consist of simple categories that will be used in the analysis of the labor cooperation process:

i. Formalization of labor process – composed by the same capital control categories; work hours; means and technologies used in labor;

ii. Interactions in the labor process – composed by the physical proximity; same or related productive process; payment of operations; labor parcellation; work relationship;

iii. The productive result – composed by the productive means proportionally lesser consumption; mass force delivering faster results.

In this paper, the analyses shall be concentrating on cooperative and collective aspects for themselves. However, in addition to these dimensions, it is still necessary to briefly aboard the historical development of the cooperation category to indicate its current position. At the feudal mode of production, following the prevailing characteristics of subsistence production, cooperation is pretty rudimentary. When the subjects realized basic subsistence activities that demand or use any type of assistance, the cooperation was present. However, the simple labor nature combined with the fief's geographical and social structure did not demand more complex cooperation forms development. So, it took over their most rudimentary characteristics, manifesting in a manner very close to the "mutual assistance". Therefore, this kind of cooperation can be called natural cooperation.

At the beginning of capitalist production, in the manufacturing stage, cooperation occurs by simple juxtaposition of many workers doing the same and only task that provide a "production on a larger scale, but [without being] no way fixed feature of a particular time" (Marx 1996, 451) and the cooperation assumes the configuration called simple cooperation. In the next stage, the big industry, the most extensive use of machines in the labor process technically orients the labor division and, during this period, labor cooperation can be called simple technical cooperation.

At the next moment, the scientific organization of labor and production thoroughly examined the labor process pursuit the cost reduction and maximizing the surplus-value extraction. Thus, the cooperation follows the technical expansion beyond the specifics labor tasks and can be called expanded technical cooperation. In the following stage, the lean production replaces the serial production employing new microelectronic technologies; the cooperation also assumed characteristics based on the use of (and in a permeated environment by) information technologies and communication and computational tools. In this step, the cooperation can be called sophisticated cooperation.

To summarize, the interest of capital absorbed the process of cooperation and the technical knowledge about the work and transformed it in the way that best made it possible to extract added value from the collective workforce. Among other things, this allowed the techniques of labor division and, later, the installment of work to become the predominant means of organization and control over work. Thus, cooperation was not replaced or overcome by the labor division, but rather the techniques of labor division changed the characteristics of cooperation at work within the capitalist mode of production, allowing increasing levels of extraction of added value to be achieved (Marx, 1996; Mészáros, 2016).

So, one can see that the forms of cooperation came with the productive forces and the labor organization development. Also, the contemporary evolution of information and communication technologies changes the way society organizes time and labor activities. This technology allows the application of ever-greater levels of "virtualization" in the labor process, whether on a local or a global scale, and can be used to fade the physical limits of time and space work, as also combined with the international quality standards, to distance control any part of a production chain without significant difficulties (Antunes and Alves 2004; Chesnais 1996; Faria 2009).

New forms of labor organization will constitute themselves in this context, with activities realized through the labor of thousands of people employing digital media, setting up a tangible form of mass cooperation. Historically, the mass cooperative labor began in the mid-1990, when the internet gains scale through the hacker's activities to set up WI-FI

networks with free access (Deskmag Magazine 2010). From that point, many community spaces appeared linked to entrepreneurs and innovation, the training of local regional and global cooperation networks.

In an attempt to provide explanations for changes in labor organization motivated by the insertion of expanded information and communication technology, several investigations carried out in contexts that use mass cooperative labor, such as Linux, InnoCentive, Open Innovation, Crowdsourcing.org, Wikipedia, YouTube, Amazon, Unilever, IBM, Honda, Camiseteria, eBay, Twitter, Facebook (Brabham 2008; Lakhani et al. 2007; Postigo 2003; Terranova 2000).

The primary observation and preliminary analysis of academic papers about mass cooperation generate a classification (not exhaustive) of mass cooperation types: i. cooperation in networks/portals that aggregate research and development issues – participation occurs through incentive the resolution of problems; ii. Cooperation in networks/portals that aggregate production activities of goods/services – the participation occurs through incentive to present the results of productive activity in a database accessed by buyers; iii. Cooperation in creative competitions or tournaments of smaller time/best answer – participation occurs through the incentive of a prize for winning the contest; iv. Cooperation in Open Source – the participation occurs through the incentive of collective production, free and open of particular good/service as the result of labor creation, development, and continuous improvement; v. Cooperation in cyber-activism-participation occurs through the incentive to develop activities that make possible free access or customization of goods/services that have been produced in closed/private logic.

