Work from Home and the Use of ICT during the COVID-19 Pandemic in Indonesia and Its Impact on Cities in the Future

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Abstract: The COVID-19 pandemic has resulted in restrictions on activities involving physical contact, such as working. Indonesia began to apply the system of work from home (WHF) to minimize the spread risk of COVID-19 in March 2020. This research is aimed at finding out the coverage of WHF, mapping changes of workplace, identifying the use of ICT to support WHF, and analyzing the concept of workplace and work systems in future cities. The method used in this research is qualitative and quantitative. A questionnaire (Google Form) was sent to different WhatsApp groups whose members are experts in urban and regional planning, geography, the environment, smart cities, and IT, with total of 176 respondents. The focus group discussion conducted online focused on the use of ICT to support WHF during the COVID-19 pandemic. The result of this research shows that even before the pandemic, both the government and private sectors had a plan to apply WHF. Because of the pandemic, it became the catalyst for the implementation of WHF. The implementation of WHF has changed workplace orientation. The use of ICT was a primary need in implementing WHF during the pandemic. However, the WHF system implemented in the government sector has not been integrated, and neither has the one in private sectors. WHF is seen to have been effective enough, but it still needs lots of support from many sectors. In the future, WHF can still be maintained, along with working from the office (WfO). The WHF concept is highly recommended for big cities because it can support reduced population mobilization, resulting in reduced congestion and movement costs, and improved efficiency of working time by reducing travel time. On the other hand, it can help in the matter of limited of space that office buildings provide.

Keywords: work from home; ICT; COVID-19 pandemic; workplace; cities

1. Introduction

On 3 March 2020, two Indonesian people were confirmed to be positive with COVID-19 [1], and an increasing number of victims followed. On 16 March 2020, the Ministry of Communication and Information began to apply the policy of work from home (WHF) for echelon IV (a structural position at the lowest level) and non-echelon (non-civil servant) officials who took public transport to work [2]. The concept of WHF is not a new one. It has in fact been in existence for the last 10 years [3]. The advances in ICT have given the option to do work virtually, leading to more efficiency and the changing concept of the workplace [4]. Because of the COVID-19 pandemic, WHF needed to be applied in jobs to prevent COVID-19 from spreading [4]. The policy of WHF then followed in other ministries, state-owned companies, private companies, universities and colleges, schools, and other economic activities. The economic and social shocks resulting from the COVID-
The 19 pandemic have shaped the perceptions of individuals and organizations about work and workers [5].

Working from home is defined as every paid job being done mainly from home and is estimated to comprise at least 20 h weekly [6]. Policymakers and managers generally have high interest in WfH [7]. Factors influencing WfH are skill in time management, the possibility of working during the most productive hours, reduced time to communicate with colleagues, the possibility of working from home when not in good health, trust from superiors, support from supervisors, the possibility of saving on transportation costs, the possibility of taking care of family members, the conformity of the workplace at home, and the possibility of accessing the organizations’ documents from home [8]. In order to make work activities run well, WfH needs several forms of support. The results of a survey of over 369 mature people in 64 Chinese cities showed that 27% of them worked at the office, 38% preferred to work from home, and 25% of them preferred to quit their jobs because of the pandemic [9]. One of the main supports was the availability of ICT, both hardware and software and education related to how to apply WfH itself [10]. In addition, training that is appropriately administered will eventually improve the skill of employees. It is very important to tackle the existing and ongoing challenges for employees that are affected by the COVID-19 pandemic [10].

The experience of WfH during the COVID-19 pandemic has led to challenges and changes in the ways of working [11]. In addition, the policy of WfH is more flexible and supports those facing obstacles, such as old people, disabled people, or those who geographically live far from work [11]. In the research in relation to the use of ICT at work, there are three conclusions that can be drawn [12]. They are (1) the use of technology when working from home during off-job time provides significant and positive effects in terms of time and psychological factors, (2) family support give positive relation in using technology for work at home during off-job, and (3) family support affects employees to feel less psychological detachment, thereby it decreases the level of work-family conflict [12]. Every employee who does WfH will be willing to work when the atmosphere is conducive and supports working from home [13]. The opportunity for an employee to continue working when not in good health will increase satisfaction for teleworkers [8]. However, what may become an obstacle to WfH generally comes from personal responsibility and family members [14].

Factors influencing the efficiency and quality of long-distance work required from teleworkers depends on the gender, age, education, work experience, and experience with telework [15]. In relation to age and gender, older female employees do not see the benefits of telework as much [8]. Females are seen to have more appreciation for telework than males [16]. Basically, women have more experience in WfH even though not all see it as productive, valuable, and paid [11]. WfH may be able to offer more flexibility that enables female employees to participate in various jobs on a larger scale [11]. Working from home is of great help for women doing academic tasks so that fast and large growth can be achieved by making use of video conferences [11]. When the pandemic is successfully resolved, female academics will still need to keep involving themselves in dialogs on the experience during the COVID-19 pandemic, opportunities to develop their careers, improvements to participation in academic life, and their role in society on a larger scale productively and sustainably, and encourage and maintain female academics for the next generation [11]. On the other hand, there is also a perception that male employees are more productive than female ones [17].

