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SECURITY ISSUES AT THE TIME OF PANDEMIA AT DISTANCE WORK

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Introduction

The chapter will work out a framework to understand new security issues at distance work. We will focus on three areas of security threats.

First security risk area is that of data **security and privacy**. Work environment at home is almost from any angle studied more prone to data privacy and security risks than work in employer's premises. Devices might be less protected, as well as telecommunication lines. Devices might be used more in a mixed-mode between business and privacy issues. Control of physical access to data, devices and telecommunication infrastructure is next to impossible to build properly in a telework setting.

Second security risk area is that of **physical safety**. Different kinds of typical work accidents, different from those happening in regular work environments, might occur. Ergonomics is often compromised, as well as quality of working devices. Because of lack of special arrangement for safety, and the constant interplay between private and business issues, human's concentration is limited, leading maybe in worst cases to larger catastrophes such as fires or water damages. In the case of simultaneous task of taking care of children the risk is further accelerated.

Third area of security risks is that of **mental well-being**. Feeling of isolation and lack of personal immediate support in the case of problems are crucial in distance work arrangements. Control of total working time, as well as separation of working and free times become challenges. Productivity measurement might get more difficult, and even when real productivity is untouched or even improving, workers might have a feeling of insufficiency in their work duties. A special issue needing focus and management is that of communication with other members of the working community.

For all of the three security issues tackled in more detail, a review of literature is conducted, a framework of the most visible risks is formulated, and methods to control and manage the risks are proposed.

Home at work

Enormous masses of people all through the world have turned to work at home because of the Covid-19 global pandemic. Some have been compelled to this, while some have taken the change voluntarily. For everyone, work at home has its benefits and drawbacks, and individuals react to different issues in diverse ways, even within similar types of professions, organizational environments or home environments.

Work at home can take several forms. For example, agricultural work has traditionally been performed at the home environment, at the farm, that is a home for the farmers. Many kinds of production work, especially in artisan tradition, can be performed at home, and even several industrial type of processes can be applied at home, because of developing technology allowing even small scale production processes to be effective and efficient. Performing arts have been produced at home already for a long time, and for example paid streaming of different kinds of performances has become a mainstream business.

In this chapter we concentrate on homework where the work performance is mainly of intellectual character. Physical work as well as performances containing a physical component are left outside our discussion, as the risks of security in these works are very diverse, work-specific and different from risks in purely intellectual work.

Academic research has studied richly work at home, but a real boom to this research started first with the turning of work to computers, where constant connection to co-workers is available, even when not always utilized. The term Computer Supported Cooperative Work (CSCW), originated in the 1980s (Grudin, 1994), very well describes the core of home work with computers. Currently, it has maybe lost some of its specificity and users, as this kind of work has become a mainstream way of working, business as usual.

The research on home work with networked computers has emerged under several terms, as well that of practice. A pioneering term was that of telework (Bailey & Kurland, 2002), at least partly inspired by the mostly American term telecommuting, where avoidance of physical commuting to work was eliminated. By the way, if this chapter would be about home work benefits, avoidance of always risky travelling to work and back home is may the biggest benefit of working at home, overshadowing many if not all homework security risks.

Telework concept further evolved in the term of distance work. One of the earliest studies that mentions telework is by Green (1988), which also documents that distance work was performed at Victorian time London. A term close to distance work is remote work, also used by several researchers (Olson, 1983; Staples, 2001).

Next development in the terminology was that of nomad work (O'Brien, 2011), referring to people working everywhere: initial workplace, other premises by the employer or any institution connected to the employer, during work and other travelling, and home including different additional places such as summer cottages.

All researchers under these different roof terms have tried to more or less convince people, especially organizational managers, to understand that working at home is a good thing. However, first the Covid-19 did the breakthrough of home-based work, something science could not do during

some 40 years of endeavor. First through Covid-19 we can say that working from home is an integral part of organizational reality, to and extend it can be called “New Normal”. New terms were also introduced, such as multi-site work, that is mainly used in organizational daily practices, but to some extend even in academic research, such as (Damian & Zowghi, 2002; Marttiin, Lehto, & Nyman, 2002).

