

## Abstract

# Study on Women Job at a Time of Digital Transformation (I): Women Job and its Future

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## 1. Introduction

- The purpose of this study is to examine how changing ways of working in different industries that undergo digital transformation will affect the amount and quality of future women employment and to propose the direction which alternatives should head for. Review found it that previous studies largely concluded that women jobs would be reduced. In fact, the WEF shared its idea about concrete numbers of

the job reduction in 2016(WEF, 2016). It would be very difficult to resolve the gender gap in the labor market and shape a gender-equal labor market structure in the future if the current state of gender divide structure keeps unchanged. Bearing this in mind, this study sought to propose changes in women's employment and future preemptive policy tasks through the prediction of the future of women employment depending on digital transformation by specific industry.

☐ Details

- An analysis of internal and external environment and women employment trend in accordance with digital transformation
- Changes in women employment in the manufacturing industry, a traditional industry, in relation to digital transformation
- Changes in women employment due to digital transition of nursing work in the health and medical service industry, which is overwhelmingly occupied by women
- Direction of women employment in the new artificial intelligence industry
- Gender division in the on-demand platform industry in the wake of the network revolution and the future of women employment

☐ Methodology

- Review of domestic and international previous studies:International organizations' recent trends, especially reports from World Economic Forum (WEF) and the ILO, and domestic policy trends.
- Raw data of the Census on Establishments (2008–2018) was employed to analyze employment trends and changes in

women employment by industry over the past decade and to identify important inflection points in the period of digital transition.

- Sections 3 to 6 of the research that cover the manufacturing, the health and medical services, the artificial intelligence, and the platform industry conducted surveys and focus group interview, after according to industrial themes.
- Discussions were held for the development of questionnaires and analysis guidance through an advisory meetings in which relevant companies and their employees, policy-makers and academic experts can participate.
- Policy tasks were comprehensively reviewed through research findings and expertise that were released by policy seminars.

## 2. Summary and Policy Tasks

### A. Changes in women jobs with the introduction of robots in the manufacturing industry

#### 1) Summary

- For the purpose of examining the impact of robot introduction in their production on women employment, a survey was done on 400 manufacturing companies with 30 employees or more that introduced robots. The findings of the survey are as follows. Those firms were manufacturers of electrical equipment, electronic components, computer, video, acoustics and telecommunication equipment, automobile and trailer manufacturing.
- The Census on Establishments (2018), which was referred to as a population, found that the proportion of female workers in three trades was 24.7% on average, and this is close to the

average of female workers in the companies this study surveyed, 23.9%. Distribution of female workers exhibited 27.7% of women took up simple jobs. In the meantime, in the professional jobs group, women accounted for only 7.0%, while 64.4% of the female workers were simple workers. Those aged 50 and higher were 33.1%, the biggest pack, revealing that older women engage with menial jobs. A meager of 7.5% and another 2.2% were team leaders and executives.

- The average tenure of male workers was 6.9 years, and that of women was 3.1. The rate of women's salary to men's was 85.4, while that of professional women and their counterparts was 59.4. These differences show that there is a large wage gap. Overall, the level of women employment is low, and current employment conditions are not good because many women are hired at their old age for short term contract, not technical or professional positions.
- Regarding robot adoption, respondents said that they introduced about 53 robots, and 32.4% of the robots were connected through network. More than half of them answered that they employed those robots at processing process, largely to improve working environment (45.3%) and reduce working hours (35.0%).
- 75.5% of the companies said that the introduction of robots reduced individual's workload. On average, men experienced 29.7% reduction, with women undergoing 19.5%. Men received greater benefits than women did. This gap is shaped by the different natures of jobs between men and women as well as low women employment. One third of the companies replied that they cut staff size, while others maintained their

existing employees through investment, job conversion, job training, and others.