The use of ICT as a means of supporting jobs leads to changes in work patterns [16,18]. These are shown in the changes in work methods from relying on face-to-face meetings to ICT-based ones; changing to work hours that are more flexible, efficient, and faster; and changing to locations that are flexibly chosen in any place or in one location with several activities [16,18]. In addition to flexibility, employees who do WfH have more advantages to be autonomous in making decisions, as well as cost efficient [19]. It is obvious that mobility decreases because physical activity at work is replaced by making
use of ICT [18]. Other impacts of WfH include the feeling of loneliness, affected mental health, a decrease in employees being active while WfO, and a decrease in the quality of the work environment [19]. Teleworking may be able to give benefits in term of cost reduction [4]. The disadvantage associated with flexible working arrangements is the perception of worries about hindering careers [20–22]. Research results in Malaysia show that it takes time to develop flexible work practices from home and make it technically acceptable in society [22]. In this regard, the government has offered a flexible work policy in the public sector [22]. Furthermore, based on the results of this research, both the positive and negative impacts of WfH will also be discussed to complete the previous study.

Both the private and public sectors seem to be concerned with the impact of telework in relation to employees’ performance [4]. Teleworkers have less opportunity to interact and build relationships and physical closeness with other employees [13]. ICT becomes the main factor in determining success [23]. Several supporting aspects of decreasing mobility due to the use of ICT are also supported with the use of e-banking and e-shopping [18]. Both e-banking and e-shopping support the continuity of working at home, and it is also possible to do those jobs from home. Such a situation is very meaningful for managers, architects, planners, and policymakers in building facility networks in a city as well as multifunction of city spaces [24]. The existence of ICT-based economic services causes the orientation of the development of service locations and settlements to have been decentralized to suburban areas [24]. It is possible that the phenomenon of WfH will be of high interest. Working from home has so far currently been a common view. Therefore, it is important for companies and the government to train their employees correctly so they are able to WfH effectively and so their abilities and capabilities can be maintained [25].

Furthermore, this research is aimed at discovering the coverage of WfH, mapping changes of workplace, identifying the use of ICT to support WfH, and analyzing the concept of workplace and work system in future cities. This research is conducted in relation to WfH during the COVID-19 pandemic. Nevertheless, from this research it is also possible to create a model to develop WfH in the future. The result of this research is expected to become the input for reducing city problems and it can also become the recommendation for developing sustainable cities in the future. The achievement of sustainable cities is usually inseparable from environmental aspects, including the availability of green open spaces, and low levels of pollution and congestion in cities. The WfH system will reduce mobility, thereby reducing the use of space for movement, which results in reduced levels of pollution and congestion on the road.

2. Materials and Methods

The method used in this research was quantitative and qualitative. The quantitative method was supported by data that were taken by using a questionnaire in the form of a Google Form that was sent to different WhatsApp groups whose members are mostly experts in urban and regional planning, geography, the environment, smart cities, and IT. The data were collected in 2020 using this questionnaire, with a total of 176 respondents. In addition, the qualitative method was supported by data that were obtained from a focus group discussion that was conducted online and was attended by several resource persons, including, among others, the Ministry of State Apparatus Empowerment of the Republic of Indonesia, the Ministry of Communication and Information of the Republic of Indonesia, the Regional Government of the Special Region of Yogyakarta (namely, the Civil Service Agency, and the Office of Communications and Information Technology) as well as consultants specializing in IT in the city of Yogyakarta and GIS consultants in Jakarta. Meanwhile, secondary data were taken from Google Community Mobility in 2021.

The technique used for analysis was spatial analysis trough maps, analysis using chi-square assessment, and descriptive statistics. Spatial analysis was carried out using maps to describe the distribution of workplace changes during the COVID-19 pandemic, WfO before the COVID-19 pandemic, WfH during COVID-19 pandemic, and changes in workplace occupancy during the COVID-19 pandemic. Meanwhile, a chi-square statistical
test was carried out to show the correlation of the relation between the reduction in mobilization and the increase in productivity during WfH.

3. Results and Discussion
3.1. Work from Home and Its Coverage

The COVID-19 pandemic has made a large number of Indonesian people experience forced digitalization. It is a kind of phenomenon in which society is forced to suddenly change from conventional habits to modern ones by making use of ICT. Those experiencing this phenomenon include officers such as civil servants, private employees, business people, etc. What is meant by the coverage of WfH here is related to the definition, system, and activities done during WfH. Work from Home is a system applied in an institution/office with the ability to connect in an electronic virtual way to create the best situation so that office jobs do not need to be done in an office.

The policy implemented by the Ministry of State Apparatus Empowerment of the Republic of Indonesia shows that the ministry began to apply WfH in March 2020, a time when the COVID-19 pandemic began to hit in Indonesia. One of the duties that needed to be done by the respective ministry during the COVID-19 pandemic was to make sure that society remained productive, safe, and healthy in the middle of the pandemic through responsive policies from the government by paying attention to what society demanded and needed. At present, there has been a basic change in society in that they prefer to put health and safety as the top priority by staying at home more while paying attention to cleanliness, health, and the safety of the family.

The Ministry of State Apparatus Empowerment implemented a work system in line with the policy made, namely, Circular Number 58 Year 2020 on the Work System of the State Civil Apparatus during the New Normal Order. The arrangement includes, first, adaptation to the work system (flexibility of place arrangement and work hours, arrangement of WfH and WfO, implementation of effective public services, and limitation of face-to-face meetings and official travels); second, support from the Human Resource Management apparatus (evaluation of employees’ performance, monitoring and supervision, discipline of employees); and third, infrastructure support (preparing facilities in workplaces, optimizing the use of ICT, and maintaining information and cyber security).

