DOI: https://doi.org/10.14267/SEFBIS.2022.01

The impact of COVID-19 on work performance, organizational communication and cyber security in the IT sector at enterprise level

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ABSTRACT

As a result of COVID-19, we have all seen an increase in stress due to the lifestyle and organizational changes brought about by the crisis, a sharp depreciation of social relationships and a transformation in human relations and communication at work. In my study, I sought to answer the question of how the measures introduced to protect against COVID-19 and the mandatory home office induced changes in work and working conditions in the corporate sector.

Keywords: *COVID-19, pandemic, home office, corporate environment, communication, cyber security*

Introduction

The coronavirus epidemic has had a destructive effect on every aspect of our lives, from health care to tourism to education.[1] The same effect can be seen in the world of work. The virus named COVID–19 has infected not only our bodies but also our economy [19]. We have seen an increase in stress due to the lifestyle and organizational changes brought about by the crisis, a sharp depreciation of social relationships, and a transformation in human relationships and communication at work. In my paper, I examine the above phenomenon from user, operational and IT security points of view. I mainly sought answers to the question of how employees experienced the changes and what steps the companies took to ensure the smooth operation of their activities and to protect the health of their employees, and how these measures affected communication between employees. It was also examined whether the needs for the development of new hardware and software solutions required by remote communication have led to changes, and how these have affected the general level of security of companies, caused interruptions in their work, and had a significant impact on security point of view. In my study, I mainly draw attention to possible changes and try to draw conclusions from them. Of course, I cannot provide quantified values, given that these are sensitive data for the companies concerned.

Measures taken in response to the Covid-19 epidemic

Due to the epidemic that was started in China at the end of 2019, a number of restrictive measures have been introduced worldwide. In Hungary, Government Decree 285/2020 (VI.17.) made the use of a mask covering the mouth and nose mandatory. [23] The requirement to wear a mask was specified in Government Decree 484/2020. (XI.10.), which also linked the attendance of public and social events to an immunity certificate. [25] The „shopping mall for the elderly" [27], the restricting of social contact and movement [28] and the quarantine obligation [22] [24] that have been introduced have all made it less and less possible for people to keep in touch, and the emphasis has shifted from personal contacts to online messengers, telephone and video calls. As the situation intensified, SMEs and large multinational companies were increasingly introduced protective measures, the biggest change of which was the institution of home office – the rules of the latter were partially standardized by Government Decree 487/2020 (XI.11.) [26]. These drastic measures have saved the lives of many people, but it must also be seen that they have posed serious challenges for employers and employees alike. After ordering paid leave and downtime, the unions and the management of the companies agreed on the introduction of the possibility of working from home for those who are in administrative and IT positions.

[1] Here we have to think primarily about the special legal order that has been introduced and its special legal institutions in the field of the functioning of the state, through which it has affected almost all segments of society. About this topic, cf. Farkas [4] and Kádár [9].

With the change in working conditions, the communication within the company has also changed. In addition to its somewhat inhibitory and difficult-to-understand effects, the face mask also deprived people of the expressive power of mimicry and facial expressions, and the mandatory social distance and the segregated work environment had a negative impact on social contact and information flow. The introduction of the home office has further worsened the quality of communication between employees. It also soon became apparent that Lipták's finding was correct, when she said that not everyone was suitable for home office, because many people took the mental strain, loneliness or reconciliation of work and family very badly. [14]

Companies that took the threat seriously developed a crisis management strategy early on. Strict hygiene and restraint rules came into force in the first days and wearing the mask was mandatory even before the relevant government decree has been published. This was followed by measures to protect workers and ensure the smooth running of work. Home office work was made possible first, and then mandatory (except for production-critical jobs). The workers also got hand sanitizers, gloves and masks. There have also been examples where the company has launched awareness campaigns to provide workers with credible[2] and up-to-date information. Posters warning about wearing masks, hygiene rules and keeping a safe distance have been put up in many places, and regular newsletters were sent out about new regulations to be observed. The importance of keeping the distance and improving hygiene came to the fore everywhere. Despite all the measures, the companies did not escape the diseases either. This was most often accompanied by a reorganization of work schedules, and suspected colleagues and those who were in contact with them were usually sent to quarantine.