- Though the introduction of robots has the effect of replacing human resources, it may create additional jobs in relation to them. Survey has found that 21.3% of the companies that adopted the robot equipment hired robot-related personnel. Gender-wise, the average number of men who was additionally employed was 5.15, while that of women was 1.0. Adding to that, 41.2% of them said that they did not put any woman on their payroll. In other words, only about one-fifth of respondents hired additional workers due to the introduction of robots, and even that was mostly filled with men. All of these can be explained with the current situation under which robot-related jobs are carried out: Most of those works are covered by floor workers and new job openings after robot adoption are largely handled by existing staff, which does not require additional female employment.
- The study uncovered that the introduction of robots needed robot maintenance and repair personnel, among others. For example, nearly half of the respondents said that they were short-staffed in areas of training, maintenance and repair, and professional operators. This showed that the adoption of robots provided more jobs.
- According to a survey on how well female workers fit for robot-related tasks, more than half of respondents answered that they were suitable for product quality control, operation monitoring, efficiency improvement, defect reduction, and data-related tasks. On the other hand, only 38.0% said that women were befitting to the most demanded positions of maintenance and repair. A meager of 16.3% replied that

women are appropriate for fixing malfunction and breakdown. Put different, there, indeed, are jobs that women can certainly perform, but it is unlikely that this robot-related field job generate jobs for women.

- On the positive side, the introduction of robots has shown a significant effect on reducing working hours and improving the overall working environment. This change is expected to bring benefits of the increase and maintenance of female employment, which is evidenced by the fact that 60.5% of the respondents said the introduction of robots made it convenient for women to work. However, given that companies mainly needed robot management personnel and skilled workers with field experience, it is necessary to nurture such female workforce.
- As there were many small and medium-sized enterprises in the relevant trades, it was difficult to actively utilize education and training to enhance employees' skills. Against this backdrop, many of them preferred to invite outside experts for such purposes.
- The study further analyzed the characteristics of companies that expected positive effects from the introduction of robots in terms of the amount and quality of women employment. The results showed that the nature of the task, the level of organizational culture and the level of CEO's awareness resulted in statistically significant differences. In other words, the more standardized the job is and the better the job rotation is, the more positive it is expected to have an impact on female employment.
- In particular, it was found that organizational culture and CEO awareness had the greatest statistical impact. The less

overtime work, the freer the corporate dining culture, the better the work-life balance, and the longer tenure of production workers, the more positive the introduction of robots was expected to create women employment. In addition, the more the CEOs respect and trust their workers, the more they emphasize the importance of female workers, and the more frequently they communicate with employees, the more positive effect the introduction of robots brings to female employment.

- These results confirm that not only physical changes themselves, including the introduction of robots, but also under what circumstances they are introduced and utilized can have different effects on women employment. Those findings can be referred to in the process of drafting policy alternatives to enhance the effectiveness of the introduction of robots.
- Despite not a few of robot-related support projects have been implemented, most of the respondents said that they had very little experience in utilizing those policies. Only about 23.0% of school-linked human resources development projects most actively took advantage of them. In terms of policy demand, however, there was a high demand for workplace improvement supports, including of process, work line, and work shift, with regard to robot use, following financial support. This requires the reinforcement of related policies, and this will be likely to influence women's employment positively.

## 2) Policy task

- Activate participation in robot support projects

- Put focus on changes in women's weight and job distribution within the traditional manufacturing industry
- Need to check how well government policies reflect requests of fields and if there are any problems with accessibility, in a wish to facilitate production automation and manufacturing innovation.
- Give extra points or preferential treatment items to companies whose employment indicators have improved recently, including about new recruitment of women and proportion of women.
- Facilitate women employment by supporting the creation of a collaborative robot ecosystem
  - More systematize investment in infrastructure, including of test bed, manpower, and standards, for the growth and rapid dissemination of the manufacturing collaborative robot sector.
  - Regarding human resources, reinforce the training for professional human resources for the development of specialized technology for cooperative robots and the re-education of existing employees so that they can well utilize such infrastructure and production sites.
  - Need to establish a safety and certification system that is appropriate for the domestic manufacturing environment.
- Strengthen support for workplace innovation to enhance the effectiveness of women's employment in the introduction of robots
  - To help women work conveniently and increase the possibility of women workforce well utilized through automation, it is necessary to have consultation on workplace innovations, including rearranging production



lines, reviewing safety issues, setting reasonable shift systems and working hours, together with the introduction of robots.

- Provide more professional and effective supports, such as business model change, if deemed needed, at a time of consultation.