It is relevant to clarify that the types listed above are not related to how the collaboration occurs between subjects who act in that cooperation types. This empirical research on Android development is classified as a manifestation type of Cooperation in Open Source.

3. METHODOLOGICAL PROCEDURES

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This research was guided by Critical Epistemology of Concrete with the relation between the subject researcher and the research object occurs in three moments correlated, non-linear and distinguishable from each other: (i) pre-syncretic moment - precarious approach stage in which the subject researcher does not "manages to apprehend reality in-depth because various constituent elements of reality and its relations appears in disorganized [and] unintelligible way" (Faria, 2015a, p. 29); (ii) syncretic moment – stage intentionally elaborates by the subject researcher, after the first contact with the research object, using "concepts, analyses, and studies ever produced to assist him in deepening your research" (Faria 2015b, 32); (iii) synthetic moment - stage in which the subject researcher performs "real scientific apprehension [by the thought] so that the elaborate or seized object becomes a theoretical object, an object built according to science rules" (Faria 2015b, 34).

Basically, the pre-syncretic moment that began precariously has two aspects: professional experience in consulting service to some city halls in internet-based, highly cooperative environments; and preliminary readings of texts and books published by the administrative area mainstream. After defining cooperative labor as a worthy topic for research, the initial problem was defining the research object. There are several application types of collaborative environments with different scopes and areas on the internet, and any one of them would serve for the research.

At this point, the precarious approach began to seek to solve the object demarcation through an open interview with a senior worker with national and international experience in collaborative environments. The interview serves to evaluate the existence of tangible materiality to should ensure the research. In other words, we sought to check the possibility or not to find corresponding points to the materiality of collaborative labor in internet-based environments. The choice of the empirical object itself occurs within a given condition, involved some mediation of consistent evaluation criteria like the size of collaborative labor, the historical horizon of collaborative labor, the extent of social insertion for the resulting product of collaborative labor.

The initial assessments have selected a group of three research objects that could be used for research. However, two of them were discarded because they do not have typically capitalist purposes and, consequently, the necessary conditions for the analysis of productive work. Thus, the empirical research object chosen was the Android development project maintained by Google, representing a global outreach project in production and consumption.

The research process utilized a research diary to plan research steps with their respective status and a specific area to monitor the research stages and recording information considered relevant. The table 1 presents the compilation by steps of information collected and analyzed.

Table 1. Summary of information collected

Paragraph	Steps	Status
1	Evaluation of the documentation on Android	47 documents analyzed
2	Evaluation of the documentation of Gerrit (GitHub Google)	84 documents analyzed
3	Evaluation of the labor community through interaction groups + realization of qualitative research with workers in Curitiba	6 observed interaction groups 6 interviews

Font: elaborate by the authors.

In step 1, the evaluation of the documentation published on the Android project development site on the internet: http://source.android.com/, following the very structure of organization adopted by Google. The information collected in this step generally presents the main points about Android development: source code, cellphones, security, and compatibility.

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With a high level of detail to demonstrate the technical aspects required to participate in Android development.

In step 2, the information from the site was collected: https://gerrit-review.googlesource.com/Documentation/index.html because in step 1, the Gerrit was identified as the main Android developer tool and it also owned specific user/developer documentation. So once again, it was noticed a high level of technical detail.

Step 3 sought to add information about the interaction processes in the collaborative development at the internet for the research object. Thus, it was consulted documentation on the development community and carried out observations on the overall function of the participant's interaction. Also, to seek to understand features and general behavior (not linked with the research object) of subjects employees in internet cooperation, semi-structured interviews were carried out with six people who work or have worked in collaborative projects. The table 2 presents a brief description of the interviewees.

Table 2-Summary of respondents

Respondents	Training	Professional experience *
1	Complete masters	10 years in Open Source development
2	Complete masters	10 years in software development
3	Complete masters	20 years in software development
4	Complete graduation degree	10 years in Open Source development
5	Complete Postgraduate	20 years managing those environments

6	Complete PhD	20 years of teaching in computer science

* The time of experience referred to is approximate (at least N years)

Font: elaborate by the authors.