The effects of working from home

The impact of changes on all employees – Questionnaire research

First, I looked for answers to more general questions that affected most employees, regardless of company or positon. I conducted this survey with the help of questionnaires. The research was carried out among large companies and their sub-contractors in different sectors (telecommunications and manufacturing). Of the 200 questionnaires sent out in two rounds, 98 were returned by the deadline, of which 86 were valid and complete.[3] I only asked employees who spend all their working time in home office. In addition to general questions on gender, age and position, the questionnaire sought to explore relevant findings on the specifics of working in a home office, changed circumstances, schedules and working methods and possible changes in communication with immediate colleagues. As part of the research, I set out to investigate not only the changed circumstances but also the emotional changes they induce. Such factors include comfort, family peace and negative effects like loneliness, stress and the feeling of depression.[4] As Hammen highlighted, stressful life events can be a predictor of depression in the clinical sense. [7] Thus, the answers can reveal important details about motivation, as these factors can influence productivity and may have impacts on the quality of work.

Most of my respondents were employees. The majority of the leaders interviewed are working in the field of operations, and all of them are in the age group of 36-45 years. Their answers were more in line with the average, except for the workload. As expected, the trainees are all under 25 years old. In terms of gender, there is a strong predominance of male respondents – but this is not surprising, given that a large proportion of them are working in operational and manufacturing positions, where men are in the majority. Among administrative workers, where the female gender tends to predominate, there were fewer valid responses. This predominance can also be observed in positions: the only leader position (head of operations) is held by a man, while a quarter of the respondents in lower positions (group leader or first person in a production unit) are women.

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[2] The innumerable amount of disinformation and fake news by some major powers over the entire period has been a significant problem. See details in the works of Aro [1], Cendic – Gosztonyi [3], Kelemen [12] and Makela [15].

[3] According to CheckMarket, about 43% of the possible responders surveyed need to be questioned in order to reduce the margin of errors below 5%. [21] About third of the employees satisfied the criteria of working from home; almost all of them got the questionnaire, in about one third of the cases, I asked them to fill it personally. The response rate was 49%, which is considered to be very good.

[4] It should be noted here that this is not depression in the medical sense of the term, which requires medical treatment. I asked about increased moodiness, lethargy, malaise, which should not be confused with an illness that requires the help of a psychiatrist or psychologist. For more details about clinical depression, see the relevant article of World Health Organization [20].

The answers to the questions to be decided focused on the changed working conditions and the changes in communication. Greater comfort at home was a strong argument for the home office for the majority of respondents (84% of the answers were "yes"). Employees also experienced more flexible work as a positive (72%) and almost all of them said that they could spend more time with family (91%). However, about half of the participants felt depression or loneliness. This is mainly due to the fact that communication has changed (felt about 74% of the respondents), and thus the relationship with colleagues has deteriorated (according to 63%). Overall, the positive effects of teleworking seem to be stronger, which has also been reflected in work performance; the majority of respondents (72%) feel that working from home is more efficient, although 2/3 said that this did not increase the amount of work – but the administrative burden on senior executives increased. This may be due to the fact that not all employees manage the software tools of teleworking at a skill level.