○ Reinforce talent nurturing programs tailored to work fields

- Large and medium-sized companies adopts job rotation to use staff who lost jobs after the introduction of robots through education and training.
- Women can use cooperative robots or the robot's teaching through several months of training and field experience, even if they are not engineering degree holders.
- Forecast the need of human resources in consideration of diverse corporate situations by trade or region and draft a long-term workforce development program.
- Contribute to maintaining the employment of middle-aged women who are more vulnerable to replacement than other age groups.
- Opportunity where women can serve other jobs than they formerly did after certain amounts of training even though they do not have engineering degrees.

○ Promote the introduction of robots through win-win cooperation between large and small businesses

- Measures where experts of large companies provide on-site training to small and medium-sized enterprises
- Design the details of the project so that large companies can participate in and support the robot introduction support program.
- Include not just funding aid but also diverse management

supports in various ways, including job analysis, HR management, and consultation on workplace improvement.

※ In this case, it is necessary to consider including indicators related to women employment, including of the improvement on gender job separation or the bigger number of female recruitment.

– Include actions to induce the participation of large companies

## B. Changes in women jobs in accordance with the digitalization of health and medical services

### 1) Summary

- Amid a steady increase in demand for the health and medical services industry, particularly from a super-aged society, the nursing sector, which is overwhelmingly occupied by female, is where not a few nurses stopped delivering their services because of high work tension, poor working conditions, ever-lasting short-staffing and high turnover. The purpose of this study is to investigate how the rapid progress of the health and medical service industry impacts the nursing field so as to know what impacts the introduction and development of technology leaves on the changes in jobs and work tasks and to identify if the adoption has been beneficial to improving labor environment and resolving structural problems in the nursing landscape.
- With the rapid development of artificial intelligence, big data and the Internet of Things and the convergence between sectors, the technology change in the health and medical service industry has been proceeding at an unprecedented pace. However, the introduction of technology has been centered on treatment. Although the standardization of information influences nurses, this is also mainly aimed at

facilitating the extraction of data on patient treatment information. Put different, nursing areas in relation to technological change have not been properly dealt with. Therefore, this study looked into how the technology introduction and change give influence to the 10 different practices, by investigating technologies that are currently in use, can be utilized, or are needed in the nursing field.

1. Electronic Medical Record
2. Automatic IV Pump Injection and Electronic Monitoring
3. Portable IT device (patient checking and monitoring, alerting, etc.)
4. Patient management using wearable devices or the Internet of Things
5. Medication management (stock management, bar code, injection equipment, etc.)
6. Robot utilization (transportation and physical assistance robots, patient transportation, companion robots, etc.)
7. Logistics system (drugs, etc.)
8. Smart bed (prevention of fall, monitoring of patient activity, etc.)
9. Information using kiosks (nurse information survey, patient transportation guide, parental information, COVID-19 caution, etc.)
10. Remote Patient Monitoring

○ Research questions are as follows:

- First, what level of technology is introduced to the field of nursing, and how much change or replacement is made compared with before the introduction?

- Secondly, how much technology change plays a complementary role in nursing work and how much improvement has been made in working conditions?
  - Third, have there been any changes in the size of nursing staff due to technology introduction and development, and is there a possibility that future technological changes will bring job replacement?
  - Fourth, is there any possibility that technology introduction and development can improve the nursing workforce problem?
  - Fifth, why has the introduction and development of technology to the nursing field been relatively slow and what improvement can be made there?
- An online survey was conducted on 402 nurses working at tertiary general hospitals and general hospitals. The investigation examined the current state of technology adoption and the changes in work after the introduction, largely in the nursing field.
- First, it was found that the level of introduction and the degree of replacement of tasks varied considerably depending on the type of technology. In the field of nursing, technologies other than Electronic Medical Record, automatic IV pump, and electronic monitoring, all of which are widely accepted and practiced, differed in terms of introduction depending on the department of work rather than the type of hospital (tertiary general hospital and general hospital). In addition, once the technology was introduced to the nursing field, more than 70 to 80% of works were replaced, which functioned favorably for work advancement and improvement. In particular, it was found that the degree of

replacement, advancement and improvement of work was greater, especially in emergency room, intensive care unit, operating room, recovery rooms, or the nursing and care-giving integrated service, etc.