Covid-19 – the surprise that should not have been

The Covid-19 pandemic hit the world with a great surprise. In most if not every global risk assessment rehearsal this topic was not recognized, also not any global pandemic, even we have had such already for several times, maybe the most fresh before Covid-19 in memory being the 1918 – 19 Flu Pandemic, also called Spanish flu, the Great Influence Epidemic or the 1918 Influenza Pandemic. It is estimated that about 500 million people or one-third of the world’s population became infected with this virus. (Centers for Disease Control and Prevention, 2021). However, the world at that time was extensively different from current World, maybe most importantly much less interconnected, and the outcomes of the 1918 – 19 Flu Pandemic were rather different from those of Covid-19.

As freshly as 2016 a global pandemic was still largely an unforeseen global risk, as for example witnessed in the Atlas Magazine report on global risks in their likelihood and impact (Atlas Magazine, 2017). The risks discussed in the article are in Tables 1 and 2, as can be seen “Spread of infectious diseases is at place 8 as it comes to potential impact, but pandemics are not at the list of high likelihood.

Table 1 Top 10 risks in terms of likelihood as assessed 2016 (Atlas Magazine, 2017)

Risk mapping: top 10 risks in terms of likelihood	
1	Large-scale involuntary migration
2	Extreme weather events
3	Failure of climate-change mitigation and adaptation
4	Interstate conflict
5	Natural catastrophes
6	Failure of national governance
7	Unemployment or underemployment
8	Data fraud or theft
9	Water crises
10	Illicit trade

Table 2 Top 10 risks in terms of impact as assessed 2016 (Atlas Magazine, 2017)

Risk mapping: top 10 risks in terms of impact	
1	Failure of climate-change mitigation and adaptation
2	Weapons of mass destruction
3	Water crises
4	Large-scale involuntary migration
5	Energy price shock
6	Biodiversity loss and ecosystem collapse
7	Fiscal crises
8	Spread of infectious diseases
9	Asset bubble
10	Profound social instability

Security in home work

Security is a key aspect in all human work, including paid work. In the work environment this phenomenon has several terms, such as work security, job security or employment security. To mix up things, these term all might connected to the very basic condition of an individual: whether s/he has a work relationship or not. Here we anyway start from the starting point that there is a work relationship, where some kind of monetary compensation is applied. We do not dwell into the details on the work relationship.

Intellectual work has always been performed at home environments, books have been written at home and great paintings have been painted at homes, as well as most of music. Here we dwell into the world of digitalized work, where a key element of work is the constant contact to Internet, where instant interaction with the employer, customers or co-workers somewhere in the service production chain is available.

Obviously, this constant communication flow through Internet is a key new element in digitalized work environment at home.

Data Security and Data Privacy

Identifying, categorizing, analyzing and counteracting data security and privacy threats and risks is an endless task, and even here we have to focus on some limited set of risks that we consider typical and highly relevant for distance work. These include:

- use of private devices
- data storage in wrong places
- use of badly secured communication networks
- mixing up of private and work life
- possible unavailability of help desk services
- social isolation leading to misconduct.

Before entering these detailed topics, a short introduction to data privacy and security is needed. As ever, the important topic has several names. Data security is a core topic untapped already a long time ago (D. E. Denning & Denning, 1979; D. E. R. Denning, 1982) but by means obsolete for the networked world (Kaufman, 2009). Data security is taken even here as the central concept, as at the very end all information system security and privacy problems are to be tracked to data in a wrong place at a wrong time. Information security is a related term, and information is processed data meaningful to someone. Data privacy is a subset and consequence of data security, there is no data privacy without data security. Data privacy is the protection of personal data from those who should not have access to it and the ability of individuals to determine who can access their personal information (Cloudflare, 2021).

Terms like IT security (Cavusoglu, Mishra, & Raghunathan, 2004), computer security (Gollmann, 2010), network security (Kaeo, 2004; Marin, 2005) and cybersecurity (Craig, Diakun-Thibault, & Purse, 2014; Singer & Friedman, 2014) are also in intensive use. In general, the terms refer to where the focus of security risks might be (computers, network, IT management). The term cybersecurity is maybe most used nowadays, and tells about the complexity and vast range and reach of security in IS operation: the problems can lie anywhere in the cyberspace, that in principle is an unlimited concept.

Somewhat simplified, data security problems can be traced back to three main areas of confidentiality, integrity, and availability. Together these form the so-called CIA Triad (Fenrich, 2008; Samonas & Coss, 2014) or AIC Triad (Al-Qasrawi, 2016), to avoid confusion with the Central Intelligence Agency of United States. The three main areas of confidentiality, integrity and availability can and should of course be divided into millions of sub-areas, but these central concepts try to make sure that any of the basic dimensions of security are not forgotten.