The coverage of WfH, according to the respective ministry, includes arranging patterns and work locations in a flexible way by optimizing the use of ICT for increasing and maintaining productivity and guaranteeing the persistence of task implementation and functions of the civil administration authority. In relation to WfH and WfO, the Ministry of State Apparatus Empowerment considers the criteria of location and work hours. The employees living in the area where PSBB (Pembatasan Sosial Berskala Besar/Social Restriction in a Large Scale) is applied have to WfH completely. Meanwhile, for those living outside the PSBB area, the authorities to which they belong need to determine which employees have to WfH and WfO selectively and accountably and need to determine which tasks need to be done by those WfH, in line with the criteria.

In relation to the employees who remain WfO, facilities such as modern working rooms need to be prepared and need to be open and collaborative so that there are no special private working rooms. Employees may choose a working room suitable for their activities, such as areas for working, collaboration, socialization, etc. The purpose of this is to build a collaborative working environment for the administration authorities or agencies in the digital era, stressing the principles of result-oriented targets, a collaborative environment, transparency, trust, and efficiency by optimizing the use of different facilities.

The resource person from the Ministry of Communication and Information stressed that WfH comprises one of the digital transformation implementations in the administration. This encompasses a bureaucracy that needs to be reformed, that is, that needs to build relationship among the administration authorities or agencies, personnel, and the government with society.
The implementation of WfH in the Ministry of Communication and Information has been dominant, with 20% of its employees still working at the office, irrespective of the regulation of 50%. Work hours are divided into two shifts: mornings and afternoons. The kinds of work that cannot be done by applying WfH are those in charge of document acceptance, security, cleanliness, and technical work. In relation to the administration management, apparatus empowerment such as bureaucratic activities also needed to be changed, in addition to keeping distance and other health protocols. The target of transformation that they plan to implement for adaptation is not only the mechanism but also the technology. They will provide general application and integration. Their target is to prepare two apps, one for the administration, and another for public services.

According to the resource person at the Secretary of Civil Affairs Board in the Special Territory of Yogyakarta, in the environment of the respective regional government, WfH is applied in line with the regulations stipulated by the central government. On 3 November 2019, before the COVID-19 pandemic hit, the Deputy of Human Resource at the coordinating meeting revealed that it was not necessary for civil servants to work in the office. However, there was a different idea on the subject, saying that they had to work in the office. COVID-19 has changed several systems about civil servants, from working in the office to working from home. The Regional Government of the Special Territory of Yogyakarta has gone over the system carefully to adapt itself to the conditions of the COVID-19 pandemic. At present, 50% of the civil servants work from home, and another 50% remain working in the office, with health protocols taken into consideration.

In private sectors, a resource person stated that at the end of 2019, an IT consultant in Yogyakarta-Gamatechno considered applying what is called “remote working” for its employees. Because there were several constraints, the plan was postponed. Due to the COVID-19 pandemic, Gamatechno was forced to implement what had been planned before. Therefore, starting on 15 March 2020, Gamatechno has officially applied WfH. Meanwhile, at the GIS-PT Waindo SpecTera Jakarta consultancy, working from the office has been applied with a percentage of 50–70% since June 2020, with health protocols put into effect, such as conducting rapid tests every other week and having to put on APD (Alat Pelindung Diri/personal protective equipment) for its employees assigned to duties outside the area of the company. In addition, online meetings and making use of social media such as YouTube series or podcasts for marketing have often been done. Hopefully in the future, in line with the same policy made by the government, private employees will also be able to adapt to making use of technology to support their work.

3.2. The Spatial Trend of Workplace Occupancy Due to WfH during the COVID-10 Pandemic

A spatial analysis related to changes in the workplace due to WfH during the COVID-19 pandemic was conducted in this study using Community Mobility data. The data were obtained from the Google Community Mobility Report in CSV format per region (province) for the country of Indonesia, from 15 February 2020 to 21 March 2021. In this report, data on daily average mobility to work in a certain period were used to compare the mobility data before the pandemic. Meanwhile, work from home activities were identified based on the difference between the average daily mobility in the residential area during a certain period during the pandemic against baseline and the data on mobility to the workplace before and during the pandemic. A questionnaire survey through Google Forms targeting respondents from various main cities was also carried out to detail data on mobility between residential areas and workplaces, as well as WfH behavior during the pandemic.

The trend of changing patterns of working from office (WfO) to working from home (WfH) started in the early days of the COVID-19 pandemic in Indonesia. Based on data processed from Google Community Mobility data, there were six periods of change in workplace occupation from the baseline, shown in Figure 1. During the early days of the pandemic, since the first case of COVID-19 was confirmed on 3 March 2020, office activities were still running as usual. Things started to change when the government announced the first local transmission case in mid-March 2020, where the average workspace occupation
fell to $-28.33\%$ from the baseline and was replaced by a trend of working from home. Then, to control the infection rate, the government implemented the PSBB from 10 April to 4 June 2020 in various cities and provinces in Indonesia. At that time, workspace occupation was successfully suppressed, reaching $-34.97\%$ from the baseline. Then, a gradual easing was carried out starting on 5 June 2020 until the new normal phase was entered on 10 January 2021, resulting in an increase in workplace occupation to $-23.78\%$. The results of the evaluation in early January saw an increase in positive cases, so the Java-Bali PSBB was enforced between 11 January and 25 January 2021, where workplace occupation continue to fall to $-31.42\%$. After that, the PSBB method was replaced with Micro PPKM to control specific areas as needed. This phase took effect from 26 January 2021, and made the workplace occupation started to increase to $-28.79\%$. However, the workplace occupation pattern had not yet returned to its baseline condition from before the COVID-19 pandemic.