- Results of the survey on the degree of replacement of work found that administrative jobs, including medical check-up tool management, drug and logistics management, and goods rearrangement, was very high, while the level of safety of tasks, including hand-over, medication administration and treatment, surgery and examination, falls and self-inflicted injuries, and other face-to-face treatment or therapeutic treatment, was low. Those findings were similarly found with both tertiary general hospitals and general hospitals, and there was no significant difference in response from diverse work departments.
- Survey on how much the change of technology plays a complementary role in nursing work found that it has drastically reduced administrative work, records and supplies management tasks, and this was more evident in the nursing care-giving integrated services. On the other hand, respondents who said it lessened patient-treatment works answered that it had a limited influence.
- It has been shown that the technology adoption and development can play a complementary role for ways of doing a work, but cannot be a solution to structural problems. Overall, it can reduce labor intensity, working hours, and exposure to accident risks. Yet, it has a weak effect to the issues caused by structural problems. These responses can be inferred from other responses depending on the way they work. More negative responses to the question

of the possibility of working condition improvement due to changes in technology were found in the three shift working system. In the meantime, the nursing and care-giving integrated services answered to the previous question that the level of positive responses was relatively high in almost all questions. This can be said as an indirect result which shows that structural problems play a more pivotal role even if a same technology introduction and development is applied and brings changes to nursing work.

- Given that labor shortage is cited as the biggest problem for maintaining the level of nursing work, even amidst technological changes and developments, priority should be given to securing more staff as this seems to be a solution to structural challenge that the nursing industry faces. To the question that asks whether technology will replace the workforce in the future and reduce the number of employees, most respondents said the workforce will be in higher demand. They said that the size of nursing staff tended to increase even with better technology compared with their early years of employment. This can be translated into an idea that there would not be a reduction in the field as a whole, even if there could be staff reduction in certain areas as a result of the technology development and change to the nursing field which is undergoing severe labor shortage. If labor force is enough, technology adoption and development will give influence to the scale of the force. At this moment, such impact has not been fully discussed. In addition, the survey investigated that if improving labor intensity or working environment through technology introduction and development would help solve workforce problems caused by

turnover and retirement in the nursing sector. Respondents showed a high percentages of affirmativeness to responses, and technology change was in need to weaken labor tension.

- About 80% of respondents said that, compared with the treatment sector, hospitals showed a low level of interest in the technology introduction to the nursing sector, or hospitals were late for the adoption or did not introduce it in the first place. 63% of them responded that the introduction of necessary technology in the nursing sector would not be helpful in terms of profitability. Put different, compensation for the items in the nursing sector is low, so hospitals invest in treatment items that can improve their profits. In short, the introduction of technology in the nursing field was slow due to economic reasons.
- It has been shown that the decision-making structure related to technology introduction also rarely reflected the opinions of the parties in the field of nursing. 71.1% of the respondents answered that hospitals unilaterally decided, and about 25% of them said that decision was made through council or union. This indicates that nurses are faced with the structure where they cannot actively reflect their opinions in the decision-making process. It seems necessary to have a structure that reflects nurses' governance in determining the introduction and change of technologies that are applicable on the field and directly affect patients and nurses. Most of all, the introduction of new technologies will impact the content and method of work, but also the amount of employment. It seems necessary for the parties to express their opinions on education and training that take place outside of working hours after the adoption of technology. It

is necessary to consider the decision-making structure in which the parties can reflect their opinions on the changing labor process since the adoption.

## 2) Policy task

- Link technology introduction with medical insurance fee
  - Need to think about applying health insurance to needed technological innovation and its adoption.
  - ※ Electronic Medical Record (medical billing system), automatic IV pump, and others spread in conjunction with medical insurance fees
- Revise Medical Service Act
  - Need to discuss future medical law revisions in areas that can change rapidly if institutional support is available
  - ※ Wearable devices, telemedicine, etc. that can collect patient information in real time.
- Expand the nursing and care-giving integrated system
  - When working in the nursing and care-giving integrated system, respondents said that the level of technology introduction was high and that job replacement rate and working conditions were affirmative, compared with other works.
  - Previous studies uncovered that nursing staff size, ward environment, and nursing service quality have improved after the implementation of the nursing and care-giving integrated system.
  - Increased nurse satisfaction and reduced stress and lowered turnover among nurses. Increased patient satisfaction and patient safety indicators, such as revisiting, pressure sore, fall and infection.
  - Government support is needed because of high cost. Currently, it is mostly found in the Seoul metropolitan area.