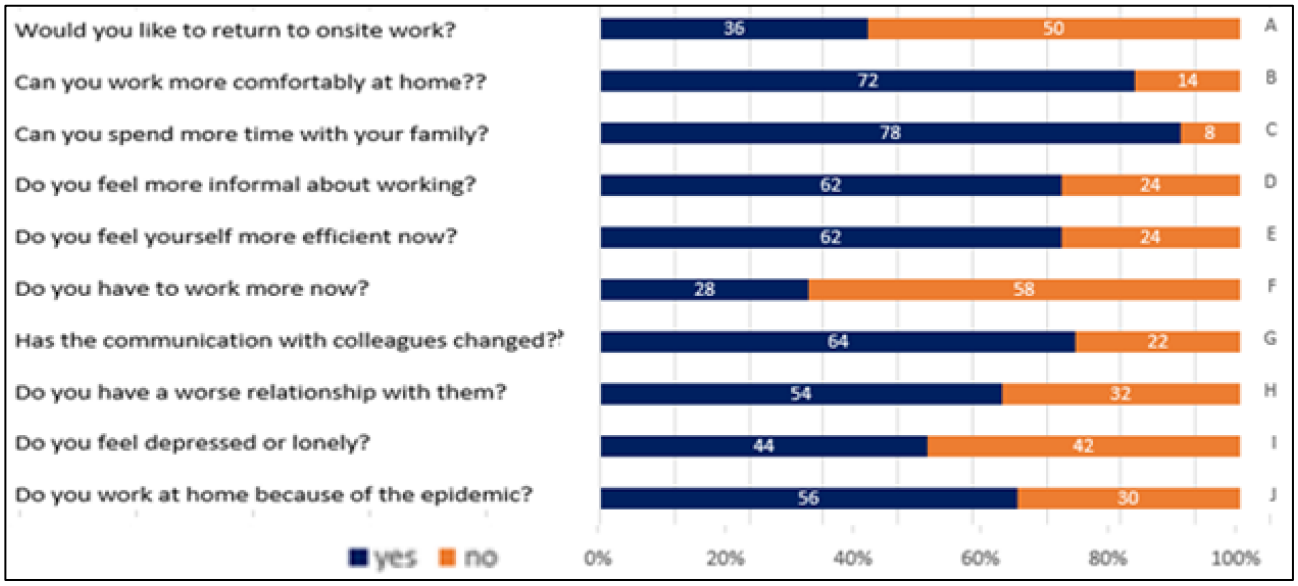

Figure 1: Distribution of dichotomous questions (source: made by the Author)

The answers to the question about the introduction of home office showed that the majority of workers were forced to work from home due to the epidemic situation (65%) and less than half of the respondents wanted to return to onsite work (42%). For a detailed analysis, and in order to explore deeper correlations, I conducted a cross-tabulation analysis to determine whether gender, age and job diversification appear in the report in a demonstrable manner. Due to lack of space, only the table showing the different distributions is included in the study. For clarity and ease of understanding, I have used percentages instead of quantified values.

Table 1: Answers received based on personal characteristics (source: made by the Author)

Characteristics*	A*	B*	C*	D*	E*	F*	G*	H*	I*	J*
Male	37%	80%	83%	73%	70%	30%	73%	60%	47%	57%
Female	54%	92%	92%	69%	77%	38%	77%	69%	62%	85%
18-25	25%	75%	83%	75%	75%	17%	67%	58%	33%	75%
26-35	44%	89%	100%	78%	78%	33%	72%	61%	50%	56%
36-45	50%	83%	92%	67%	67%	42%	83%	67%	67%	67%
Above 45	100%	100%	0%	0%	0%	100%	100%	100%	100%	100%
Trainee	33%	100%	100%	67%	83%	33%	100%	67%	17%	100%
Employee	38%	81%	91%	78%	78%	25%	72%	63%	63%	56%
Lower-ranking leader	50%	75%	75%	25%	25%	75%	50%	75%	25%	75%
Senior leader	100%	100%	100%	100%	0%	100%	100%	0%	0%	100%

**The legend for the column headers is on the right side of the diagram in Figure 1.*

While just over half (57%) of men have indicated quarantine as a reason to work in home office, this proportion is much higher for women (85%). This may be due to the fact that the latter tend to work in areas where teleworking is less prevalent. Loneliness and the feeling of depression are more common in women (62%). This is, of course, related to the higher proportion of women entered home office. A similar proportion (60%, 69% and 73%, 77%, respectively) of the deteriorating relationship with colleagues and the changed communication were answered “yes” for both groups, although the values are slightly higher for women. There is also no difference between the genders in that only approx. 1/3 felt that they had to work more in teleworking, and roughly two-thirds of respondents believe they did more efficient work nonetheless. The positive consequences of working more freely, the more comfort at home and the more time spent with family are the same, regardless of gender. Overall, a much lower proportion of men (37%) would like to return to onsite work, which is strongly correlated with the finding that more than half of men already (mostly) worked from home.