Despite the high experience in collaborative software development and academic qualification, none of the respondents direct worked on Android development. Several attempts to trace Brazilian workers on Android development were performed, but it was only identified some workers who develop applications and do not participate in the Android development itself.

At the syncretic moment, a general categorization was performed to identify thematic groups that would be refined to identify features that help understand the research object. In this way, past research reviews intend to focus on three major categories: goods, labor, and cooperation. These three groups appear together in concrete reality researched, and the effort for apart them is just a didactic (or propaedeutic) to helps to understand features of the research object. In this paper, only the analyses regarding the cooperation category are demonstrated.

The resumption of previous administrative literature allowed to perform reflexive actions about the information gathered to identify how characteristics found in reality correspond to conceptual descriptions and, mainly, which changes come from the historical development of productive forces that were not reached by existing theoretical descriptions. This dialectical movement revealed layers and object behaviors did not perceive at the moment pre-syncretic; also, the researchers can note that some sets of empirical information (for example, technical specifications), although necessary to the object itself, were not aligned with the research themes.

In this way, the research object became an "elaborate object and, as such, it results from the research subject activity. This stage is syncretic because the knowledge is valorized through an elaborate perception" (Faria 2015b, 32–33). Besides that, it was also identified

and elaborated concepts, descriptions, and categorizations during this process. Thus, the elaborated knowledge opposes precarious knowledge, and this tension created the conditions for the emergence of the synthetic moment.

At this synthetic moment, it is still necessary to return with the object and the concepts for the movements of reality and the set of theoretical departures to reposition them in their original places. However, this reposition does not occur with the departure object, but yes, with the new object reworked within the object's limitations, the research means limitations and the researcher limitations.

This last movement, which is not the final step, will always be temporary since as much reality and academic knowledge are moving, allowing comments, reflections, and questions that were impossible before. Still, the reposition stage only can happen by the existence of the arbitrary cut on the research process itself, which represents the "researcher (reached) the limit of your understanding and not the final limit understanding of reality" (Faria, 2015b, 35). Also, about the results presented in the following section, it is noteworthy that the exhibition logic is necessarily different from the research logic (Marx, 1996).

4. ANALYSIS OF ANDROID DEVELOPMENT

The mobile operating system Android is the concrete object of analysis and was chosen for being the "free" software or the open-source more widespread in the world and has Google, a capitalist organization, as your main developer. Therefore, the analysis presented here had as primordial source the extensive documentation published by Google in the Android development site.

Android is an open-source programs suite that can be used in different computational devices (Google, 2015). According to the documentation, the primary objective was to construct a digital open platform available for different organizations and developers to facilitate the production of goods targeted to mobile users.

The documentation analyzed indicates that there are three basic ways to collaborate with the Android development: (i) to report bugs (errors); (ii) develop applications; (iii)

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contribute to the code. The security errors are treated in a confidential way to avoid situations of vulnerability, and the common errors are linked to the operation of Android on different devices or applications. To send an error report does not create an immediate response demand, and the Android forums feature extensive files of already solved errors.

Concerning the labor for processing of errors, the documentation states that the set of errors reported are reviewed periodically by maintainers who update their status/phases until the error reported be moved to a group of resolved issues and have the status of released in the current version of Android or will be released in the future version.

In this process emerges the non-formal cooperative labor relationship, in which appears the developer/employee who works in the Android development with no formal labor relation with Google. Also emerges another characteristic of cooperation in which developers/workers are not side-by-side physically, but they are virtual. Virtually here, it is not in the sense that there is "only in potency or like faculty, without real effect", but in the sense that it is an actual process created via electronic means, namely, a form of cooperative labor that takes place in the plan of virtuality.

All the work connected with the errors reported, thus, depends on the cooperation of users, and it configures a workflow independent of standard Android development. In other words, if there were not this form of collaboration, Android development would be limited by the capacity of handling errors identified by the original developers at some point during the programming process.

In addition to the errors report, the documentation also indicates the interactions between developers/employees or between these and the project's leadership for issues related to Android development labor is mediated by internet-based interaction tools and occurs through forums and mailing lists. Because most developers/workers are in different geographic locations and the work meeting occurs only virtually, the labor process coordination occurs asynchronously due, for example, time zone differences and the availability of time for the individual worker to realize tasks relating to Android's development. On the other hand, simultaneous processes are restricted basically to random times of two or more developers/workers are at the same time working on Android or the previously combined moments between them.

