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RELATING VOLUNTARY TURNOVER WITH JOB CHARACTERISTICS AND WORK EXHAUSTION – A QUALITATIVE STUDY WITH BRAZILIAN DEVELOPERS

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Trabalho de Conclusão Curso apresentado ao Curso Bacharelado em Ciência da Computação do Centro de Engenharia Elétrica e Informática da Universidade Federal de Campina Grande, como requisito parcial para obtenção do título de Bacharel em Ciência da Computação.

Orientador: Professor Dr. Tiago Lima Massoni.

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Relating Voluntary Turnover with Job Characteristics and Work Exhaustion - A Qualitative Study with Brazilian Developers

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Abstract

Software developers often leave their jobs due to not feeling motivated for work or due to the emergence of new career opportunities. Companies need to keep their employees to avoid hiring, training, and time-consuming costs. In this paper, we complement a quantitative work, analyzing qualitatively over a sample of 10 software developers working in Brazil who have voluntarily left their jobs, as the work characteristics and the exhaustion are related to their turnover. For this purpose, we use Grounded Theory by C. Uzarewicz and W. L. Neuman. The reports reveal that the need for professional development and the excessive workload are indicatives to voluntary turnover. With this paper, companies can better understand turnover causes, lower their rates, and possibly increase employee retention.

Index Terms - Turnover, Work Exhaustion, Job Characteristics, Grounded Theory, Qualitative Research.

1 Introduction

With the growth of the software market, the demand for skilled labor increases thus, high turnover rates continue to subsist. Too much time is spent when an employee decides to leave the company for a new job. In this way, the development team needs to train a new person in a working period so that there are no delays in the project, or consider hiring someone external, more competent, and that can take over temporarily until the program is completed. Alternatively and as a last resource, to postpone the delivery to the client could be a solution. Companies are worried about the permanence of these professionals, as guaranteeing their preservation avoids additional costs of hiring and training [1, 2].

Professionals that work in projects for a 6 month period or more have a deeper understanding of all its base and structuring. They know how to work more efficiently in any new functionality and can easily give support to any kind of bug. Other than these characteristics, they know the direction the system might take and the processes they should follow or not (Section 2). Therefore, the moment an employee decides to leave its job, either for not feeling well, or not being motivated enough, there's a great loss to the development team, having another person to assume its responsibilities [3, 4].

In this paper, we conducted a research study (Section 3) based on the Grounded Theory [5], with the objective of understanding how the job characteristics and exhaustion are related to turnover intentions. In this model, the data collection was carried out through interviews with software developers that are at least in their second job. While data was be-

ing collected, it was possible to begin directing the research, assessing characteristics that are more alike in each participant. In this way, it was possible to gradually develop an answer to our research questions.

From the interviews, we observed that the need for professional growth was the most frequent feature among the data, along with the excessive workload (Section 4). Both are interesting topics, that seems to be very common in software development. Therefore, having a greater understanding of people's experiences can help create a healthier, more rewarding and lasting work environment. This research aims to increase knowledge about the main factors that can lead developers to voluntarily resign from work; the scientific data on this subject can help companies get their employees more involved in their community and support balance between life and work.

2 Background

2.1 Related Work

The software development domain is afflicted by psychological disorders such as Burnout, that causes developers loss of interest, display low activity, and feel powerless [6]. Due to the high demand for skilled labor, new jobs are often available, and specific skills generate extra costs; companies should find qualified substitutes and train new staff [2].

Even when companies effectively attract and recruit specialized technical talent, they are lucky to retain them for more than a year [7]. Organizations should consider retraining their IT workers with skills the organization currently requires or which may otherwise be in-demand [8].

The high turnover intention among technology professionals is related to work exhaustion [9]. Turnover is a significant concern in our software-driven society, having a dramatic impact on the project success [10, 11]. IT workers who suffer from stress, burnout, or are concerned about their job's security are more likely to consider a different career [8].

2.2 Previous Research on Voluntary Turnover

Hackman and Oldham's [12] MPS model calculates a person's work motivation. Starting from some constructs, it evaluates several aspects and reduces them to a single number. The results are classified as low (below 50), moderate (between 50-87.5) and high (greater than 87.5), predicting that motivation, performance, and satisfaction are affected by this score. The model reveals that high MPS values reduce turnover intentions, likewise, a lower MPS value increases turnover intentions.