3/4 of the young people were forced into home office due to the Covid measures. For those aged 35-45, this proportion is 67%. The result was 56% in the middle class (aged 26-35). A remarkable trend is that as age increases, the number of people experiencing loneliness and feeling depression increases significantly. Based on this, young people seem to adapt more easily to the conditions of teleworking. Deterioration in relationships with colleagues and sensitivity to altered communication also increase with age, but to a lesser extent (58% – 61% –67% and 67% –72% –83%, respectively). The deterioration in the quality of communication brings with it the amortization of human relationships. Only a small proportion of young people (who are half trainees) feel that they have to work more (17%), while over 35, a much higher proportion (42%) shares the same view. However, senior executives are among them, who had more administrative responsibilities in the new situation. The middle group is almost geometrically located in the middle (33%), which also supports the above statement. Despite the increased workload, the majority (75%, 78% and 67%) believe that working in home office is less constrained than office work. The increase in time spent with the family was perceived by a high proportion of all age groups – everyone between the ages of 26 and 35, but also the younger ones (83%) and the older ones (92%), rated this change as positive. A broadly similar trend can be seen in the responses to the dichotomous question, which seeks answers on greater comfort at home (rate is over 75%). Unsurprisingly, younger people have a better understanding of the benefits of working from home and less of the negative effects. This is also supported by the answers: only 1/4 of the group of young people would like to return to onsite working, while this proportion is 44% in the median group and 50% in the group between 36-45 years.

It is worth examining the position and the different responsibilities arising from it separately, as both the stress on the given individual and the nature of the work differ significantly at different levels of responsiveness. Due to the low number, it is not worth drawing far-reaching conclusions from the examination of the set of senior leaders. The trainees are all members of the youngest group surveyed – two-thirds said that they did not want to return to the workplace. Only a third of them believe that they have to work more, and even so, they typically (67%) feel that the work process is less regulated, and the majority consider their work more efficient. They appreciate the more time they can spend with their family in the greater comfort of home. Although they felt changes in communication, only 2/3 of respondents believe that this comes to the expense of relationships. Summarizing the above, the number of trainees experiencing depression and loneliness is lower than expected.

There are larger differences between employees. Roughly half of the group (56%) was forced to home office due to the epidemic, although only 38% would return to onsite work. From this, we can also conclude that in addition to those who have been volunteering from home so far, some of the others have been convinced of the benefits of teleworking. Those who would rather return to office work have a decisive factor in feeling depressed (63%), depreciating relationships (also 63%), and altered communication (72%). More time spent with the family as a positive phenomenon can also be observed in this group (91%). It can be seen that the majority (75%) do not work less, but they spend their working time more efficiently (this is the opinion of 78%). Leaders feel less positive about the home office institution overall. This is mainly due to the fact that they are typically able to solve their managerial tasks on the spot more efficiently, while the number of administrative responsibilities at home has increased. Depression and loneliness are not typical in the group. It was generally felt (3 out of 4) that they needed to work more this way, yet they reported some reduction in efficiency. More time spent with family also

appears here, in parallel with the greater comfort at home, however, unlike other positions, leaders do not feel home office less restricted, so they have the highest proportion of those who prefer to go back to the office.

Based on my own experience, I expected that older people would be more mentally able to cope with teleworking, and the younger they would be, the more they would miss informal conversations, collegial teasing. During the research, the opposite picture emerged; the younger the person, the less pressure they experience, the less depression they feel. This picture is, of course, nuanced by the fact that members of the Generation Z[5] typically have higher technical knowledge and are better in adapting to the challenges of digitization.

The impact of changes on IT workers – Interviews

In the next step of the research, I was already looking for answers to more specific questions – to what extent the difficulties encountered by IT professionals working in similar positions and the changes in their working conditions show similarity. To this end, I interviewed seven people[6] working in the field of operation, production support and IT security – I tried to shed light on their personal views, feelings and the possible changes in communication. Three main directions were distinguished: 1) colleagues who switched to hybrid work; 2) workers forced to home office and 3) senior employees. The different categories were needed to be able to assess whether the different circumstances, age, gender and responsibilities meant any psychological, communication or work performance differences. It should also be noted that the participants in the interview survey had also completed the questionnaires (asked personally), so those were also part of the interview.

