Analyzing Opinions of Subscribers about Artificial Intelligence and Manpower Issues in Newspaper Coverages

Aki Nagano*
Independent researcher, Tokyo Japan
ngnak2017@gmail.com

ABSTRACT

The significance of mass media is that of setting news agenda and facilitating the public opinion on the basis of this agenda setting. Thus, the role of mass media is not only an intermediary body for disseminating information to the public, but also influence on the manner, in which people consider and view society. Artificial Intelligence (AI) and manpower issues are deserved to setting news agenda because the issues are critical agenda of the current era. However, the previous literatures pointed out that newspaper coverages mainly covered with the business and industrial aspect of AI issues and less attention has been given to the analysis of specific frames from public opinion. Thus, this study aims to address the opinion of subscribers about newspaper coverage on AI and manpower issues. This study employs two approaches, quantitative and qualitative analysis. The results of quantitative analysis on topic model point to three frames, namely, humanity, society, and robotics. The study then applied these frames as the basis of qualitative analysis. Subscribers are mainly concerned about a lack of humanity and the violation of human dignity due to the implementation of AI. Additionally, subscribers discussed the manner, in which AI is changing the meaning of work. In terms of robotics, opinions were clearly polarized into positive and negative: Positive points mainly viewed the benefits of robots, such as addressing the shortage in labors, eliminating heavy labor, becoming friends with human beings, among others. Conversely, the negative opinions mainly associated with the fear against robots. This study suggested that the government needs to utilize means of implementation to mitigate the user's sense of aversion against AI. Additionally, the government needs to delineate the future society toward co-existence and cooperation between machine and humans.

CCS CONCEPTS

• **Social and professional topics**; • **Computing and business; employment issues, automation, economic impact**; • **Applied computing**; • **Law, Social, and Behavioral Science; Economics, Sociology**;

KEYWORDS

Artificial Intelligence, Manpower issues, public opinion, topic model, newspaper coverages

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1 INTRODUCTION

The significance of mass media is that of setting news agenda and facilitating the public opinion on the basis of this agenda setting. Although the number of newspapers is decreasing after the advent of the Internet, the level of credibility of newspaper remains higher than those of other news media. According to annual surveys conducted by the Japan Press Research Institute (2020), the Japanese evaluated newspapers to hold the highest level of credibility of among news sources at 69.2 points followed by state-run broadcasting news at 69.0 points [1]. Moreover, Internet news ranked fifth at 49.7 points [1]. This ranking indicated that newspapers are the most reliable news source for the Japanese. In Japan, automation risks have become a popular topic in news media since the publication of a report by Frey and Osborne (2017) entitled "The Future of Employment: How Susceptible are Jobs to Computerization?" They examined the impacts of future computerization of the labor market in the United States that approximately 47% of total employment in the United States is at high risk of being automated [2]. Following the publication of Frey and Osborne, the Organization for Economic Cooperation and Development (OECD) addressed the risk of automation for 32 OECD countries and reported that approximately 14% of jobs in OECD countries are highly automatable, especially in the areas of agriculture, construction, and manufacturing [3]. Prior to Frey and Osborne, Arai (2010) posited that white-collar workers face a 50% possibility of being unemployed because AI performs relatively well in conducting work that requires the accumulation of knowledge, routine work, and pattern recognition [4]. Previous studies indicated that manual and routine tasks display high risks of being automated, as such, human beings would be relieved of employment.

Currently, notable AI implementations in Japan are observed in financial and banking services. Three large banks, namely, the Mizuho Financial Group (MFG), Mitsubishi UFJ Financial Group (MUFG), and Mitsui Sumitomo Financial Group (MSFG) are typical examples. According to Hirose (2020), the MFG planning to reduce its number of employees by 19,000 until 2026 using AI [5]. Moreover, MUFG will reduce by 6,000 employees until 2023, whereas MSFG plans to decrease its employees by 4,000 until 2019 [5]. The

replacement of routine works using AI based banking services operated through attrition. Conversely, the AI replacement of manual and routine works is seemingly unsuitable in the production sector. Japan has faced labor shortage due to its decreasing population. The foreign technical intern trainee system (FTITS) address labor shortage in production sites such as agriculture, constructions, and manufacturing. However, the FTITS encounter many problems, such as communication, human rights abuse, low wage, outrageous alteration of work, scarce support systems, and long working hours. This evidence presented that difference between the past hypothesis and reality is gradually becoming clear. The critical public debate that intends to confront AI and manpower issues and the role of mass media provides sources for discussing such issues. Moreover, the role of mass media is not only an intermediary body for disseminating information to the public, but also influence on the manner, in which people consider and view society. Although automation and manpower issues are critical agenda of our era, less attention has been paid to the analysis of the specific frame based on public opinions. Thus, this study aims to frame subscriber's opinions in newspaper coverage regarding AI and manpower issues.

