

Software Development Process and Covid-19 in SME

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ABSTRACT

During 2020 the COVID-19 pandemic disrupted labor markets globally. It came suddenly and unexpectedly and caused a major shift in the work environment. Employees who normally worked in the office until they were forced to do their work from home. In this paper we have studied how working from home in COVID-19 affects the software development process based on study in Small and Medium Enterprise (SME) in software development with 30 employed software engineers. The advantages of doing work from home and the challenges that these employees most often faced were collected and analyzed based on survey questionnaire and analysis. Following, the results and interpretation are shown, where we show a way to better understanding how to adapt and upgrade the work process in software engineering based on lessons learned and experiences gained in lock down period. We show an insight to better understanding of working from home characteristics, what we face in such work and whether it is an appropriate approach to develop a new working methodology in post pandemic economy.

General Terms

Software Life-cycle Management

Keywords

Working from home, Covid-19, software development, SME

1. INTRODUCTION

Advances in ICT have opened the door to new ways of organizing work, where we are shifting from a regular, bureaucratic working time pattern towards a more flexible model of work [1]. These new ways including teleworking however was encouraged already before COVID-19 pandemic arose, mostly due to the increasingly effective ICT tools and environment. A modern workplace located at home was therefore available before the crisis. Fecak points out one of the reasons that make us think why working from home would make sense in the case of a company that deals with software development, at least in certain cases or projects [2].

Companies have namely mainly moved philosophy of closed workplaces or closed offices to open workplaces, which are intended to encourage cooperation between employees. This arrangement is also more cost-effective for the company; however, such work may be less favorable by some types of the work. On the other hand, closed and open spaces have additional characteristics. For example, in the case of closed offices doors can be considered as a barrier to communication, yet they are also reliable defense against noise and interference and interruptions by co-workers.

An open office may really add value to face-to-face collaboration and good relationships and better communication between co-workers, as confirmed by some

studies on the efficiency and impact of open offices on productivity and employee satisfaction. However, these studies do not apply to software development professionals who need to be extremely focused on carrying out their work. Studies that have dealt with this area, however, have reported examining the work of programmers who, after being interrupted by someone, took quite some time to start editing the code again. In this case, studies have also argued that the number of productive hours lost due to disruptions that can otherwise be avoided by a different approach represents a cost in the productivity of a software development professional [1].

Among the advantages of working from home the following factors could be decisive in addition to work disturbances: prolongation of working hours for the comfort of home, removal of additional time burden due to driving to work, work in the environment closer to the worker, a better work-life balance, or the possibility of a team of professionals working regardless of geographical location. Combs in *In the office or WFH: What is better for developers?* [2] highlights the view of the Executive Vice President and Chief Human Resources Officer of the American company Blue Yonder (American program and consulting company), who says that the regulation of teleworking and the operation of this arrangement convinced all skeptical executives. However, he also points out that one of the biggest drawbacks is that the usual rhythm of the working day can become a long session of various work behind a computer.

In this paper we will analyze some of these characteristic and will apply them on the pilot case of Software SME using the analytical methods and a survey that was conducted for this purpose - to see the benefits, challenges, and disadvantages of working from home compared to working in a traditional office. The research focuses on the pilot case of ICT SME software company, which main services are software development and production.

2. WORKING FROM HOME VS. OFFICE – ADVANTAGES AND DRAWBACKS

The Covid-19 pandemic has caused sudden demands to move the workplace from the office to the only starting point for work, work from home. The software development process has the advantage that such work can be moved quite easily. However, programmers also had to face sudden demands to do their work effectively at home, where they may have to quickly improvise their work environment and face various distractions (e.g., other family members working from home or children, study from home), which has certainly brought them many challenges.

Working from home is not something new, because today many professions that use technology for work can be done

right at home, where we are also provided with a constant internet connection. However, the situation resulting from Covid-19 accelerated this process, as many companies had to temporarily move to work from home if they wanted to continue providing their services. The potential for reducing working hours, providing more flexible working hours, work-life balance and consequent satisfaction are most often highlighted. Some advantages however are still being identified, such as e.g., what productivity is (or it is higher) and what factors provide it [4]. The UK survey states among its results that some employees are just as productive at work from home as in the office and that productivity has increased in cases where employees have increased work intensity from work from home. The results also showed that productivity is lower in industries and in occupations that are less suitable for work from home [5] as advantages of working from home compared to the office.