From the quantitative data of Massoni et al. [11] previous research, on Table 1a, the mean MPS is within a 95% confidence interval of [67.16, 95.46], showing a moderate score. Table 1b, shows that Job Satisfaction has a moderate score from its three items, with a low standard deviation, suggesting that developers, although not reporting a significantly negative experience, were not inspired or stimulated by work. The data indicates that less satisfied developers with work tend to look for new opportunities. This reinforces the theory of high developer turnover in software companies [11].

These results reveal that, just like satisfaction, exhaustion is also a predominant factor that leads developers to look for a less stressful job and it's related to the Burnout syndrome [11]. This syndrome is a physical, emotional, and mental state of extreme exhaustion, a result of excessive accumulation of work situations that are emotionally demanding, stressful and that require a lot of responsibility [13].

2.3 Grounded Theory

Qualitative research methodology operates inductively, as Uzarewicz and Neuman et al. [5] declare, a Grounded Theory study begins with a question, or just with the qualitative data collection. Still, as researchers review the collected data, themes and repeated elements are tagged and extracted from data. As more data is collected and revised, codes can be grouped into concepts and then into categories. As such, these categories become the

Table 1: Average scores.

JCT Core Char.	Items	Average	Stand. Dev.
Skill Variety	4	4.68	1.70
Task Identity	3	4.29	1.49
Task Significance	3	5.15	1.41
Autonomy	4	3.75	1.49
Feedback	3	4.16	1.51
MPS	-	**81.31**	**62.75**

(a) JCT Results

Concept	Items	Average	Stand. Dev.
Work Exhaustion	4	4.0	1.63
Job Satisfaction	3	4.08	1.48

(b) Satisfaction and Burndown Results

basis for a new theory. Thus, Grounded Theory [5] is quite different from the traditional research model, where the researcher chooses an existing theoretical framework, and only then collects data to show how the theory applies or not to the phenomenon under study.

3 Methodology

The present study represents the analysis of a set of interviews conducted with a group of developers. We used a qualitative observational methodology, conducting interviews with 10 candidates [5]. These were selected from the quantitative data, of Massoni et al. [11] previous research.

The structure was based on two research questions:

RQ1: What Job Characteristics are the causes of voluntary Turnover? The goal is to identify coded properties that become concrete reasons for developer Turnover, trying to understand why the MPS on Table 1a was moderate.

RQ2: How does Work Exhaustion influence voluntary Turnover? In this context, the objective is to analyze coded properties that evidence job characteristics that cause exhaustion and show how much it contributes to Turnover decision.

3.1 Study Participants

Participants are software developers working in the public or private sector in Brazil, who must have worked in at least two paid jobs; all the research items refer only to the previous work, given the need to understand reasons that lead people to resign. From a previous research [11], we extracted a set of e-mails that made possible contact people and collect data.

3.2 Sampling Strategy

Our previous research revealed that the voluntary Turnover of Brazilian software developers is affected by Exhaustion and Job Characteristics, thus making the study of these two topics our goal. With this objective, participants were selected as follows: two with high exhaustion; two with low exhaustion; one with medium exhaustion; two with high MPS; two with low MPS; one with medium MPS. A total sample made of 10 developers, chosen in a random manner within the standards established above, all selected from Massoni et al. previous study. This provided all the empirical material to conduct qualitative analysis.

E-mails were sent to developers, inviting them to participate in semi-structured interviews, consisting of a small number of general questions. This allowed participants to fluently report their experiences and talk about the most common aspects on a daily basis [14].

3.3 Procedure and Measurements

3.3.1 Survey Design

The interviews were defined to be semi-structured, where there is no rigid questions order. In this type of interview, according to Couto et al. [15] and Duarte et al. [16], the interviewer proposes the thematic or situations of the study object, and the interviewee talks about the exposed subject based on what he knows about it, or according to the situations he lived.

Moré et al. [17] and Nunes et al. [18] understand that the depth of the semi-structured interview, in the context of qualitative research, and respecting the adequacy of the individual context, is one of the main instruments of data collection, making it flexible, and producing more reliable answers. It allows bringing information about different angles of the investigated subject and grants a better integration and understanding of the data in the analysis process.

The interview script was composed of four predefined questions, two relating to exhaustion and two referring to Job Characteristics. We asked participants to openly report the experiences they had in the companies they worked, and how they were affected. To further deepen our study, depending on people responses, the interviewer asked unspecified questions, that allowed to increase the amount of empirical data.