The Android development has many complexities, and to deal with them, demand the interactions became grouped into major themes: (i) android-platform - for general discussion about the Android project or platform technologies; (ii) android-building - on the construction of the Android source code and build system; (iii) android-porting - connected developers who want to embed Android into a new device; (iv) android-contrib - for contributions to the code for Android; (v) android-kernel - contributions to the Linux kernel used by Android devices; (vi) android-ota - for contributions in the Android system Over The Air (OTA), method of distribution of system updates.

During the research, the regular monitor of such lists has shown that the most active are android-building, android-porting, and android-kernel, and the posts are in a large majority about questions or problems encountered by developers. Moreover, the frequency of the interactions does not follow a regular pattern and can take hourly, daily, and weekly features. These characteristics enhance the information passed by the interviewees that the hours dedicated to free development are variable and depend on the developer/worker's schedule agenda of professional or personal activities.

The Android development documentation encourages user self-regulation in email lists, but there are also mechanisms of moderation enabled for owners of lists. All the information gathered in the interviews indicates that regulatory standards are understood as necessary to guide internet-based collaborative labor. However, the set of respondents suggests that these standards could not exist if developers/workers were sufficiently getting used to an internet-based work environment and adopt appropriate behaviors. Note that a certain level of regulation in the interactions between people (at work or not) is normally considered a historical part of any social organization. However, the situation found in the research presents exciting questions.

In the first place, the "free" work context implies that employees are at the same level, and the existence of rules may have a more consensual development with possibilities of continuous review. However, interestingly, the research did not find any vestige of forums to discuss behavioral rules or any other operation or structure development rules in the Android case. This situation suggests that Google's intention to open the Android development is closer to establish a mechanism to gain access to skilled labor without

remuneration than a real development of a free system, increasing considerably the production of surplus-value that may be appropriate for the company. Moreover, the establishment of rules and the coordination of activities by Google could result in legal issues in the labor area to avoid the company adopt the strategy of volunteering without coordination.

At the beginning of activities developed in the capitalist production unit, moments related to unpaid factory workers during the formal work (under historic law applied), even though these activities would last 12 hours, 14 hours or 16 hours, as Marx (1996) reports when he studies the workday. Currently, within the case study scope, those moments have been time and place extended, covering all time available for work and involving any worker with minimum conditions to perform some development labor.

In addition, the development for open-source software improvement is "freely" organized by the developer/individual worker. However, that labor should not deviate from the production process or have unproductive periods because of two simultaneous conditions: (i) it is not a question of employment labor or remunerated directly; (ii) the work shifts during the software development is completely intensive. Thus, for example, if a developer/individual worker left his activities at a specific point, there are no obstacles for other developers to continue the development process from that point. When the first developer/individual worker resumes his activities, they will no longer be at the same point he interrupted them.

Secondly, the existence of rules to regulate interactions in internet-based work environments, even in free developments, is considered by respondents as something expected, which signals that this control aspect has already been internalized subjectively by the internet-based worker. Despite the subjectivity control mechanisms (Faria 2004a), the interviews indicate that those rules might not exist if employees were more "polite" signals that the worker's understanding of your position in the labor process was kidnapped by capital logic and had her direction implicitly guided by the productive capitalist organization.

The Android development activities organization realized by the mass of developers/employees on the internet occurs through the widespread use of Gerrit software to support the code repository. For example, on the page https://android-

review.googlesource.com/#/q/status:open, anyone can view all development tasks with "open" status and a table with information that describes the activity, owner, related area, development branch that will be forward, latest updates, and labor progress status itself: code review, pre-submission prepared, pre-verification and verification.

Furthermore, through the cited page/tool anyone can view and download the codes that are being worked on in real-time Android development.

The use of a minimal toolset for all workers in Android development is related to Marx's (1996) statement that the workforce in cooperation consumes means of work in a range proportionately more minor than the goods produced. A single piece of software is produced in Android development, and the massive set of developers/workers only uses the same tools. Thus, the value of the individual or collective work transferred to the goods produced is very low. Even though Google has assembled a global structure to support Android development, the analysis shows that this structure is very simple. In that way, the production condition previously described combined with the lack of remuneration for the vast majority of developers/employees allow, now in productive terms, that Android has exchanges values not represented monetarily and could be "freely" distributed for your users.