Data Confidentiality deals with protecting against the disclosure of information by ensuring that the data is limited to those authorized or by representing the data in such a way that its semantics remain accessible only to those who possess some critical (NIST, 1995).

Data integrity refers to the property that data has not been altered in an unauthorized manner. Data integrity covers data in storage, during processing, and while in transit (NIST, 1995).

A kind of another side of the coin is data availability: data can be well protected, well protected in confidentiality and integrity, but no-one has benefit of the data if it is not available. Data availability is about the timeliness and reliability of access to and use of data. It includes data accessibility. Availability has to do with the accessibility and continuity of information. (University of Delaware, 2021)

Use of private devices was taken under close scrutiny with the introduction of the term Bring Your Own Device (BYOD). While the term had its heyday some ten years ago (Miller, Voas, & Hurlburt, 2012; Thomson, 2012), the term is still enjoying heavy use (Ratchford, El-Gayar, Noteboom, & Wang, 2021). Key problems with worker-employed devices are their position outside complete device maintenance and management of the employer, and the mixing of data and activities on it at the private and work sphere. Use of personal devices may also be shared with other family members, further increasing security risks. Problems of electricity supply might also become a problem in home environments, that do usually not have proper uninterrupted power supply (UPS) arrangements. Overheating (or cooling) of home devices is also a risk, as home environments are usually so much professionally controlled as it comes to room climate as organizational facilities.

Data storage tends to become distorted and disintegrated in non-organizational setting. Data is most safe usually when it resides just in one place. In general, the more storage places, the more risk. Even the danger of keeping all eggs in one place is rather minimal, as keeping security copies of organizational databases is a rather mature discipline. Home environment is especially vulnerable place to keep data, as data storages are not professionally managed, and can take various forms. Even the theft of data storage devices is much easier in home settings than in most organizational setting. Printers are always a key risk device group for data privacy, and even much so in home environments.

Use of badly secured communication networks is very usual in home settings. Again, professional management is missing from local networks. Home wifi-networks remain often unprotected, and everyone can maybe have access to them. This is bad in the sense that any telecommunication chain is as strong as its weakest link. In the absence of proper networks, data transfer can even happen through the transportation of the data storage device, and interactions through the network may easily suffer from bad data integrity, also unauthorized or even by mistake taking data disintegration can happen. At away from work settings, data availability can always be a great problem.

Mixing up of private and work life is a natural and acceptable phenomenon in home working. This should anyway not be extended to data and information processing activities. Using same communication platforms (etc. social media, e-mail, instant messaging) for both private and work-related communication can easily lead to data security breaks. Access control to premises is hard, and in principle anyone having free access to home can also have free access to work-related data, if not carefully protected. Openly drifting papers are of course a major security treat even in home environment.

Possible unavailability of help desk services is a major treat. Any automatic monitoring of work-station infrastructure performance is not usually possible in home settings. This means that software and hardware problems are always not professionally addressed. Software is not updated, malfunctioning hardware might remain unnoticed, found problems and malfunctions of systems are not reported and taken care of. It is not possible to extend helpdesk and related activities to IT devices that are not owned by the work organization.

Social isolation even when performing information processing activities may lead to distorted habits, when any social control is not available. Private computers are beyond the coverage and analysis of any log data. The computers might be not shut down for long times, inhibiting automatic software updates and cumulating risk-vulnerable data to different intermediate storages and buffers of the IT infrastructure, finally opening a channel to possible intrusion risks. Automatic security copy production of data is most likely not working at home environment. Constant switching between the work and private information sphere may easily lead to the mixing up of data storages and processing activities as well. Eating and drinking by the work-station is always a major risk to the hardware, and simultaneous data might be lost.