It is necessary to expand the nursing and care-giving integrated system in connection with local revitalization through preparing a separate budget.

- Raise the penalty criteria for mandatory nursing personnel quota
  - The main reason for the lack of nursing staff in hospital is structural problems that hospitals do not comply with the nurse quota standards.
  - Complying with the nursing staff quota is directly related to nurses' working environment but also to the patient's safety.
  - It is necessary to conduct strict monitoring and strengthen legal punishment.
- Mandate the share of nurse in decision making scheme
  - The 25 members of the Health Insurance Policy Committee under the Ministry of Health and Welfare shall be comprised of the chairperson (Vice Minister of Health and Welfare), eight representatives of insurance policy holders, eight representatives of the medical community, and eight representatives of the public interest in accordance with applicable legal provisions.
  - No member among the eight representatives of the public interest to represent the field of nursing.

#### C. Expand the artificial intelligence industry and women jobs

##### 1) Summary

- In this chapter, the study predicted how the development of artificial intelligence technology and the expansion of it will affect the labor sector, especially the women employment

sector, and explore policy alternatives for positive changes and adaptations. To this end, this chapter aims to take an approach that presents future policy alternatives for women jobs within a comprehensive understanding of the overall discussion of artificial intelligence technology or industry rather than a research approach focusing on the issue of female jobs at this point, considering that fields of artificial intelligence or artificial intelligence itself is an area where continuous change and development will take place in the future. Specifically, this chapter summarizes various discussions on artificial intelligence through existing literature, and checks some of the status of artificial intelligence technology and industry in a detailed manner through quantitative and qualitative surveys conducted on its own.

- Summary of the discussions in this chapter is as follows. The term artificial intelligence, which can be defined as "software and system that function like human brain does" (Yang Hee-tae et al., 2018:ii), first coined in 1955, and has recently gained much attention thanks to its rapid development. As seen in many recent forecasts, the artificial intelligence industry is expected to expand rapidly in the future. Global IT companies have continued to make large investments lately to gain the upper hand in the artificial intelligence industry. In particular, US IT companies are standing out globally in this competition to dominate the artificial intelligence industry. In order to secure competitive edge in the artificial intelligence industry, governments are also announcing various policies to develop the industry.
- Putting its ground on the object of perception and analysis as well as technology needed for its realization, artificial

intelligence can be divided into image and video recognition/analysis, signal recognition/analysis, text and language recognition/analysis, data retention/processing technology, and computing technology (Yang Hee-tae et al., 2018). One of the areas that is prone to be overlooked in AI discussions is data and computing technologies. Although recognition/analysis technologies directly related to algorithms are still important, the easy-to-overlook technologies are also critical. In particular, the data retention/processing technology area is considered to be an area that will inevitably experience significant changes and expansion along with the expansion of the artificial intelligence industry. This area is not only an area that plays a key role in the rapid development of intelligent artificial intelligence, but also an important area in terms of job creation.

- Regarding jobs, it is clear that if artificial intelligence is used in more areas, which functions like human brain, many of the tasks performed by humans, especially simple tasks, are likely to be replaced by it, and at the same time, the demand for related manpower is likely to increase if the AI industry expands. In particular, regarding the latter part, not only highly skilled professionals who develop artificial intelligence but also data-related jobs that require large-scale, low-skilled labor will greatly expand in the future. If the AI industry advances, it is highly likely that new and diverse jobs will be created, including those that can link with or integrate the artificial intelligence technology into various industrial sectors.
- Regarding women jobs, it was confirmed that women took up

a small proportion of an artificial intelligence expert group. In addition, in the context mentioned earlier, previous studies have confirmed that the simple tasks performed by women are much likely to be replaced by artificial intelligence, and that gender inequality in jobs may worsen if they fail to actively respond to new changes caused by the advent of artificial intelligence.