Long-term work from home has its proponents and those who are not convinced that the benefits that working from home currently brings will remain advantages. Bellmann and Hübler for example [6] find in their research that working from home does not have a long-term impact on the work-life balance and that working from home only temporarily increases job satisfaction.

Working from home therefore increases flexibility, employees are not tied to the office, and they can adjust their work according to their personal life, which means that satisfaction and trust in the employer also increases. Working from home can provide a calmer environment, increase focus on work, and sometimes employees even work longer (personalization, flexibility of time). The convenience of working from home is convenient for both employees and employers who save on office space and other costs. The technology that is available and the internet that allows for a constant connection to the office are tools that facilitate communication between co-workers and teams, and sometimes even lead to more successful meetings and appointments.

All the above advantages however also bring some drawbacks. Not only does such work not suit every individual, but some employees also much prefer the routine and structure that office work brings. Some prefer personal interaction with co-workers, while others have difficulty working from home due to interruptions caused by their family members. Still others do not have the physical space to provide them with adequate workspace. Many people may feel isolated, excluded from the team and from the company left to themselves. Working from home can be distracting to many people, there may not really be interference that can occur in the office (noise of other co-workers, interruptions by co-workers), but equally annoying can be the noise made at home e.g., caused by household chores by a family member. Burnout at home can also occur more quickly, as sometimes an employee forgets to differentiate between professional work and domestic life, and performs work for a longer period, without regular breaks and rest.

All the listed shortcomings are quite general for the case of other industries, however, in the case of the software development at home, we can also talk about specific shortcomings that arise from the very nature of work. In the case we can identify the needs of hardware and software needed to perform the tasks at the software company. As primary negative factor there is a risk of information security. Employees need remote and safe access from home to servers over the Internet. From the office the employer will provide appropriate measures to protect the company's data by

installing encryption software and remote erasure applications such as a virtual private network that encrypts the data and provides secure remote access and prevents access to an unauthorized person. Employees in the field (we are emphasizing this) have expertise and are skilled in this type of security approach and data management, also in the case of teleworking. However, yet when working from home, due to various unexpected disturbing factors that can only happen at home, there may be an error or unintentional violation of any of the employer's safety rules. Therefore, a contingency plan should always be prepared for such cases, which requires additional work and procedures.

Another of the shortcomings we see in this work relates to the hardware itself. When working in the office and if any computer part fails or breaks down, it can be replaced immediately. Replacement of any equipment is immediate as the company has it in reserve. When working from home, in such a case there may be a work stoppage and loss of time due to solving the problem and replacing equipment that requires additional work (notification to the company, taking over the necessary work, installation or replacement). A similar thing can happen in case unforeseen events occur, such as e.g., power outage. The company has an uninterruptible power supply system UPS, which ensures stable power supply of the connected equipment even during power outages or voltage fluctuations. We must also add that such systems are of course also possible for home use and, depending on the professionalism of the employees in question, it is possible that they also have a power supply system at home. However, the company has fire safety, which is not the same as when working from home, although work from home must be assessed by an expert or inspector before starting work from home.

The following section represent research done in pilot software developed company that employs highly qualified professionals, whose work is entirely done on the computer. Their work also includes work in groups, but for a certain implementation of projects the key is the work of the individual and his productivity. Working in groups involves collaboration and time to get the job done, which can also be achieved through virtual collaboration. With the research we will try to understand and identify what the advantages of work from home are and what are the characteristics that enable this same work to be better performed in classic office.

3. PILOT RESEARCH IN SOFTWARE SME

3.1 Methodology

As stated, a survey was implemented based on described characteristics on pilot software company SME (FlawlessCode), placed in Slovenia. Following a methodology and results are presented regarding the perception of advantages and challenges in the work in office compared to work from home.