These questions were based on Massoni et al. [11] table results (Tables 1a & 1b), given *MPS* and *Work Exhaustion* scores, as previously described in *Background* section. These are the two utmost relevant topics for this study, thus leading us to understand the context that made these professionals resign from their former jobs, and allowing to identify common ideas among them.

3.3.2 Analysis

Through the interviews we can apply metrics and qualitative methodologies that allow a more detailed data analysis, being able to locate themes that are repeated, organize them in a smaller number of categories and finally interpret identified ideas.

We analyzed the data, developing a coding strategy, applying open coding, axial coding and selective coding as defined by Uzarewicz and Neuman [5].

We begin by coding each interview individually, analyzing the topics related to Exhaustion and Job Characteristics. Two researchers coded the same set containing five interviews, other two researchers coded the remaining five interviews, and one distinct researcher coded all ten interviews, making a total of three researchers per interview.

The researchers compared the structure of the open coding, discussing the most repeated ideas and identifying common themes. After this step, they merged the codes by organizing them, eliminating redundancies and separating them into more abstract categories, thus making up the axial coding.

Finally, the last researcher made selective coding, examining the most external topics and validating if the data support the found themes. The selective coding was validated with another researcher, more experienced, verifying if the categories and themes adequacy found was in agreement with the research objectives.

The end result is two coding trees (Figures 1 & 2) that contain the main topics that refer to Exhaustion and Job Characteristics, which allowed us to identify categories that evidence the answers to our RQs.

4 Results

In this section, we synthesize qualitative data from our study concerning our research questions. Initially, we summarized the *Job Characteristics* that potentially become reasons for leaving the job, and then we discuss *Exhaustion*, showing how much it contributes to this decision.

For the *Job Characteristics* that most often lead developers to leave their jobs, we identified about 39 coded instances and grouped them into 5 more abstract categories. The scheme structure is shown in Figure 1.