Work at home – aspect of physical safety

It is widely agreed that working from home, or flexible work arrangements are generally beneficial for both the employee and the worker. In some occupations it is possible to maintain personal choice in the decision about whether to work from home or on the other hand, to decide to come into work when preferable. Condition for working from home is, that the worker has an appropriate and well-maintained safe place for performing the duties. This is not the case, if the worker lives in space-constrained living conditions, has a family with home staying children or lives close to a construction site with lot of noise. When the Covid-19 pandemic hit the world, working from home included an assumption that workers were able to work peacefully and have a spare room that can be converted into a home office. Additionally, when the lockdown started, the assumption was that the worker has safe seating, desk and lighting arrangements, ergonomically safe equipment, safe electric supply and injury-free immediate environment. (Pennington & Stanton, 2020 <http://hdl.voced.edu.au/10707/539165>)

The common factor for injuries is that the person loses control of what he or she intends to do by the sudden incident that causes loss of life or health. Yet pandemic may affect in the physical condition also without any sudden incident. This was the case as during the Covid-19 pandemic there has been widespread use of information technologies and the inadequate ergonomic positions, which can might have led to various health conditions. These conditions include illumination, noise, temperature and furniture. (https://link.springer.com/chapter/10.1007/978-3-030-80000-0_38) During the lockdown period and work from home, the search for better spaces for virtual working has lead the workers – or students – to move to closed places with less illumination or ventilation. In addition, it is possible that the individual works with smaller devices such as the cell phone or tablet. This in turn, might cause musculoskeletal damage as the bad postural habits may generate during longer time. (https://link.springer.com/chapter/10.1007/978-3-030-80000-0_38)

All these issues are concerning the risk area of physical safety. It has to be noted that there are two separate concepts for being in the harm-free condition without risks. Safety implies a human-aspect, freedom from accident or injury, while security implies deliberateness or intent, as well as protection from dangers. The concept of security is used mainly in the context to protection against undesirable threats, whereas safety is frequently used in connection of injuries (water safety, home safety, fire safety) (Somerkoski & Lillsunde 2014 <https://doi.org/10.1007/978-3-319-10211-5>).

In general, working is a protective factor for worker as the employers must comply with the labor legislation. The condition for this is, of course, that the employer complies with the law in these respects.

Every year, unintentional injuries take the lives of over three million people globally. For people aged 5-29 years, injuries are the most common reason for death. Major part of these are home and leisure injuries. For instance, falls that are an under-recognized public health issue, account for over 684 000 deaths each year for children and youth. Tens of millions more people suffer non-fatal injuries that lead to emergency department and acute care visits. Hospitalization might be both expensive and painful. The researchers have found several risk factors for injuries for instance alcohol or substance use; lack of adult supervision of children; poverty; economic and gender inequality issues, unemployment or a lack of safety in the built environment. Also, some social factors and determinants might affect to the frequency of injuries, for instance easy access to alcohol, weak social safety nets including unsafe housing or schools. In vulnerable communities where trauma care services are inadequate, the consequences of injuries can be exacerbated. (<https://www.who.int/news-room/fact-sheets/detail/injuries-and-violence>)

In response to the global COVID-19 pandemic, many countries, if not all, implemented physical distancing to limit transmission of the coronavirus. During the pandemic the physical restrictions, such as the lockdown periods affect the workplace, traffic, sport and leisure activities. Respectively, more people were staying at home. This caused increasing numbers of home injuries. For instance, in Australia the home was the most commonly reported place for injury occurrence as proportionally the injury rate increased proportionally by 9.3 % compared to the time before the pandemic (2017 – 2019). This figure was based on the emergency service health department use. (<https://www.monash.edu/muarc/research/research-areas/home-and-community/visu/injuries-during-the-covid-19-pandemic>) Also, in the U.S. the pandemic almost doubled the number of injuries in the household. In U.S. the representative sample of 26 % reported having experienced an injury in the household during pandemic. The comparative figure before the pandemic was 14.3 %. Falls were the most common cause of injury, being consistent with earlier studies (McDonald et al. 2016; <https://doi.org/10.1146/annurev-publhealth-031914-122722> ; Gielen et al. doi.org/10.1177/1559827616629924 PMID: 27141210; PMCID: PMC4850836.)

Families with children living in the home were significantly associated with a higher likelihood of reporting injury. Household with children reported almost three times more injuries during the Covid-19 pandemic compared to those without children. However, the researchers in this study did not find an overall connection between increased time spent at home and the report of injuries. (Gielen et al. <https://doi.org/10.1186/s40621-020-00291-w>)

Product safety is a part of physical safety issues. Covid-19 pandemic affected to the consumption of products and product-based injuries widely. For instance, in the U.S, school-related injuries and sport activities dropped sharply 81 %. This was the most probably for the suspension of the school and sports club activities. Respectively, skateboard, hoverboard, scooter and bicycle injuries that were treated in the emergency services increased by almost 40 % during Covid-19 pandemic. Button battery injuries (swallowing or inserting in the nose) increased by 93 % in injuries to 5 – 9 year old children. (<https://www.cpsc.gov/Safety-Education/Safety-Guides/COVID-19/Consumer-Product-Injuries-during-the-COVID-19-Pandemic>)