Using a survey questionnaire sent to FlawlessCode employees, we explored the experiences of computer software developers while working from home due to the Covid-19 situation. Within one week, we received 30 duly completed questionnaires returned. The participants in the survey remained anonymous, and in the last part of the questionnaire they provided demographic data, namely gender, age group and length of service in the current company.

The questionnaire consisted of three sets of questions and a set in the last part where we collected some demographic data.

In the case of the first set, we asked the participants to read some advantages in the form of statements that, according to theoretical findings, should prevail in working from home. Respondents had to assess the extent to which they agreed with each statement, based on their experience of working from home, which they assessed with the help of Likert's 5-point measurement scale, where on the one hand the answer was that they do not agree at all and on the other hand that they completely agree with the above.

In the second part, we highlighted the challenges that employees are most likely to face when working from home. Respondents had to use the Likert 5-point scale, this time to assess how often they faced which challenge. On the one hand, the answer was given very often this time, and on the other very rarely.

In the third part, we asked the respondents how they assess their productivity at work from home. We provided five responses expressing an assessment of productivity, and respondents had to choose the one that applied to them when doing their work from home.

3.2 Results

The study involved 30 employees of the IT company, of which 80% were men and 20% were women, 100% of whom belonged to the age group 25 to 35 years. Regarding the length of service in the company in question, most respondents (44%) are employed in the company from 5 to 6 years, followed by staff from 3 to 4 years (33%), and just under a quarter of those employed in the company since its establishment (23%).

Table 1 presents the results of the first set. According to their experience, the respondents largely agreed that the work-life balance is better at work from home and that they were saved quite some time because they did not have to drive to work. Other benefits they often agree with include wearing more comfortable clothing, having less distractions and interruptions at home, and spending less money at home. However, more than half of the respondents do not agree that they have more time to complete work at home and that they have more control over work at home.

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Table 1. The importance of benefits when working from home (%)

	1	2	3	4	5
At home, working hours are more adapted to my habits	/	20	33	40	7
The work-life balance is better	/	13	20	40	27
At home, I can focus more on work	13	20	20	30	17
I have more time at home to finish work	17	50	33	/	/
I can have several breaks at home	/	40	50	10	/

The home-work environment is more pleasant	/	20	60	20	/
It saves me quite some time because I don't have to drive to work	/	/	33	40	27
I can wear more comfortable clothes at home	/	/	40	50	10
I have fewer distractions and interruptions at home	/	13	27	40	20
At home, I have more control over my work	16	50	17	17	/
At home, I can spend more time on physical activities	/	20	30	33	17
When I work from home, I spend less money	/	/	40	60	/

Ratings: 1- I do not agree at all, 2 - I do not agree, 3 - I neither agree nor agree, 4 - I agree, 5 - I completely agree.

Table 2 presents the results regarding the most common challenges faced by computer software developers in the selected company at home. Respondents estimated that they most often face a lack of personal interaction with co-workers. However, they also often face a poorer work environment at home. Half of all respondents, however, believe that they often also face greater problems at home when they have to replace a piece of hardware. However, they do not see any problems in making it more difficult to communicate with co-workers from home, in the absence of a boundary between professional and private life, and in making them less physically active due to working at home.

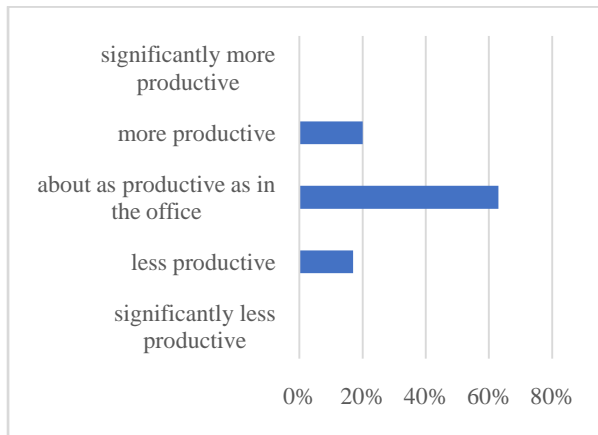
Table 2. Facing challenges at work from home (%)