The changes in workplace occupancy also differed in each province in each period. In general, the trend of working from home had more impact on the formal sector in urban areas. Therefore, provinces with high population density and more cities had a greater percentage of reduction in workplace occupancy. The distribution of workplace occupancy in the early days of the COVID-19 pandemic in Indonesia is shown in Figure 2. Most provinces still had workplace occupancy as usual, except for Bali province, with a leading economic sector in tourism, which lost its occupancy when the pandemic started to spread beyond China to other countries.

The early days of confirmed positive cases due to local/community transmission put a great deal of pressure on the occupancy of the workplace. Although there is no official WfH policy from the government, several private companies have done so with the aim of protecting human resources, or have been forced to close due to loss of consumers as a result of reduction in population mobility. The pressure on workplace occupations grew even more when the government officially issued a large-scale social restrictions/PSBB policy, as shown in Figure 2. The implementation was started in the capital territory of Jakarta, and was followed by other provinces in the following days. However, there are two provinces that did not apply the PSBB officially, but saw a decrease in workplace occupancy by more than 35%: Bali and the Special Region of Yogyakarta. These two provinces are very dependent on the tourism sector, where domestic tourists mainly come from provinces that implemented the PSBB officially, so the decline in occupancy in the two provinces had a double meaning due to public awareness and pressure on the tourism industry.
The transition from WfO to WfH also influenced patterns of movement between regions and within regions. Working from home contributes to reducing traffic congestion, as well as moving work activities from office areas or business centers to residential areas in the suburbs and rural areas. Based on the results of a survey that was conducted with 176 respondents in 55 cities and regencies, which are shown in Figures 3–5, there was a decrease in the number of people still working in their formal workplaces and choosing to WfH in surrounding cities/regencies.

Before the COVID-19 pandemic, as shown in Figure 3, a large number of commuter movements occurred in Greater Jakarta and Greater Yogyakarta. In Greater Jakarta, the main commuter movement came from Bogor Regency and the City of Depok to workplaces in five cities located in the capital territory of Jakarta. Meanwhile, in Greater Yogyakarta, the main commuter movement came from Bantul Regency and Sleman Regency to workplaces in the city of Yogyakarta. This commuter movement caused traffic congestion at peak hours on the main connecting roads between cities. However, the situation changed during the COVID-19 pandemic, as shown in Figure 4. As a result of the implementation of the WfH policy, there was a change in workplace occupancy, which shifted to WfH activities in peri-urban areas such as Sleman and Bantul. The flexibility of WfH also makes workers less attracted to the city center where their original workplaces is located, thereby reducing urban mobility.

Furthermore, the details of changes in workplace occupancy are shown in Figure 5. The decline in the number of workers in Central Jakarta City, West Jakarta City, and North Jakarta City ranged from $-90\%$ to $-130\%$ compared to the baseline before the pandemic. On the other hand, WfH activities increased significantly (>200%) in surrounding cities, such as Bogor, Depok City, Bekasi City, Bekasi, and South Tangerang City. The same thing also happened in Greater Yogyakarta, where WfH activity increased in Bantul Regency.

Figure 2. Distribution of percent change of workplace occupancy during the COVID-19 pandemic (source: [26] and data processing).
such as Bogor, Depok City, Bekasi City, Bekasi, and South Tangerang City. The same thing also happened in Greater Yogyakarta, where WfH activity increased in Bantul Regency.

Figure 3. Distribution of working from the office (WfO) before the COVID-19 pandemic (source: questionnaire survey through Google Forms, 2020).

Figure 4. Distribution of working from home (WfH) during the COVID-19 pandemic (source: questionnaire survey through Google Forms, 2020).

Figure 5. Change in workplace occupancy during the COVID-19 pandemic (source: questionnaire survey through Google Forms, 2020).

3.3. The Use of ICT to Support Work from Home during the COVID-19 Pandemic

In Government Regulation No. 21 Year 2020 on Social Limitation at a Large Scale, neither the minimum nor the maximum age of those who have to apply WfH are stated. However, several institutions such as the Ministry of Industry and State-Owned Companies suggest that those above 45 years old should apply WfH. The results of survey showed
that 57% of 176 respondents were between 23 and 44 years old. Meanwhile, the rest were between 45 and 64 years old. Therefore, they were advised or even obliged to apply WfH. For young people, home is an increasingly important place to use information and communication technology (ICT) and to acquire new digital skills, especially on an informal basis [27]. During the COVID-19 pandemic, people in the productive age group carrying out WfH inevitably learned about using ICT to work at home.