- It was confirmed that Korea's artificial intelligence technology had not so much developed as other advanced countries, and that Korea's IT giants were also relatively left behind in the global competition for the dominance of the artificial intelligence industry. We can see recent cases of AI technology being applied to several industrial areas. In fact, Korea's AI industry is currently in a situation where large companies have actively taken the lead in introducing those latest AI technologies; there are just a few small companies or startups that have technological capability related to artificial intelligence development.
- In this study, we checked the current status of artificial intelligence IT companies except for large companies through a survey. Most of the respondents were in the early stage of growth, so they did not have much sales related to artificial intelligence, and many of the recognition/analysis areas had special technologies in image and video recognition/analysis rather than text, language, or signal recognition. In addition, it was confirmed that data processing was a critical part of artificial intelligence development. The average number of employees was 23.4, while that of the core artificial intelligence technology was 8.2. Furthermore, the gender gap was found in the

composition of the workforce. Respondents said that they are experiencing difficulties in recruiting core technical personnel because of short supply in the labor market. One of the most difficult issues for these companies to run their businesses was to secure professional talents. They also talked about financing difficulty. This study additionally checked the application and utilization status of artificial intelligence technology in the public sector, which has a high potential for policy utilization for the development of the AI industry. One of the findings was that only 6.6% of the respondents said that their companies were using AI technology. The development of artificial intelligence, or the maintenance of AI-related technologies, is often carried out by external private companies, so it can be said that the expansion of the use of artificial intelligence in the public sector has the potential to contribute to the expansion of the artificial intelligence industry in the private sector. The biggest stumbling block to the application of artificial intelligence was the lack of budget and AI application idea, and this implies the support for these points is in need.

- Meanwhile, Korea's national policy for the development of the artificial intelligence industry has been announced several times over the years, and the most recent one, Digital New Deal policy, also includes some AI-related policies. However, the absence of a choice and concentration strategy that fits the current development situation, the absence of an integrated and organic perspective across the artificial intelligence industry, and the absence of a long-term perspective are being talked as problematic.

## 2) Policy task

- Need to provide direct support of business development costs and multi-faceted aid for companies that possess artificial intelligence technology and develop and produce products for the development of the artificial intelligence industry.
- Review ways to increase the utilization of artificial intelligence in all industries
- Need to actively invest in artificial intelligence in the public sector, including public corporations
- Need to strengthen the link between large-scale investment in securing big data and workforce and AI development in obtaining big data.
- Review ways to operate state support and job brokerage platforms operated by socioeconomic entities for pre-treatment and labeling of big data
- Need to have a long-term perspective in nurturing core human resources for artificial intelligence development.
- Prepare for new jobs to be created or derived by the development or advancement of the artificial intelligence industry
- Offer active support for the vulnerable participating in low-skilled jobs related to the pre-treatment and the labeling of big data
- Suggest policies related to women jobs which are key topics of this chapter.
  - Need to design long- and short-term policy for female workforce to more actively participate and resolve male-dominance issue in engineering and data analysis in relation to artificial intelligence.

- Establish a systematic job strategy where women can participate in various related jobs after identifying various jobs within the artificial intelligence industry
- Review various employment policies that can practically lower barriers that bar women with limited careers or middle-aged women from participating in the pre-treatment and the labeling of AI learning big data

#### D. Changes in women jobs due to digitalization of the on demand platform industry

##### 1) Summary

- Housekeeping service based on mobile applications, which is classified as a women job, features work-family compatibility as it enables one to choose time and place. Although this type of labor is not likely to raise one's real income significantly, it meets the need of flexible working for additional income. People find this flexible working attractive as they can use their time as they are pleased to generate income as much as they want, rather than having to work from 9 am to 6 pm. In the case of women, even if they work on mobile application service, they have a tendency of having to work for a set time because of caring duty to their family. Yet, in the case of delivery, which is mostly covered by men, it offers more chances to earn more income than housekeeping service on average. Furthermore delivery service providers can choose working hours for their convenience. Because of this, more people would flock to delivery application labor in the future.
- In the case of housekeeping services, the way they work has

dramatically changed: Smartphone applications are widely used these days, but in the past those services were available through personal introduction, or word of mouth. While there is a big change in how services are delivered, service fees have not been changed much. In the meantime, the delivery service industry has changed tremendously, and the number of gig workers in the industry has increased drastically. As a result, the compensation system is being applied more flexibly to delivery application service workers and is turning this job into a work that can generate high income. Looking at these differences, it is implied that in order for the housekeeping service market to develop into a larger market size in the future, an advanced market strategy that can bring about specialization and better recognition will be in need. It is difficult to expect as big growth as the delivery industry made. As the emergence of AI-based home appliances that help users do housekeeping chores on their own as well as the development of delivery application services and simple-to-cook food are solving many chores, it is not likely to grow on an industrial scale if drastic changes in housekeeping application services are not guaranteed.