Overall, the majority agreed in that the administrative burden had not changed; their responsibilities were usually accompanied by a thorough documentation obligation, which did not change during the home office. The volume of productivity can also be considered constant, with a few exceptions – however, there were workers who were able to reach the level expected during onsite work over a period of time. Contrary to expectations, the relationship between employees did not really change, and the loneliness and depression that we often hear from employees in other fields were not typical – these were less noticeable in the IT sector. It was also found that neither gender nor age is a decisive factor, but the position held is. The situation was very similar for male and female respondents in the same position. In general, it can be concluded that workers who have been forced to work hybridly prefer teleworking; while those working in permanent home office would prefer to return to the office. This is probably also due to the fact that it is not possible to go to the community due to the pandemic, so the working days are quite monotonous, while those in hybrid work are understandably worried about the risk of infection. The effects of home conditions are considered primarily by the difference in who lives in what neighborhood; a person who is working in a village surrounded by neighbors is understandably disturbed by the noises of the outside world, the barking of dogs, the roar of children, while those working in a residential park do not feel any changes in circumstances. The biggest difference was in the positions. The communication of the interviewees in a middle management position did not change, but they were forced to do more administration. This was mainly due to the need for much more detailed reports in addition to the staff health report.

The lack of personal contacts puts an increased burden on a person, and everyone experienced it differently depending on their habitus, age and tasks. In addition to social changes, there were significant changes in the flow of information, a reassessment of personal relationships, and, to a lesser extent, there was some cliquey between “stay-at-home” and “onsite” workers. Overall, a smaller proportion of IT workers felt depressed or lonely.

New security challenges generated by the home office

Changes in the hardware and software environment – findings from the interviews

The hardware and software environment did not change significantly as the focus shifted to teleworking, provided that the employee worked on a device owned by the company with the appropriate operating system, upgrade

[5] „Generation Z” is the generation that has never lived in a society without the Internet. For the different situation of the generations and their digitization competencies, see the study of Földes and Szederkényi [6].

[6] The original idea was to interview 3-3 people in each area, but this was not fully realized, mainly due to time constraints.

and patching level and protection software. If someone had to work on their own device, this was usually possible, but these devices had to be meet several criteria. Compliance with key elements is part of any security policy [13] that governs the level of protection for external devices. There were companies where it was also determined what software and data could be on these machines, which was also checked regularly.

Companies have also paid more attention to filtering out illegal or potentially risky software.[7] As employees could only work on a server or upload files in an authorized format only, and can access to dedicated folders, the chances of external infection were minimized. A common feature of all major companies is that only IT staff can install applications on virtual machines used over an external connection. If a user wants a software that is not part of the "menu," these software have gone through the licensing process. Programs that do not require installation are harder to filter out. There have been several ways to control this; in some places it was not possible to download executable files, in other places the use of the browser was tied to permission-dependent Internet access. All in all, it can be said that the use of external devices, maintaining the security of the connection gave a lot of extra work to the IT specialists, but this was solved with more or less effort in all companies. External access itself was made possible by companies via VPN using multi-factor authentication.

Regardless of the company, the disadvantage of employees in the corporate environment was the unimaginable dependence on service providers; power outages, disruptions to Internet access and mobile communications have had an unpleasant effect on everyone. Due to the increased amount of video and conference calls, employees received communication devices, speakerphones, headphones and webcams. In terms of working methods, the biggest innovation for several companies was the introduction of a kind of "daily circle time". It's a voice-based, continuous conference where everyone gets involved from the start to the end of work, so everyone gets instant access to the latest information. In communication with partners and production, personal meetings and telephone inquiries were replaced by less frequent electronic mails, video conferencing and sending of notes; however, the extent of communication did not change, only its nature.

Security risks of the home office

While worms and viruses are the most common pests for individuals and SMEs, the real threat at the corporate level is cyber espionage and cyber attacks through sophisticated tools developed for this purpose [10]. All IT security experts are aware that the weakest link in cyberspace is the human factor; employees, who, by their very nature, are bona fide, can be deceived or intimidated and unaware of the potential risks; that is why they are the targets of social engineering attacks. [11] In today's digital world, every employee is exposed to computer systems, handles confidential data, and is therefore a potential source of risk. This risk is further increased if the employee operates outside the corporate environment with less control. At the corporate level, a successful attack causes serious financial damage, not to mention side effects such as loss of customers/partners, reputation, business data and possible legal consequences. [18]