The rule on the implementation of WfH is varied in practice between government and private sectors. As many as 69% of the respondents applied WfH in March, 48% in April, 2% in May, and 1% in June and July. Activities belonging to WfH are mostly similar, namely, running and joining meetings, doing administrative work such as making reports and doing things related to promotions for higher positions, teaching, becoming a resource person for webinars, becoming a webinar participant, doing things related to research, developing digital products, monitoring activities, examining students, doing research studies, analyzing data and publications, and making website content. Meanwhile, in general, those 176 respondents agreed that WH means bringing office work home individually to avoid physical contact. Employees may still be able to run meetings with their colleagues by making use of ICT and applications or other available platforms. Meanwhile, the use of platforms for meetings and messaging such as Zoom, Google Hangouts, Webex, and WhatsApp are intended to maintain the system of WfH. In relation to the media that the respondents follow to update information from their workplace during the implementation of WfH, 35% of the respondents used WhatsApp, 24% used email, 18% used Instagram, 15% used Facebook, 5% used Telegram, 2% used Line, and 1% used internal applications.

Teleworkers need technology and communication, besides needing space and time to work [28]. This was especially true for those who carried out WfH during the COVID-19 pandemic. In the context of the use of ICT, it includes the use of hardware, software, and the Internet. Based on the results of survey, 95% of the respondents used laptops and cell phones as their hardware to support WfH. Only 5% used PCs, tablets, and home telephones. Even though that hardware has to be available at home, the fact is that 83% of the respondents stated that they were their personal belongings, not ones provided by their office. The difference in hardware quality affects the performance of employees due to slow response, quick heating, etc. Those factors can be a constraint on jobs since they cannot be carried out optimally. Besides, some of the respondents felt that WfH made them lose focus on what they were doing because of slow Internet connection and insufficient facilities. At least 60% of the respondents revealed that they agree, internet connection could be a constraint and that they could not focus on work during WfH. In relation to working from home (work–home) and the use of ICT, another study showed that the use of ICT related to work outside work hours is really useful as a tool to balance work and a better personal life [29]. The more people make use of ICT to do work at home, the better they regard work/their family limits as flexible and permeable. Low flexibility and high permeability from the use of ICT at home is much more influential in increasing family–work conflict [30].

In addition to hardware, software is also of primary importance in WfH, such as messenger and virtual conference applications to enable people to meet online. Good Internet access is necessary to support the performance of both the hardware and software. The fact is that those who have to do WfH mostly rely on WiFi, followed by Internet access using mobile data and tethering. However, 20% of the respondents felt that the cost of their mobile phone payment and Internet during WfH increased sharply and they could hardly pay. Meanwhile, 70% of the respondents felt that the cost of their mobile phone payment and Internet also increased, but that the increase was still in the proper limit, and 10% of
the respondents felt that there was no increase in their mobile phone payment and Internet during WfH.

In this case, every administration authority is required to pay attention to what its employees need to access the Internet, like an Internet quota. Based on the survey results, 27% of the respondents stated that they received some aid for an Internet quota from their office, 13% of the respondents received some funds for their mobile phone payments, and 59% of the respondents did not receive anything from their office. This should be taken into consideration for the office where they work, since most of the cost for WfH is allocated to Internet quotas and mobile phone payments (98%).

The application of the WfH system using ICT also affects employees’ increasing electricity bill. A total of 71% of the respondents admitted that their electricity bill increased but was still in the proper limit and payable, 19% revealed that their electricity bill sharply increased and it was hard to pay, and 10% of the respondents said that there was no increase in their electricity bill. Nevertheless, WfH still makes employees focus on their work even though they are not in the office, but not all employees feel there is an increase in the productivity of their work.

In relation to the application of the WfH system and non-optimal work due to bad Internet connection, the survey results showed that 36% of the respondents did agree that the application of a WfH system made them lose focus on their work because of bad Internet connection. Meanwhile, 24% of the respondents considered that they really depended on the situation and condition that made them lose focus on their work due to a bad or slow Internet connection. On the other hand, 40% of the respondents revealed that they did not agree with the statement that the application of a WfH system made them lose focus on their work due to Internet connection. When WfH is applied with ICT support for a bad Internet connection, there are, in fact, several other obstacles faced. They are, for example, limited funding for an Internet quota, limited ICT hardware, and tiredness because of spending too much time on the gadget. WfH can also cause employees to experience problems related to the implementation of ICT [15]. In addition, other problems related to WfH include communication and collaboration with other employees [15]. However, ICT is seen as making it easy to communicate. The same is the case for the use of social media.

There are two sides to the application of WfH: positive and negative. The positive side is cost efficiency and the negative side is changeable work hours. According to a resource person from the Ministry of State Apparatus Empowerment, using an online working system makes work hours longer and makes employees overloaded with different kinds of work. This in fact results in budget efficiency for costs and services, and even the budget in Ministries/Institutions has been cut to handle the pandemic.

Private sectors prefer to use ICT in their work so it is possible to do work wherever and whenever they want. Those with positive opinions about the application of WfH thought that WfH offers effectiveness, efficiency, time savings, productivity, a comfortable atmosphere, and high flexibility. Meanwhile, WfH was considered negative by some of the respondents because they become bored easily, they need a special policy for it, their electricity and Internet bills increase, they cannot work optimally because of not being in the office, and it takes time to adapt to a new habit. The findings related to WfH improving productivity were proved with statistics [8].