Non-monetary representation of this good, i.e., free to use, can be considered a strategy of Google to increases the consumption and sale of other goods that use the Android system environment. Besides, the constant free improvement of Android by developers/workers and the free user access operate as a kind of "decoy" for sale products that use this system. Also, the collective labor performed by the mass of developers/workers on Android enabled developments much faster than other competing systems.

For example, the massive development allowed Android operated with wearable devices (smartwatches and Google Glass) long before the other competing systems. This aspect suggests that labor collaboration, characteristic of capitalist production, does not depend anymore on sharing physical space but reaffirms Marx (1996) conception about the fact that the workforce in cooperation (symbiosis) carries out collective activities that generate better and faster results than the simple sum of the individual activities (synergy).

The concentration of operational activities of Android development on Gerrit works as an organized system where the tasks are being performed by the developers/workers. In

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appearance, rather than allocate work directly for developers/workers, the Android development presents what is happening, and the workers themselves choose the tasks they want to collaborate. However, the division of the tasks that will be realized is already previously established without developers/workers' participation in this choice. Furthermore, they neither participate in task management, such as deciding about delivery results deadlines and labor management.

Those points presented indicate that Android development labor is mass cooperative or mass collaborative to perform tasks previously established. The decisions about labor management are not cooperatives or collaboratives, reinforcing that the work is free participation or free contribution to the tasks already defined, but not for the task's design or management. It reiterates the arguments presented by (Faria (2004b) and Kuenzer (1995), for example, about worker autonomy, that be restricted to aspects linked to tasks but far from the aspects linked to economic control on how to organize and execute the activities.

The analysis of the cooperation category showed that it still be a basic form of capitalist production (Marx 1996), but some of its defining characteristics have changed. For example, the condition of proximity, which in the traditional industry is limited by the physical proximity and the simultaneous operation or continuous (days of shift work), in this new production process, both the physical and the temporal aspects were virtualized. Therefore, cooperation can take place in different spaces and at different times. Even so, it still suffers restrictions by the use of the same technical support tool.

The production condition is still referring to the same goods and under the control of the same capital. However, the means of work consumption and delivery of results have been exponentially changed by technological increase: the first adopting an inverse proportional guidance and the second with direct proportional guidance.

The labor on Android development is presented as free, collaborative, and, sometimes, the meaning of satisficing work. This labor can even be considered creatively free; however, any creation/contribution must be posted in the development environment and receive approval to be built into the Android system. In this way, free participation happens necessarily within limits previously established by Google. So, the technological developments had made possible employee free participation/contribution, but this can

never be considered labor liberating or labor's emancipation. That is because the control over the labor process and the labor results remain under the capitalist control decisions. Therefore, internet-based collaborative labor is not equivalent to work-free.

The condition for a fraction of operation and work also changes with continuous labor technologies insertion. In Android development, technical support is a fundamental and necessary condition for mass cooperative labor because it enables the requirements to the fraction of operations for industrial activities happens in a massive internet-based context. Thus, from the case under examination, the kind of massive cooperation is not mostly simultaneous. Undoubtedly, the most significant portion of developers/employees works isolated and individually for Android improvement. They use the same technological tool with the dual function to aggregate these individual works and to show what is running.

In this sense, one can realize that in Android development, the technology applied to the process promotes a hyper-fractionation of tasks down to the level of lines of code that can be written and rewritten by thousands of developers/workers in any device and place with access to the internet, overcoming the limits of classic production location (manufacturing industry). So this cooperation form is certainly beyond the condition of lean production at capitalism stages. However, that cooperation is not free and, at the most, takes the settings that can be classified as a type of sophisticated cooperation expanded.

After this analysis, it is possible to submit a proposal for updating the cooperation concept, positioning it in the current historical context: cooperation is a labor form in which many, with support of physical, computational technologies and management technologies, can work as planned, side-by-side or virtually, at simultaneously synchronous and asynchronous time-period, in the same production process or different but related production processes.