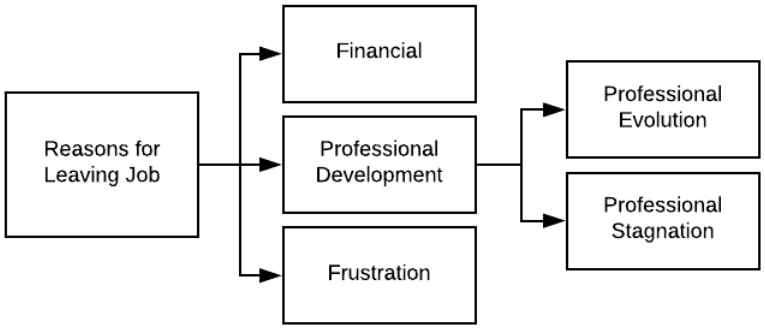

Figure 1: Reasons for Leaving Job Categories

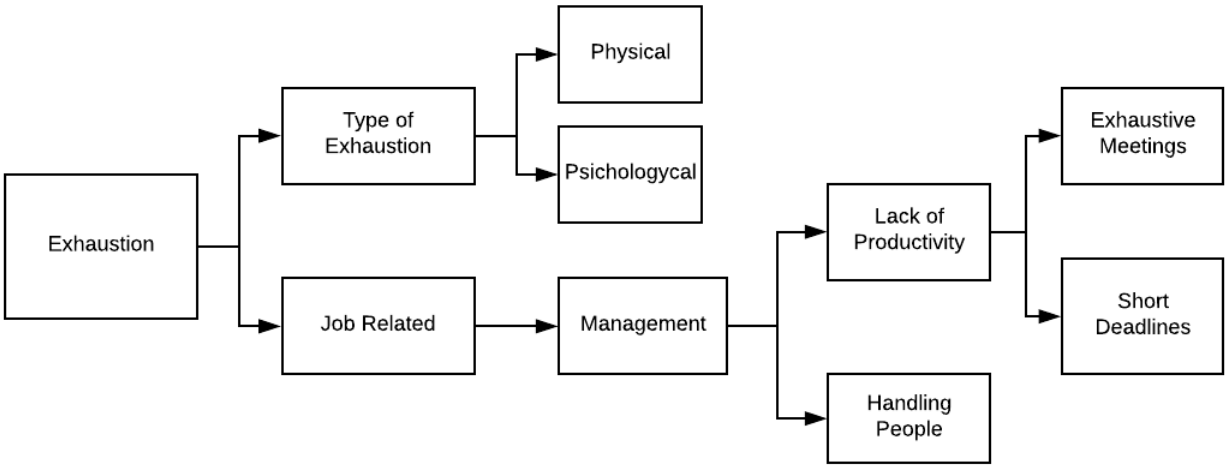

Figure 2: Exhaustion Categories

For the *Work Exhaustion* influence in the voluntary Turnover of Brazilian developers, we identified about 32 coded instances and grouped them into 9 more abstract categories. The structure of the scheme is shown in Figure 2.

4.1 Reasons For Leaving Job

In this section we refer to the reasons that lead developers to leave their jobs. The objective to highlight the themes that are directly related, focusing on those that most commonly appear among these professionals, see Figure 1.

The most important reported reasons for Job Turnover are, in terms of frequency: Financial Motives; Professional Development with two subcategories as Professional Evolution and Professional Stagnation; and Frustration.

4.1.1 Financial Motives

Financial Motives is a topic that deals with all reports related to salary and satisfactory financial compensation. Here we were able to explore in the participants, those who felt to some extent poorly rewarded by the work and function exercised.

The main characteristic observed was that most companies only make salary correction, and do not offer their employees a career plan that allows them to evolve and grow in the company, thus revealing a wage stagnation: *"salary was the even, and only made the annual correction, I thought, that in 10 to 15 years I'll be doing the same thing, same way"*.

There is also a need for equalization between worked time and work valuation. One of the participants pointed out that there is no large difference in salary between senior and junior developers: *"everyone wants to work*

harder to earn more, everyone wants to try to reach a level that the time worked is proportional to work value".

4.1.2 Professional Development

In *Professional Development*, we were able to identify two main ideas that embrace the whole thematic being: *Professional Evolution* and *Professional Stagnation*. The emergence of these topics leads us to believe that the need for growth and learning is inherent in most people who work with software. Perhaps this is due to the accelerated emergence of new technologies, or because there is simply a need to take on more mature and more responsible positions. We will discuss this in more detail in the two sections below.

Professional Evolution:

The *Professional Evolution* category collects all the reasons described on how to grow in the market and/or academically. The main highlight is the need for new experiences, in which developers show curiosity in learning and working with different technologies, or opening their own company/startup: *"technical challenges, I believe that we work with a lot of new technologies", "I'm learning a lot with the technologies of the company", "think of opening my business, I'm going to make an application for this".*

Another important point to be discussed is the emergence of new work proposals, be they in or out of the country. The emergence of opportunities like these seems to have a great impact because, as described above, it is a chance to supposedly do new things, improve remuneration and life quality: *"I asked to leave, in fact I received a better proposal to work outside the country, and that is why I asked to resign", "I'm going to work in Portugal, I thought it was cool, the environment is super good, no problem at all, the issue is just a matter of growth perspective".*

Some other respondents reported that they wanted to grow academically, and change the way they work, entering the public sector, working as a teacher and conducting research: *"I like being a teacher, you research what you like to research, you have a contact with students", " seek to evolve in studies".*

Professional Stagnation:

Professional Stagnation category is where we find a more negative part in the developer's interviews, related to their jobs. The fact is that many of them, or almost all of the respondents stated that one of the biggest reasons was the lack of growth and evolution in companies. Antagonistically to the above theme, this is precisely the part that bothers the professionals within the scope of feeling that their present work does not add more to their professional life.

One of the most observed characteristics was the lack of a career plan (career plan - would be a map of professional development, it is structured and leads to internal corporate ascension), in the companies, which seemed to cause some dismay among the interviewees: *"I did not see many aspects of growth within the company, it was very slow", "there is no career plan, and in fact this is what led me to think otherwise".*

Another important topic is limited opportunities, where changes in companies can restrict their employees, preventing the emergence of larger scale projects: *"there was a change in the company's objective at that time, the focus was the city of Campina Grande. Then they opened another branch in Recife, thus there was more than one branch in Brazil's Northeast, and the focus became Recife, so let's say the best opportunities the company had were in Recife".*

We observed that the limitation of technical growth influences severely on developers decision to leave the job, since, as said in the topics above, the need for learning is inherent to developers, and knowing that it will delay on having any kind of innovation and changes, can cause demotivation and lead to voluntary *Turnover*: *"seeing that in that company I would not grow technically, and depended on a lot to grow professionally within the company technically, because the process was very "plastered" and we had no chance to study or work*

with new things and technologies, to acquire experiences with new things and that was beginning to lag far behind in the market".