In this research, the positive side was also shown with the idea that WfH is seen to be efficient, as stated by 60% of the respondents. Meanwhile, 40% had a different opinion. Most of the respondents who agreed with WfH were those working as private employees whose work does not make direct contact with others. However, they hoped for additional facilities from their office to support WfH. Meanwhile, those who did not think WfH is efficient were those working as government employees whose work requires them to make direct contact with others (such as public services and others). They were also worried that their work was affected. Furthermore, both positive and negative impacts of WfH as stated by the respondents are summarized in Table 1 below.
Table 1. Positive and negative impacts of working from home.

| Classification of Impacts of WfH | Opinions about WfH |
|----------------------------------|--------------------|
| Positive                         | Effective, efficient, time saving, controllable, productive, comfortable atmosphere, high flexibility |
| Negative                         | Bored, in need of special policy, higher bill (electricity, Internet), not optimal at work because of not being in an office, need more time for adaptation |

Source: questionnaire survey through Google Forms, 2020.

WfH is seen to give more benefits, such as cost efficiency, reduced allowance, efficiency in office expenditures (electricity, paper, ink, etc.), reduced pollution, reduced garbage production, and reduced risk of traffic accidents and disease spread. In addition, improving harmony in families can also be created. The performance of government employees is measurable because all those working with technology are recorded and attached with a log that is also measurable. On the other hand, the reduced time to communicate with colleagues is expected to be able to increase employees’ productivity at a distance. This will be achieved with WfH because the work is done without help at home. Meanwhile, from the company’s perspective, cost efficiency can really be achieved by hiring individuals willing to work from home [32]. This may be due to the potential for efficiency by not providing office space for those working from home. The changing opinions on the use of ICT as a means of accessing the Internet for consumptive to productive needs was presented by one of the resource persons from the GIS consultancy in Jakarta.

According to resource person from the Civil Affairs Board in the Special Territory of Yogyakarta, the aspects that need attention are the work structure (human resource, provision, and cost) and suprastructure, such as the need for SPJ (Surat Pertanggungjawaban/document stating responsibility). For example, because an electronic autograph still cannot be accepted in several fields, an authorized official still needs to come to the office to sign certain documents. There are several strategies and adaptations to support WfH or new habits. The first is related to structure. There should be more IT technicians, a process of “change management” with human resources specially assigned to keep up with changes and the implementation of WfH, and budget support for any cost related to changes. Suprastructure includes a policy supporting the implementation of several applications, especially ones involving OPDs (Organisasi Perangkat Daerah/Organization of Regional Units) in the Special Territory of Yogyakarta, city/regency government, and stakeholders of Pentahelix, the collaboration of academics, businesses, communities, government, and media. The presence of a manual for work process changes internally applied in the Provincial Government of the Special Territory of Yogyakarta is, for example, related to the implementation of smart offices. Infrastructure includes increased capacity of the server belonging to the provincial government of the Special Territory of Yogyakarta for online services in the internal provincial government (applications, services for online meetings, e-learning, etc.), from which there are 90 applications for public services. There should be more infrastructure for Internet connection for society, businesses, education, and other activities related to the economy.

The use of ICT, both hardware and applications, to support the effectiveness of WfH is a necessity because it is seen as being able to facilitate employees. A total of 70% of the respondents agreed that the use of ICT made their work easy to do from a distance and they did not face any obstacles. Meanwhile, the rest of the respondents (30%) faced some constraints due to bad Internet signal, and they relied on ICT to complete their work.

Efficiency in travel costs and travel hours was a positive opinion about WfH. Working from home is considered to reduce travel, which results in reduced costs and time to travel. Those involved in WfH are from various kinds of occupations. In this survey, they were government employees (73%), private employees (16%), academics (4%), businesspeople (2%), those working for the government but considered non-government employees (2%), and those working for BUMN (state-owned enterprises) and BHMN (state-owned legal
As many as 105 respondents admitted that they agree that WfH can save travel hours to the workplace. Therefore, they can spend their reduced time doing other work. In addition, WfH can also reduce travel costs to the workplace [8]. Efficiency in travel cost to the workplace was revealed by 143 respondents.

Even though WfH is certainly done at home, it does not reduce the principle of professionalism of the work itself. This is because the administration authority applied work hours as long as 6–9 h during the implementation of WfH. This was shown by the respondents, 83% of whom revealed that their work hours last between 6 and 9 h, 4% of whom revealed their work hours last between 10 and 12 h, and 1% of whom revealed that their work hours last for more than 12 h. Meanwhile, those who revealed that their work hours last between 2 and 5 h were 12%. From the data processing of the questionnaire results, it can be concluded that the application of the WfH system can reduce mobilization from the workplace to the home or otherwise. This can be seen from the questionnaire answers, where 27% of the respondents agreed and 63% of the respondents strongly agreed that the application of WfH system can reduce mobilization from the workplace to the home or otherwise.

As many as 176 respondents agreed that their mobilization to the office was indeed decreasing because of WfH during the COVID-19 pandemic. However, there were 52 respondents whose mobilization was only to the workplace or office, and 126 respondents gave double answers. They included mobilization to the office and to the shopping center and food court, which received decreasing visits during WfH (Table 2).

| Places with Decreasing Mobilization during the Pandemic | Number of Respondents |
|--------------------------------------------------------|------------------------|
| Office                                                 | 52                     |
| Office and shopping center                             | 10                     |
| Office, shopping center, and market                    | 7                      |
| Office, shopping center, market, and food court        | 107                    |

Source: questionnaire survey through Google Forms, 2020.

One of the factors causing decreasing mobilization during pandemic was that the respondents began to get used to using online services to fulfill their needs during WfH. This was stated by 79% of the respondents. Meanwhile, 21% of the respondents did not make use of online services. There are several daily needs available online to support WfH for employees. They include, for example, rice, vegetables, side dishes, vitamins, and fruits. In addition, they are also in need of writing books, printers, hard disks, and Internet quotas.