Today, both the number of cyber attacks and the extent of the damage caused are on the rise. Most large companies have already developed preventive monitoring, content and mail filtering systems, VPNs, external and internal firewalls and malware reporting systems that can be used to detect a significant portion of attacks during the attempt phase. The entry into force of the General Data Protection Regulation (GDPR) [5] [29], introduced in 2018, represents a major step forward in the field of personal data protection. In connection with working from home, events and actions affecting data protection may also have arisen. Monitoring the activities of employees at home has also become common practice in some companies. This is a rather delicate area – recognizing that, the government has enshrined in Decree 487/2020 the right of the employer to remotely monitor compliance with occupational safety and health rules using a computer device. [25] It is also worth pointing out that no specific IT security training on home office working was provided in the companies I examined. This may be partly due to the fact that employees work on the intranet network, which is sufficiently isolated and protected from external influences. In essence – and rightly in my opinion – decision makers put more trust in strict company policies than in the safety awareness of employees. On the other hand, as mentioned by one of my

[7] A PUP (Potentially Unwanted Program) " is a piece of software that is also downloaded when a user downloads a specific program or application. PUP is similar to malware in that it will cause problems when it is downloaded and installed." [16]

interviewees, risk-based security training is part of the induction process for colleagues, specifically in terms of data, mobile device and physical access security – thus, all workers had to be aware of the critical security risks.

The companies I am investigating did not always have enough stock available for everyone to work on a device provided by the company. For this reason, companies have made it possible to their employees to use their own devices to access the company's internal network through their own machines. However, this posed new problems, as the security level was much lower in that case. In a corporate environment, the general rule is that you can only connect to the internal network through a firewall using VPN connection, and some parts of the network cannot be accessed externally. The standard practice for accessing to the so-called "jump servers" is to use two-step authentication, which is implemented in companies using hard and soft tokens. The former is a common, highly reliable solution, however, these relatively expensive tokens are easy to lose and their acquisition and monitoring is a time consuming and rather expensive process. In many places, to simplify the process, the use of software tokens on mobile phones has been made mandatory for external access, which is easier to manage and can be protected better against unauthorized use. In many cases, in addition to the network connection rules, two-step access to critical content and apps was required.

However, there are aspects from which teleworking has reduced the risk of cyber threats. Here, we have to think primarily about physical security. Although traffic at entry points was reduced to almost zero, the reception and access system was maintained everywhere. Due to the significantly reduced traffic, all entrants underwent a much more thorough inspection, leaving no room for unauthorized access.

In the following, I will investigate whether home office has caused any detectable change in the number of home office, using data recorded by the malware reporting system of the companies monitored.

Examination of the changes in the number of monitoring alerts

According to the latest report made by Kaspersky Lab [8], malicious e-mails, exploits and brute force attacks[8] are the biggest threats at the industry level. Today, there is no large company where the number and composition of malware blocked by antivirus, intrusion attempts by a firewall and threats detected by spam or web filters would not be analyzed afterwards. Important conclusions can be drawn from these reports on the suitability of the security system for the areas to be developed. As I am working in this field myself, I have some insight into the number and composition of alerts at many companies. I am not in a position to provide specifics in my writing, however, some conclusions can be drawn from the change in the data – not for specific companies but for the industry as a whole. I created two groups for the study; I have handled digital malware (viruses, trojans, etc.) and desktop (typically portable) programs run by users (often unintentionally) separately. The time frame of my survey was the interval from January 2020 [2] to October 2021. I plotted the measured data against each other in a monthly breakdown, where 100% was the highest value measured. As the values shown are confidential information for each company, I can't provide concrete numeric values or even orders of magnitude.

Based on aggregated alerts from several companies, the data show that the announcement of the emergency did not increase the number of detected malware threats. The time spent in home office not only did not increase, but even reduced the number of alerts induced by digital malware, due to the fact that employees worked in a much stricter security environment with limited access via VPN connection. The situation was also new to many people, so perhaps they were more careful and safety-conscious. As companies began to return to onsite working, the number of alerts has increased exponentially everywhere. This was may be due to the fact that employees have returned to their usual environment, to their usual circumstances. The end of the summer was accompanied by a decline in alerts at most companies. This is reasonable, because most of the workers take their summer holidays at that time. The assumption is also supported by the fact that the value observed in the previous month was restored in September. Thereafter, the number of alarms gradually decreased from month to month. The end of the year and the beginning of the next year is extremely low (again), compared to the previous ones, which is not surprising, considering the vacations and holidays at the end of the year.