- Regarding the work system, housekeeping application services are more established, compared with delivery applications, and work-related guidelines are largely arranged. While both housekeeping and delivery applications have a system in which customers can evaluate service providers, the other way around was relatively rarely available.
- Unfair treatment was more common for housekeeping service workers than for delivery. Among those unfair treatments, the



most common response was that service details were different from what had been told. Most of the delivery service workers responded that they had been ignored. Regarding countermeasures, it is said that there is no effective action. Under this situation, more than half of the housekeeping service respondents said that they did not need legal service for human rights protection, while more than 60% of delivery service providers said they needed.

- Considerable numbers of people working on housekeeping and delivery application services said they needed essential education and qualifications to do their jobs more professionally, and that they should be social insurance policy holders for job security. However, regarding the need to restrict qualifications, the response of delivery application service workers was higher than that of housekeeping application service workers. Concerning the question of different wage system depending on ability, delivery application service workers were much more supportive than housekeeping ones. In particular, regarding the question if they earn enough income, the affirmative response rate of delivery application services doubled that of housekeeping application ones, confirming that individual's capability matters in making money in the delivery application services. On a same note, the results of an in-depth interview (FGI) showed that application proficiency is a crucial factor for high income, implying that young people are better positioned to make more money in the service trade.
- Regarding future delivery application services, more than half of the workers in the delivery application service responded that women also could participate in the job and would be

able to work in greater numbers in the future. This can reduce the current gender gap in the delivery application service labor, although it is now male-dominant sector. In addition, if future delivery application services are carried out by other equipment, including drones, than current modes, such as motorcycles, bicycles, or kick-boards, the current gender difference in the service is likely to decrease significantly. However, it is still necessary to ensure that there is no gender gap in relation to operating such machines.

- In relation to fair trade in mobile application-based services, both of those working in the housekeeping and delivery application service industry had similar subscription rates of about 10%. Yet, the National Pension Service had higher subscription rates among housekeeping service providers, while the industrial accident compensation insurance was higher among delivery providers. On the need for employment insurance and industrial accident compensation insurance, both the housekeeping and delivery service providers were similar in their perception that those policies were in need. However, the need for national pension and health insurance was higher among delivery workers. Half of the housekeeping service providers secured a contract for their service in the form of agreement on terms and conditions, while half of the delivery service providers signed on standard contracts. In response to the question of the relationship with the application company, delivery providers perceived fairness with higher affirmative rates than housekeeping did. Regarding unfair practices, the domestic service providers pointed out information asymmetry,

including about evaluation and wage, while delivery ones singled out a poor compensation system as the biggest problem.

- Satisfaction with application-based housekeeping and delivery service jobs was largely made for the reasons of work autonomy and working hour control. As for the willingness to continue application-based gig labor, more than half of those engaged in the housekeeping and delivery services were willing to continue, with the response of the first being higher than that of the second. Even if they have a complaint about the housekeeping application service, they cannot easily move to other careers. This is because most of them are in older age and thus find it harder to take other options. In the case of delivery service workers, as confirmed in the focus group interview, there is no reason for them to pursue other jobs that do not guarantee career development or job security. But if they amass money earned from the service, they could transfer to other types of jobs.
- As ways to better the quality of service, both housekeeping and delivery service providers agreed on the need for appropriate service cost and the appropriateness of the fees paid to the application companies. In addition, housekeeping service workers said that work intensity should be reduced, and delivery service providers responded that social awareness needs to be raised.
- Regarding what mobile application companies should do, both trades agreed that those businesses should make concrete improvement on pricing standards and play as an active mediator in the event of conflicts with customers. Meanwhile, delivery service workers strongly argued for

addressing issues, including insurance subscriptions, education and training, and employment restraints.