Because of the reduction in mobilization, the productivity of WfH tended to increase. To find out whether there is a correlation between reduced mobilization and productivity, a chi square statistical assessment was conducted (Table 3).

The hypothesis determined in this assessment is as follows:

**Hypothesis 1 (H1).** There is no relation between the reduction in mobilization and the increase in productivity during WfH ($p > 0.05$).

**Hypothesis 2 (H2).** There is a relation between the reduction in mobilization and the increase in productivity during WfH ($p < 0.05$).
Table 3. Correlation of the relation between the reduction in mobilization and the increase in productivity during WfH.

| Correlations | Productivity | Mobility |
|--------------|--------------|----------|
| Kendall’s tau_b | Correlation Coefficient | 1.000 | 0.2900 ** |
|               | Sig. (2-tailed) | 0.000 | 0.000 |
|               | N | 176 | 176 |
| Spearman’s rho | Correlation Coefficient | 0.290 ** | 1.000 |
|               | Sig. (2-tailed) | 0.000 | 0.000 |
|               | N | 176 | 176 |
|               | Productivity | Correlation Coefficient | 1.000 | 0.326 ** |
|               | Sig. (2-tailed) | 0.000 | 0.000 |
|               | N | 176 | 176 |

** Correlation is significant at the 0.01 level (2-tailed). Source: researchers’ analysis, 2020.

The value of significance described is 0.000, where \( x = 0.95 \) and \( p < 0.05 \). Thus, \( H_0 \) was declined and \( H_A \) was accepted. The conclusion is that there is correlation between the reduction in mobilization and increase in productivity during WfH. The strength of correlation can be obtained from the value found for the correlation coefficient in the Kendall’s Tau and Spearman’s Rho columns, as well. The values described were 0.290 and 0.326, respectively, and therefore it can be concluded that the reduction in mobilization and increase in productivity during WfH are closely related. WfH can in fact increase work productivity because of the reduced mobilization. The time that should be used to travel to a workplace can be used to do other work.

Meanwhile, at the Ministry of State Apparatus Empowerment, ICT support was implemented through the application of an SPBE (Sistem Pemerintah Berbasis Elektronik/electronic-based administration system) in the new work system and Human Resource Management apparatus. The electronic administrative services provided by the government include e-office applications, communication and collaboration applications, and other supporting applications. There are applications related to planning, personnel, electronic manuscripts, and complaints from society. There was a call center for complaints from society and it became the center for all government authorities. In this ministry, a paperless system that could make dispositions from anywhere was applied. Like what has been applied at the Ministry of State Apparatus Empowerment, the management related to employees at the Ministry of Communication and Information also uses the official website gate, where video conferences and meetings using Simaya can be found. In the ministry, the application generally used is an online internal application with which its employees are familiar, and electronic autographs have also been implemented. The hardware used includes smartphones, tablets, and PCs.

According to resource person from IT Consultant-Gamatechno, one of the WfH challenges is related to the work process of every employee. In addition to paying attention to the desk of every employee, there are also several weaknesses, such as internal coordination that should be done in the office, the channel of the documentation process (compiling, revising, reviewing, and validating), problems with work units and infrastructure, and external interaction because the output of their work cannot be separated from interaction with external parties. In general, the policy of WfH that Gamatechno presented has several points, namely, full WfH is applied to management and engineering, half WfH is applied to non-engineering, and scheduling for employees on duty in the office is also applied. In relation to target-based activity, there are several points, namely, the policy of having to be present is not applied, transport benefits are accumulated into the monthly salary, and the schedule of virtual coordination for every coordinating level is implemented.
Then, in relation to the use of applications, Gamatechno is a firm specializing in the field of IT and is used to using various kinds of application in its activities. The applications used are the result of development by Gamatechno itself to support its work. In addition to initially using Zoom, Gamatechno also uses a platform that it developed called AWOR. Like the one the Ministry of Communication and Information uses, the platform Gamatechno has developed is aimed at saving costs and replacing Zoom. The company even offers this platform to the public to support WfH.

In addition to AWOR, which it uses to replace Zoom, Gamatechno also developed Gtcrm for the interest of marketing. There is also a platform called Pakaryo, which is used to give assignments to staff members whose duties are mobile outside the office. Gamatechno also uses other applications called GTFinance and Lunaz. Thus, in general, it is not a big problem for Gamatechno to do work in a remote manner. Gamatechno made some initial policies, such as flexi working hours (the implementation of a flexible work scheme for schedules and work locations), working adaptation (the improvement of office design), and intensive remote working and tool optimization (improvement of integrating all digital tools).

3.4. The Use of ICT, Change of Workplace Orientation, and Sustainable Cities of the Future

Up until the first five months of 2021, the COVID-19 pandemic did not show any signs of ending. This led us to take WfH into consideration. The results of the survey show that when the COVID-19 pandemic ends there are two alternatives: working in the office again or maintaining WfH. As a lesson from WfH during the COVID-19 pandemic, 73% of the respondents revealed that they still want to apply WfH and at the same time also want to apply WfO in the future. To do so, in the future there are still many things to improve, such as providing an application with integrated services that are online, providing network access available throughout Indonesia, improving the digital mindset and work patterns, providing ICT that is cheap and friendly to users, providing cheaper Internet access, making more fixed regulations, and improving security of data. One reason the respondents wanted to maintain WfH and WfO is that the combination of both was seen as more effective and efficient in this case related to time and cost management (transport and allowance), more flexible jobs, and minimizing boredom during work. An increase in productivity during WfH may lead to an assumption that Indonesia is ready for digital transformation.