[8] A BF attack is a "method used to obtain information such as a user password or personal identification number (PIN). In a brute force attack, automated software is used to generate a large number of consecutive guesses as to the value of the desired data". [17]

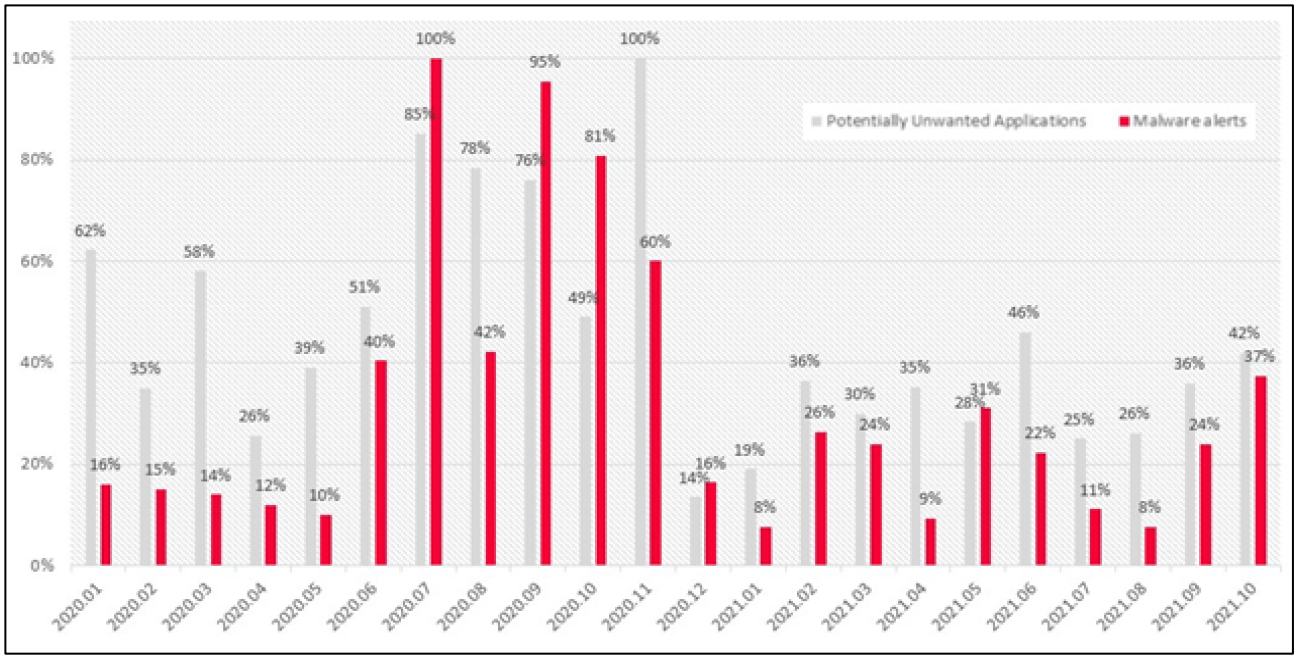

Figure 2: Total alerts triggered by malware and potentially unwanted applications, January 2020 - October 2021 (source: made by the Author)

The above findings are largely supported by the examination of potentially unwanted programs. The first month examined is somewhat high based on the preliminary conclusions, but later on, the trend outlined earlier can be seen. According to this, the period spent at home in home office (April-May 2020) did bring a lower number of "unwanted" applications installed on users' computers, and the return to the offices also led to increased alerts in this group. It can be observed here as well that the number of alerts is lower during the year-end holidays in December and January, and this finding can also be applied to the summer holidays.

Conclusion and further research objectives

As a result of COVID-19, we have all experienced increased stress, lifestyle depreciation and a shift in human relationships and workplace communication due to the lifestyle and organizational changes brought about by the crisis. In Hungary, the regulations on protection measures came into force continuously from March 2020, but long before the law came into force, companies took measures to protect the health of employees, ordered downtime and forced the employees to work in home office. With the change of working conditions, it could be observed without exception that the communication within companies also changed radically. Despite all the measures, the companies did not escape the diseases either.