	1	2	3	4	5
Lack of boundary between professional and private life	27	40	13	20	/
Lack of personal interaction with co-workers	/	7	20	43	30
I had more frequent disturbances and work interruptions at home	13	27	43	10	7
At work from home, I faced a lack of routine	13	37	30	13	7
At work at home, I faced a lack of motivation	20	20	37	13	10
At home, I faced less time to complete the task	13	40	30	10	7
Due to work at home, I was less physically active	37	20	20	13	10
I take less breaks from work at home	/	30	30	40	/
At home, I have a poorer work environment available for work	/	/	37	46	17
I find it harder to communicate with co-workers from home	30	47	23	/	/
At home, I more often wait for others to do their work in a joint project	7	43	30	20	/
I have more problems at home when I need to replace hardware (mouse, keyboard, etc.)	10	17	23	50	/

Ratings: 1- very rare, 2 - rare, 3 - neither common nor rare, 4 - common, 5 - very common

Graph 1 below presents the results of the answers to the third question, where the respondents had to assess their productivity while working from home. Respondents generally reported that their productivity remained the same as that of office work. However, about the same percentage of respondents reported that they were either a little more productive or a little less productive. None of the respondents reported a significant change in productivity.

Graph 1. Assessing productivity at work from home



In the case of the advantages that are most important to the respondents when doing work from home, the balance between professional and private life stands out, which is supported by other exposed advantages. We can see that computer program developers appreciate the balance of time between work and private life and the saving of time spent on the way to work, and that they can be at home in more comfortable clothing. However, they are not entirely sure whether the home environment is more pleasant to work in and that the advantage is that they can take more breaks at home. According to other answers, we conclude that due to the nature of work, they also adhere to a specific order and work schedule at home, although, as they assessed themselves, they believe that they do not have as much control over work at home or e.g., more time to complete the work. However, they most often face the lack of personal interaction with co-workers. Given the nature of their work, it is possible to perform their tasks completely without personal contact, which is indicated in one of the statements, where they believe that they have no problems communicating with colleagues when working from home. However, despite estimating that they have fewer distractions and work interruptions at home, which is extremely important for their work and focus, they still lack social interaction.

Productivity has largely remained at the same level, which is important for doing work from home. At home, employees face significantly more disruptive factors, there may be a lack of motivation, some lack the prescribed routine (which was also perceived from the answers), there is not as much control and the like.

4. DISCUSSION

The current situation with Covid-19 is an unusual, unexpected event that has affected all areas of life. In essence, however, if we look at the positive side, it has offered companies an opportunity that may not yet have been seized, namely, to examine how work from home would go in their case. Such studies have a great impact, as the company acquires the appropriate knowledge for cases of intensive periods or some other critical periods, and at the same time explores new

possibilities of the approach to work and increase productivity.

In the pilot case of the software company in question, this is an area of work that is, at first glance, easy to organize and do from home. Roughly speaking, computer software developers only need hardware, this is provided by the company and the environment where the work is done. However, in addition to all the other details (e.g., electricity, internet connection, information security), employees need, due to the nature of their work, ergonomic furniture and a good working environment, as this affects their focus. This need was also shown in the case of the survey, where respondents felt that they often face a poorer work environment at home. Regardless of how the work is done, independently or in collaboration with other colleagues in a project (respondents estimate that they also have no problems with communication and cooperation when working from home) and that most appreciate the balance of work and private life allows you to work from home, but computer program developers mostly miss social connections and personal contact with co-workers.

In the case of the presented research, this is only one of the possibilities of determining the impact of work from home. The insight is presented based on some of the recent findings in literature and individual evaluations of employees. For a more detailed analysis, it should be investigated whether productivity can remain stable over time. The advantages and challenges exposed are such that they can affect the individual in completely different ways, but probably time also plays a big role in this scenario. Perhaps this way of working was suitable for someone in the current period, which does not mean that they could do their work in this way for a longer time period. The boundaries between working in the office and working from home are increasingly blurred, but we still do not fully understand how working from home affects certain key factors, such as motivation, performance, productivity, job satisfaction. However, we are one step closer to adapting work in the future, not only because of necessity but also because of new appropriate solutions in the implementation of quality work.

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