By applying a WfH system, the use of hardware and ICT applications increases. This means that facing Industry 4.0 and Society 5.0 is a big step for Indonesia. In the results of the survey, it was found that 3% strongly agreed, 32% agreed, 16% did not agree, 44% were neutral, and 5% strongly did agree that WfH is able to increase the speed of Indonesian industry to Industry 4.0 and Society 5.0. This is because of several reasons, such as insufficient infrastructure and quality of human resources. The society did hope that there would be support from the government to accelerate this transformation. The support can be by providing an application with integrated services that are online, making network access available throughout Indonesia, improving the digital mindset and work patterns, providing ICT that is cheap and friendly to users, providing cheaper Internet access, making more fixed regulations, and improving security of data. The same case is also related to the motion of WfH during the era of the new normal. Most of the respondents hoped there would be an improvement in ICT facilities so that the implementation of WfH is more efficient. Meanwhile, in relation to WfO, almost all the respondents had the same idea that health protocols still need to be maintained in any environment.

Sustainable cities in the future must pay attention to these changes. Among them is accommodating the changes that have occurred due to the COVID-19 pandemic. This research shows that there is a change in the workplace and the use of ICT to support jobs. Both have an impact on decreasing the mobility of people. In the future, the concept of working from home is highly recommended for big cities. This can sustain reduced population mobilization, resulting in reduced congestion, reduced movement costs, and
efficiency in terms of working time due to reduced travel time. On the other hand, it can reduce the need for office space. In addition to the massive work from home phenomenon during the pandemic and the strengthening of the use of ICT, it is also possible that the population will move from cities to suburbs and even to rural areas. The use of ICT enables the decentralization [33,34] of office locations, business places, and residences from being concentrated in the city center to moving to the suburbs or even rural areas [33]. There is a spatial effect of ICTs on urban spatial structure, which is demonstrated by the existence of a greater effect of decentralization than centralization [34].

At this time, the use of ICT is also being boosted by the COVID-19 pandemic, which is forcing people to work at home with ICT. During the COVID-19 pandemic, symptoms of population movement from cities to suburbs and rural areas emerged, because people wanted “access to more space” and “easier social distance” [35]. It appears that the WfH concept will be sustainable in the future. A survey conducted by the Pew Research Center in December of more than 10,300 panelists found that 54% of Americans would consider working from home after the COVID-19 pandemic ends [35]. It is possible that in the future it will change the structure of urban space, where the city center has more roles for government offices, central offices, and large-scale socio-economic services. Meanwhile, the addition of small offices and space for shops/retail will not occur, considering that currently there is a strengthening of the existence of virtual offices and e-shopping. There needs to be a proper understanding of the relationship between ICT and urban spatial structure, which is considered very important for city planners [34]. However, in the future, city planners also need to pay attention to changes in the use of urban space by increasing phenomena of work from home patterns supported by the use of ICT. However, for urban planners and practitioners, foresight for contemporary cities presents difficulties when trying to imagine the future to make long-term development decisions [36].

4. Conclusions

Mapping using Google Community Mobility Report data clearly shows changes in the workplace during the COVID-19 pandemic because of implementation of a work from home system. In the case of Indonesia, changes in the workplace are highly visible in the distribution of big cities such as Java and Bali, which are the centers of government and economic activities. The coverage of WfH is that entire jobs that can be done at home with the use of ICT hardware. WfH is adapted to the work pattern and location in a flexible way to in-crease and maintain productivity, effectiveness, and efficiency, and so the continuation of task implementation and the function of an administrative authority can be guaranteed. The lesson from WfH during the COVID-19 pandemic is that the desire to keep implementing WfH beside WfO in the future is very strong. Therefore, in the future there are still many things to improve, such as the importance of providing integrated service applications with an online basis and network access available in more areas in Indonesia. In addition, a digital mindset, work patterns, ICT provision that is more affordable and friendlier to users, inexpensive Internet access, fixed regulations, and data security need to be improved as well. Furthermore, the concept of working from home is highly recommended to be applied in big cities, especially to reduce congestion problems and limited space for movement, as well as the need for work space. The phenomena that occurred related to the COVID-19 pandemic and the change in work place need to be considered in future city planning as well as sustainable cities of the future. This study has limitations in terms of collecting data from a questionnaire survey that only received a total of 176 respondents, although the results are considered to be able to provide an overview regarding WfH and the use of ICT. However, more data collection will certainly contribute to a better analysis. Meanwhile, further research needs to be conducted related to WfH in the post-COVID-19 pandemic period.

Nevertheless, the results of this study indicate that the existence of work from home, which was supported by the use of ICT during the COVID-19 pandemic, has an impact on reducing the movement of the population from home to work. With ICT, most work
can be done at home. The positive impact is on reducing traffic congestion, reducing air pollution, and reducing the need for space for offices. This will lead to a reduction in the burden on cities in the future by reducing the accumulation of activity in the city center. The results show that by implementing work from home, an effort in achieving sustainable cities, especially in terms of urban environmental management and spatial planning, will certainly be easier.

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