- More than 60% of the respondents said they needed an organization that represents their interests. More than 20% of delivery service workers understood the necessity of such organization. In contrast, only 8.2% of housekeeping workers grasped it. Based on these results, those involved in both housekeeping and delivery service hoped that gig labor would find their places as one of the mainstay labors in society, unlike in the past, and that they would be able to receive the benefit of social insurance, secure the opportunity of vocational training, guarantee the quality of service through qualification scheme, and have a representative organization that advocates their interests. This desire is more specific and systematic among delivery service workers than among housekeeping service workers. In particular, their demand for job training and a qualification system is interpreted to be concrete actions that delivery providers see their job sustainable one, not a path through which they can go to another work.

## 2) Policy task

- The realization of government policy on the housekeeping service industry: The realization of legislation on housekeeping workers act
  - Revise social security and related institutions that protect both laborers and consumers through housekeeping workers act.
    - Ensure that they are qualified for the four major insurances and vocational training and provide the protection related

to industrial safety.

- ※ Need to make it mandatory to apply industrial compensation insurance as in the case of delivery workers.
- ※ Provide vocational ability development programs so that those service providers can move from housekeeping service to other jobs with the help of employment insurance
- ※ Need to make complementary institutional steps with regard to maternal leaves before and after delivery and child-care leave at a time of subscribing employment insurance
- Provide users with professional and reliable housekeeping service which is qualified by the certifying authorities.
- ※ Need to provide vocational training as more devices, equipment, and medicines are available at home
- Arrange legal measures so that the certifying authorities can screen the background of housekeeping service providers for the purpose of user protection
- Strengthen the organization that represents of housekeeping service workers' interest and encourage their participation in it
- Expand the service area that considers the needs of local communities by supporting housekeeping-related social enterprises and cooperatives
- Make it common to use standard agreement so that fair contract can be made with housekeeping application platform businesses
  - Propose appropriate commission guidelines of the government
  - Establish principles in relation to fair contracts
  - Encourage platform companies to share terms and conditions of contracts and make labor agreement (benefits of tax and social insurance, etc.)
- Fortify the change in the traditionally divided areas by gender

and the social protection system for gig workers.

- Four major insurance coverage and social protection systems
  - Make it mandatory to introduce industrial accident compensation insurance and promote the introduction
  - Provide career development programs for delivery service providers to move to other careers, which can be available through employment insurance policy
  - Offer supplementary institutional measures to maternal leaves before and after delivery and child-care leave at a time of subscribing mandatory employment insurance.
- Render it compulsory that delivery workers attend relevant application program through the revision of business owner's training system
  - Develop and implement a standard curriculum by mandating delivery service-related job training to employers
  - Provide the education of "social responsibilities" to business owners of platform companies (campaigns to be needed)
  - ※ Need to train the elderly and women who do not know well digital devices for a better use of mobile applications
- Activate and support the organization that represents delivery service providers' interest.
- Universalize the use of standard contract so that fair contracts are made with delivery platform companies
  - Suggest appropriate commission guidelines of the government
  - ※ Improve a delivery service pricing system
  - Establish principles with regard to fair contracts
  - Encourage platform companies to share terms and conditions of contracts and make labor agreement (benefits of tax and social insurance, etc.)

- ☐ Changes in gender division in the labor market due to digital transformation and development of gender-sensitive policies
  - ☐ Need to design a detailed system for gig labor women to apply for maternity leave before and after delivery and child-care leave at a time when employment insurance is mandatory.
  - ☐ Strengthen digital job training for a better use of mobile application and other necessary items
  - ☐ Reinforce vocational training, largely led by Saeil Center, to close gender division
    - ※ Develop new programs, such as educations for delivery transportation vehicles.
  - ☐ Introduce and continuously monitor gender impact assessment of policies for on-demand platform companies and workers.
  - ☐ Need to establish detailed job-specific statistics for platform workers

#### E. Integrated policy tasks on the utilization of women workforce

- ☐ Need to design ways to foster and utilize future female workforce at a time of digital transformation
- ☐ Produce underlying statistical data for understanding the structure of female workforce across all industries: production of gender-separated statistics

Research areas: Labor•employment

Keyword: Digital, Occupational gender separation, Women's job