4.1.3 Frustration

This category, as its name implies, is related to a psychological side of what motivates job resignation. It is a feeling of powerlessness that something expected does not happen, occurring when the expectations or desires of the job are not satisfied [19].

In the participants reports, stress was a frustration milestone, for as it was related to processes inefficiency within companies: *"I think it was a lot of stress, playing a lot of functions that were not mine, and it really was very stressful, processes being broken, that kind of thing".*

To be client limited, also caused frustration because applications supposedly have needs that are beyond the client's urges: *"we still got bounded to the client, as much as we worked with Open Source, we still had to do the priorities of that particular client that sometimes, did not even know the priorities very much".*

Being professionally underestimated surely is one of the most frustrating reasons for discouragement and work demotivation, this affects not only self-confidence but shows that those who hold a higher position than yours, probably do not give you the due value. This can lead to a reduction in work quality and job resignation [19]: *"often the lack of manager confidence that is above you. They could assign tasks with higher responsibilities, assign some kind of decision, something that makes you feel important, and also make you take pleasure in always wanting to make the best product, want to always make the best software, these are factors that I saw a lot in the first company I worked for".*

4.2 Exhaustion

At this moment we analyze what most often leads developers to *Work Exhaustion*, evidencing how much it can contribute to the job resignation, characterizing the topics of greater prominence and more common among the interviewees, see Figure 2.

The most important themes that evidence Exhaustion are, in order of frequency: Types of Exhaustion, which can be Physical or Psychological; Reasons related to Work and Management, which can be Handling People or Lack of Productivity.

4.2.1 Physical

Exhaustion Physical Type is one of the most commonly identified topics among those interviewed. Most of them revealed that it often happened because of overwork hours in companies: *"it was physical fatigue, of not being able to stand"; "exhaustion, it happened for several reasons, one of the reasons was the physical reason, usually because of several hours of work in a row, sometimes without rest or anything, it seems that is common in the software area".*

Another important point was the fact that, during an application development process, there were tasks that were not programmed for that week sprint, this added to the tasks already scheduled, and it became more work to be done in a shorter period of time: *"days when people encountered unexpected things, for example, there was a requirement that we were not expecting, and it appeared at the last minute, or some bug that just came up"; "when I delivered everything right, the company still managed to put more activities because the manpower was cheap".*

Some other participants reported an excess of processes (internal company bureaucracy), where they had to follow methodologies that often became unnecessary and were more exhaustive than the actual programming work itself: *"this internal work of processes, I think it made me feel more tired than sitting down to develop or solve some bugs"; "I think that more about process issues, so we had to fill out documentation and prepare presentation material".*

4.2.2 Psychological

Pressure for results seems to be common, even among those more experienced, where

over-charging affects people's emotional state and leads to this kind of exhaustion and stress: *"pressure to have to resolve it with the least time possible"*.

Some people have reported that they feel stressed because they spend too much time doing the same task. This ends up getting to the point where it becomes impossible to continue working because from there, the quality begins to decrease: *"Usually we have a mental exhaustion right, we are there programming, thinking of something so much that it has time that we can not think anymore, have to stop, breathe, do something else and then come back"*.

Most responsible positions, like team leadership, usually cause a certain level of stress because apparently there is a greater degree of requirement, since the duties include everyone involved in the project, and still have to deal with everything that is occurring almost at the same time: *"the role was management, the responsibility fell on me a lot, while the developers were just keeping the schedule, on my side I saw the responsibility that things worked right, regardless of working time"*.

4.2.3 Job - Related & Management

Topics related to work and management are where a large proportion of developers have demonstrated the occurrence of further depletion. Our evidence indicates that this happens because there are several tasks in the lives of these professionals that are uncomfortable or that imply an extra effort in their execution but cannot be abandoned because they are part of the work. These are obligations which developers cannot escape. These tasks were subdivided into two categories below, Handling People and Lack of Productivity.

Handling People

Dealing with people is not an easy task. The interviews reveal that on a daily basis, managers and work colleagues are hardly free from having to face difficult, indecisive, people that most disturbs than are able to help.