Researching and navigating the Covid-19 pandemic environment might help minimizing the risk of future. In addition, the researchers might understand the factors better, such as the dynamic of children and their social environment. This was the case, when researchers found that unintentional

burn injuries among children rose 32.5 % during the first six months the COVID-19 pandemic compared with the same period in the previous year. Researchers state that this was due to stay-at-home orders given during the beginning of the pandemic.

(<https://www.safetyandhealthmagazine.com/articles/21885-childrens-burn-injuries-rose-during-early-part-of-pandemic-pediatrician-group> or the other reference

<https://www.eventscribe.net/2021/AAPexperience/fsPopup.asp?efp=SIZYT1RRUloxNTA5Ng%20&PosterID=422440%20&rnd=0.3808011&mode=posterinfo>)

Because of lack of special arrangement for safety, and the constant interplay between private and business issues, human's concentration is limited, leading maybe in worst cases to larger catastrophes such as fires or water damages. In the case of simultaneous task of taking care of children the risk is further accelerated.

Mental well-being and work from home

Another view of safety and security is that of well-being. According the World Health Organization, safety is a condition where factors that are a threat to a society are managed so that everyone has the feeling of well-being and prosperity. (Welandar, G., Svanström, L., Ekman, R.: Safety promotion –an Introduction, 2nd Revised edn. Kristianstads Boktryckeri, Kristianstad (2004) Additionally, the concept of well-being is often used when emotions are in question. Mental well-being refers to stable condition of mind.

There seems to be some kind of global consensus that Covid-19 pandemic, lockdown, physical isolation and work from home has affected the workers in versatile ways. Firstly, some of the findings suggest that the Covid-19 pandemic has had negative effect on the well-being of employees. On the other hand supervisor support may protect mental health and well-being of workers. (Evanoff & Stickland, 2020<https://www.jmir.org/2020/8/e21366/>)

Sharing the home with others during Covid-19 pandemic seems to have an effect to mental well-being as well. Having an infant at home predicted better overall mental well-being. Also, working parents were having a better physical and mental well-being status since they were spending more time at home with their kids. Yet there was a simultaneous increase in new physical and mental issues due to the increased distractions in work life and lack of support from day care centers or babysitters during work day. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7934324/>

Some researchers state that individual work management skills have a connection with how well the worker thinks he or she can manage when working from home. Autonomy and self-leadership seem to have a positive relationship with productivity and work engagement. Work from home may also play a protective role for workers, since they were not asked to go to work and respectively, they were not exposed to possible Covid-19 contagion by leaving home. This situation sets new challenges for the employees, as they should provide more support and understanding for family-work conflict - not to forget the need for mental recovery and right to disconnection of each worker. Furthermore, there might be a demand for some organizational changes to support the mental well-being of working from home workers.

https://journals.lww.com/joem/Fulltext/2021/07000/Work_From_Home_During_the_COVID_19_Outbreak_The.16.aspx

To sum up, policies that promote physical activity, reduce psychological distress and support balancing childcare while working from home are important. Some of these issues the employee can be active at, but it is also essential that employers monitor workers' well-being systemically, for instance providing breaks or logistic support. It is also essential that the employer is able to make adjustments in the "new" workplace and in the productivity expectations. Hernández et al. ,2021 <https://derby.openrepository.com/handle/10545/626045>

Summary and conclusions

→There is a consensus that Covid-19 sets new challenges for both workers working from home and the employees. The condition for bearing the heavier work load and performing effective self-management is family-work balance, flexibility in working conditions and employee support

→those individuals who live in vulnerable communities have been even more vulnerable during the Covid-19 pandemic (inadequate living space, many children ..) alcohol or substance use; lack of adult supervision of children; poverty; economic and gender inequality issues, unemployment or a lack of safety in the built environment. People living in such conditions are in even more vulnerable during Covid-19 pandemic lockdown as more time is consumed at home.

→The fact that health is no longer only a demographic or an individual-level issue, but rather a global pandemic (Hakovirta & Denuwara, 2020 <https://www.mdpi.com/2071-1050/12/9/3727/htm>)

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