In the first phase, I sought answers to more general questions that affected most employees, regardless of company or positions – I conducted this survey using questionnaires. Overall, the answers received showed that the majority of employees had a positive experience of greater comfort at home, less constraints and the ability to spend more time with their families. The majority believed that they could do their job more efficiently at home, but did not have to work more. Nearly half of the respondents experienced depression and loneliness, which is partly due to the decline in the quality of communication with colleagues, which naturally goes hand in hand with the depreciation of social relationships. A significant proportion of respondents have been forced to work from home due to the epidemic, and less than half of them want to return to their offices.

In the course of the further investigation, I primarily sought an answer to the question of how similar the difficulties and changes in their working conditions are in the case of IT professionals working in similar positions. Overall, the majority of respondents agreed in that the administrative burden did not change and they did not feel a decline in their own productivity. Among IT professionals, the relationship between employees has not really changed, and they were not overwhelmed by the loneliness and depression that we often hear from employees in other fields. The survey also revealed that neither gender nor age is a decisive factor, but the position is. In

general, it can be concluded that workers who have been forced to work hybridly prefer teleworking; while those working in permanent home office would prefer to return to the office. It is clear from the answers that the lack of personal contacts puts an increased burden on a person, and everyone experienced it differently depending on their habitus, age and tasks. In addition to social changes, there are primarily changes in the flow of information and the reassessment of personal relationships can be observed.

The hardware and software environment did not change significantly as the focus shifted to teleworking. If someone wanted to work on their own device, this was usually possible, but these devices had to be meet several criteria. Companies have also paid more attention to filtering out illegal or potentially risky software. All in all, it can be said that the use of external devices, maintaining the security of the connection to the corporate network gave a lot of extra work to the IT specialists, but all companies could handle this. Regardless of the company, the disadvantage of employees in the corporate environment was the unimaginable dependence on service providers; power outages, disruptions to Internet access and mobile communications have had an unpleasant effect on everyone. In communication with partners and production, personal meetings and telephone inquiries were replaced by less frequent electronic mails, video conferencing and sending of notes.

A significant number of companies did not have enough laptops, tablets or smartphones available for everyone to work on devices provided by the company. For this reason, companies have made it possible to their employees to use their own devices to access the company's internal network through their own machines. However, this posed new problems, as the security level was much lower in that case. It was only possible to connect to the corporate network via a firewall using VPN connection, and the standard practice of accessing internal networks was the two-step authentication, which was implemented by using hard and soft tokens.

The concluding phase of the research sought to answer the question of whether working from home meant a change in the number of alerts detected by companies' security systems. During the investigation, digital malware (viruses, trojans, password crackers) and PUAs run by users were evaluated separately. Based on the aggregated alerts of several companies, it can be concluded that the global situation has not caused an increase in the number of detected malware threats. The time spent in home office not only did not increase, but even reduced the number of alerts induced by digital malware. When the first wave have passed, companies began to return to onsite working, and the number of alerts has increased exponentially everywhere. The end of the year and the beginning of the next year is extremely low (again), compared to the previous ones, which is not surprising, considering the vacations and holidays at the end of the year. From February 2021, values have largely returned to that steady, albeit somewhat higher level, which was typical before the home office made mandatory due to the pandemic. The above findings are largely supported by the examination of potentially unwanted programs. According to this, the period spent at home in home office (April-May 2020) did bring a lower number of potentially unwanted applications, and the return to the offices also led to increased number of alerts in this group. It can be observed here as well that the number of alerts was lower during the year-end holidays in December and January, and this finding can also be applied to the summer holidays.

For the future, I do not intend to change the nature of the survey – in terms of statistical calculations, the research is aimed at comparing the individual rates and examining the distributions. The questionnaires deliberately contain only open-ended questions so that accurate conclusions can be drawn, leaving no room for misunderstanding. However, it may be worth expanding the scope of the survey, given that the sampling frame was, if only by a hair, below the 100-item sample target – there was simply not time for more. However, no significant change is expected from this expansion. The present research is cross-sectional, based on data from one period. Later, when the pandemic has subsided, it may be worthwhile to conduct a longitudinal survey, repeating the questionnaires and interviews, and drawing further conclusions from the change in rates. Instead of aggregate values, it may also be worth comparing individual companies with each other, possibly involving more companies into the research, as the survey cannot be considered representative without this.

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