Interviewee reports have shown that some teammates can be very difficult to deal with. The evidence is that there are different types of people, making it necessary to deal in different ways too, something that in the long run causes mental fatigue from the environment in which one works: *"dealing with people is always more difficult than just sit in front of a computer and start programming. You have to deal with each person in a different way"*.

Dealing with clients can be one of the most frustrating tasks in a software developer's career. Most of them are undecided about the features they want in the system they have hired. Consequently, end up in endless reunions with the developers to only discuss the system requirements: *"meeting that we did not need to be there at that time, only when after they had made a decision for example on how a requirement should be written or discussed and closed the idea of some functionality"*.

Lack of Productivity

The *lack of productivity* is something that can have great consequences for businesses and end up causing delays in project time. It has been further described related to Exhaustive Meetings, Short Deadlines and other general topics that will be discussed below.

Exhaustive Meetings: In almost all analyzed cases, meetings often ended up being one of the tasks that most cause exhaustion in the professionals. This is because they were often badly planned and took a long time to define a few things: *"sometimes it prolongs too much and ends up in a very long meeting, after a certain time, I do not understand things right anymore"; "normally when this happened it was because we had had many alignment meetings and these were exhaustive, and got me a bit tired at the end of the day"*.

One interesting point that emerged among those interviewed was that some of their project managers had very stressful meetings to charge everything that was going on. The way they charge generated a very high level of wear and tear, which resulted in high levels of fatigue reported: *"we had meetings that were stressful due to the way they charged, meetings*

that were very long, about a lot of problems".

Short Deadlines: We identified that small time slots to solve complex tasks were aggravating to the tiredness described by the developers: *"it took a lot of time, more than we had"*. Some reported that they felt overwhelmed by performing tasks that were not theirs to meet the needs of the project: *"performing a lot of functions that were not my job, and it really was very stressful"*. In the reports one of the reasons appears to be a small development team: *"our team was not so big"*.

Other: Another feature that came up during the interviews was that when the deadline for project delivery approaches, managers are charged more heavily, putting pressure on developers for fast and efficient results: *"there was a manager who said that the promotion was not going to happen, that people's assessment was going to be low. So it's not about working under pressure, because in the company where I worked, working on pressure is a constant, but it's about how to carry out this pressure"*.

5 Conclusion

In this article, we complement a previous quantitative research [11] and present the results of a qualitative study carried out to investigate the reasons that lead developers to voluntarily resign from their jobs and the influence of exhaustion on this type of decision. In the contexts observed from evidence and information collected, it is strongly believed that there was a greater understanding of what affects the professionals in the area, thus preventing and helping companies to improve working conditions and keep their employees for longer periods of time.

One of the findings was that the need for growth and professional development is present for most developers. Just as Lee [20] states in his paper, this strong need for growth plays a significant role in intentions of voluntary turnover. The reason this happens is that computer professionals work in an extremely volatile industry branch.

About learning new technologies, the effect that causes in general is that leads us to believe that after a long time working with the same thing, it is natural to want to seek to know and study the innovations that will potentially be the future of the market. In this way developers respond to occupational demands in which they can expand their skills, avoiding that in the future they would become obsolete.

On exhaustion, one of the most relevant points to be observed is the fact that developers have a very extensive and sometimes very irregular workload, causing significant levels of physical and psychological fatigue with high levels of stress.

Maslach et al. [21] states that when the amount of work begins to become too excessive, that is, when there is a need for an individual to do many tasks, his energies are drained to a point that makes recovery impossible. Still, Maslach et al. tells us that overwork and exhaustion may result from the wrong kind of work, referring to the fact that it lacks the skills necessary for its execution.

In our interviews, we observed just some of these issues, in which excessive amount of processes, tasks and hours worked combined are the main precursors to exhaustion, being allied to the environment, skills necessary for tasks and co-workers.

A suggestion of future research is replicate the study in different areas of computer science, trying to observe more specifically the inequalities among its most varied fields. The intention would be to compare results between the other divisions of computing and try to understand how these same characteristics are evident in each one, leading us to a better understanding of how each department works so that we can make the necessary changes in detriment of the turnover rates. As an example, we could compare the test areas with development, checking if the turnover reasons are similar and, likewise, whether the reasons that lead to exhaustion are similar or not.

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