The continuous evolution of the information and communication technologies and the management has made it possible for Google, as a capitalist organization, global access the workforce through the internet as cyberspace unregulated in labor terms, demanding only to build a single project structure and wait for the massive convergence of workforce. In more detail, the whole structure of world development built by Google is revived massively by developers/workers to appropriate surplus value generated by labor production of a single

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good. This repository of all massive value generated will also be strategically massively distributed as a free operating system that enables the value realization, not through the Android system itself, but by other goods subordinate to the Android environment and operating system as a Google property marketing mechanism.

5. IN PLACE OF A CONCLUSION

The last moment of this research represents an effectively deliberate choice to perform an arbitrary cut in research development which does not allow a conclusion. Arbitrary because although the apprehension condition of the possible totality of the research object has been satisfied and the research object's real concrete movements still are in very initial stages in historical terms. The research time horizon did not have conditions to follow the total sedimentation of research object defining characteristics. However, there are consistent indications of conditions of their historical development.

The comprehension of intrinsic features of the labor relations established in internet-based mass collective labor contexts and their relationship with the predominant capitalist logic of labor organization was the general interest of empirical field investigation. Thus, we sought to preliminary explore a gap present in the empirical field, starting the research phase called precarious approach that simultaneously began given shape for the research object, the empirical field, and the theoretical development required to perform the apprehension of real concrete through thought.

The analyses presented here emphasized the study of (i) fundamental characteristics that define, internally and externally, the collective labor in mass cooperation/collaboration perform by developer/employees, which was made possible by intensive use of information and communication technologies and management; (ii) influences of mass cooperative labor mode on workforce and production organizations; and (iii) implications historically situated for labor relations and labor organization in the current production model. Furthermore, in theoretical terms, the discussions presented here constitute an effort to update classical

conceptual categories for the theories, understood as an explanatory tool of a certain reality, to keep their validities and potential applications in the science fields they belong to.

The research identified that technological changes in microelectronics, information systems, and management enable the emergence of sophisticated cooperation expanded and modified features of theoretical categories such as labor organization, work, and labor cooperation. However, all the modifications do not alter the condition of surplus-value production, even though this production and appropriation are not monetarily express.

Among the additional analytical developments arising from this research, we can check that the technological changes in microelectronics, information systems, and management have created new conditions for capitalist access to the workforce. The situation found at Android development demonstrated that, now, the virtualized workspace is commonplace to all workplaces in the world, which means the possibility of access to the global workforce.

This situation may seem like a world just designed for the extended capital accumulation process, but at the same time and contradictorily, to get access to a mass workforce, the capitalist production process takes an unusual work rhythm. At this rhythm, surplus value extraction rates also assume unusual levels. However, all those baselines can only be sustained if there is a maintenance of free workforce flow in the production of goods under the control of the capital, and that does not imply that the production of goods will necessarily find their realization in exchange value. That is, if for some reason the free workforce flow is reduced or stopped, the whole labor process organized is also interrupted and, consequently, the surplus-value extraction rates collapse and the value realization does not occur. In this context of "unbearable lightness" of surplus-value production, the capital is in a situation in which accumulation can take on tremendous values and, at the same time, minimum values.

In an attempt to ensure prosperous winds, since the workforce can merely stop working for free, the capital needs to invest in the development of control mechanisms

increasingly subtle and powerful. The analysis conducted by Faria (2015a) about capitalism continuously hijacks free worktime to turn it into the time available for work indicates that this movement is deliberate to erase the difference between work time and the other kinds of time. One consequence of this movement can be described as follows: when disappearing the distinction between work time and free time, more easily the employee will perform work activities in periods beyond the workday. The passage of Harvey (2014) indicates that capital aspires to change the natural perception of temporality itself is not without reason.

This research suggests that by using a highly qualified workforce without employing any kind of financial compensation, at the same time, the capital grants to the worker "resume" the control over part of your work time, which is dedicated to Android development. This control can indicate certain work emancipation but also indicate a new form of submission.

The form of sophisticated cooperation expanded allows the generation of surplus value to reach incredibly high levels and, at the same time, it provides mechanisms for workers to perform production activities autonomously. However, that does not mean overcoming capitalist production, but signals that it does not a homogeneous block and the seeds of its own overcome may be cultivated inside of its own contradictory developments.

The research conducted has no claims to exhaust all possibilities of analysis that the empirical field offers. So, the content developed here attempts to observe and reflect critically about concrete movement in the labor process, labor organization, and forms of labor cooperation at the development of digital goods.

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