2 RELATED LITERATURE

Surveying public opinions regarding government policy have accumulated in various fields such as political science, communication studies, social marketing, and media studies. This is also relevant to the New Public Management (NPM), which brought the customer-oriented strategy into public services. Although NPM had many critiques about the implementations because of its neo liberalism approach, one contribution was to promote public engagement between government sector and citizen sector. Then, public survey was introduced to evaluate citizen's satisfaction regarding government services. Alternatively, the recent development of emerging technologies made possible to cooperate with IT technology in the government sector [6]. Some scholars regard this phenomenon as the post NPM regime in terms of digital-era governance [7]. Chaston (2015) posited that advancement of Information Technology allowed public sector entities to provide more interactive and high-quality multimedia content and the public sector made available additional services and began to build closer relationships with both other organizations and the public [8]. Additionally, the Web 2.0 technologies encouraged social interaction between government and citizens, specifically Social Networking Services (SNS) playing the critical roles. Linders (2012) posits that the role of citizens is transformed from customers to partners in the age of social media, Web 2.0, and ubiquitous connectivity [9]. This idea is also associated with open government principles, which consist of transparency, integrity, accountability, and stakeholder participation. An open government encourages citizens to become more informed and involved in governance [10] and to promote effective public governance through information and communication technology. Government interacted with employees, other agencies, and citizens to obtain their views on services, service design, new ideas, policies, and plans [8]. According to Zhou et al. (2017), the detection of topics and opinions disseminated via social media facilitates the identification of emerging societal trends and enables the analysis of public reactions to policies and business products [11]. They developed a new method of integrating opinion mining and context-based topic modelling to analyze public opinions using social media [11]. They posited that this new method of opinion mining would enhance systemic feature and enable the discovery of hidden patterns in datasets [11]. Du et al. (2019) performed literature reviews on social media text mining applications from an environmental perspective, especially emphasizing sentiment analysis [12]. They suggested several avenues for future research such as multilingual domain-specific social media mining, enhanced geo-location tagging with advanced demographics analysis, focusing on subtle issues such as irony and sarcasm in social media, examining the veracity of information disseminated on sensitive subjects, and crowdsourcing research in conjunction with social media mining [12]. Hubert et al. (2020) developed a Twitter application tool to analyze interactions between government, arguing that governments have widely adopted social media to support public policymaking through communication [13].

Social media are not the only channels to offer the function of information sharing. Traditionally, this role was discharged by newspaper companies. As noted above, the Japanese have confidence of newspapers as reliable news sources. Newspaper companies have constructed rich digital archives and the accessibility of such digital data also informed the present study's decision to use newspaper coverage as its data source. Brennen et al. (2018) argued that news coverage provides space and resources to make sense of and address pressing public discussions on AI [14]. The findings demonstrated the coverage of AI, which is mainly focused on industry concerns, products, and initiatives instead of commercial concerns [14]. This notion suggests that the coverage undercuts a wider understanding of AI as a public issue [14]. Brennen et al. (2018) suggested that engagement from various stakeholders required to provide alternative views [14]. Chuan et al. (2019) analyzed the coverage of major American newspapers on AI through content analysis [15]. The authors noted that the topic of business and economy dominated the newspaper coverage about AI [15]. Moreover, they found that the topic of ethics has been covered in recent years, whereas the benefit of AI was abundantly discussed instead of the risks [15]. Vergeer (2020) aimed to understand news reports on AI featured in national and regional newspapers in the Netherlands from 2000 to 2018 [16]. The author found that recent AI articles are more prominent among tech giants and fake news instead of robotics [16]. The author pointed out that religious newspapers released less publications on topics related to AI [16]. So far, the previous literatures pointed out that newspaper coverages mainly addressed the business and industrial aspect of AI issues [14-16] and the public opinions are not overly considered as academic agenda.

3 METHODS

3.1 Analytical framework

This study analyzed the frame through opinions of subscribers regarding AI and manpower issues. Entman (1993) proposed that frame analysis examines the selection and salience of certain aspects of an issue by exploring images, stereotypes, metaphors, actors, and messages [17]. Additionally, Matthes (2009) noted that frame analysis features two basic genre of definitions: The first denotes frames

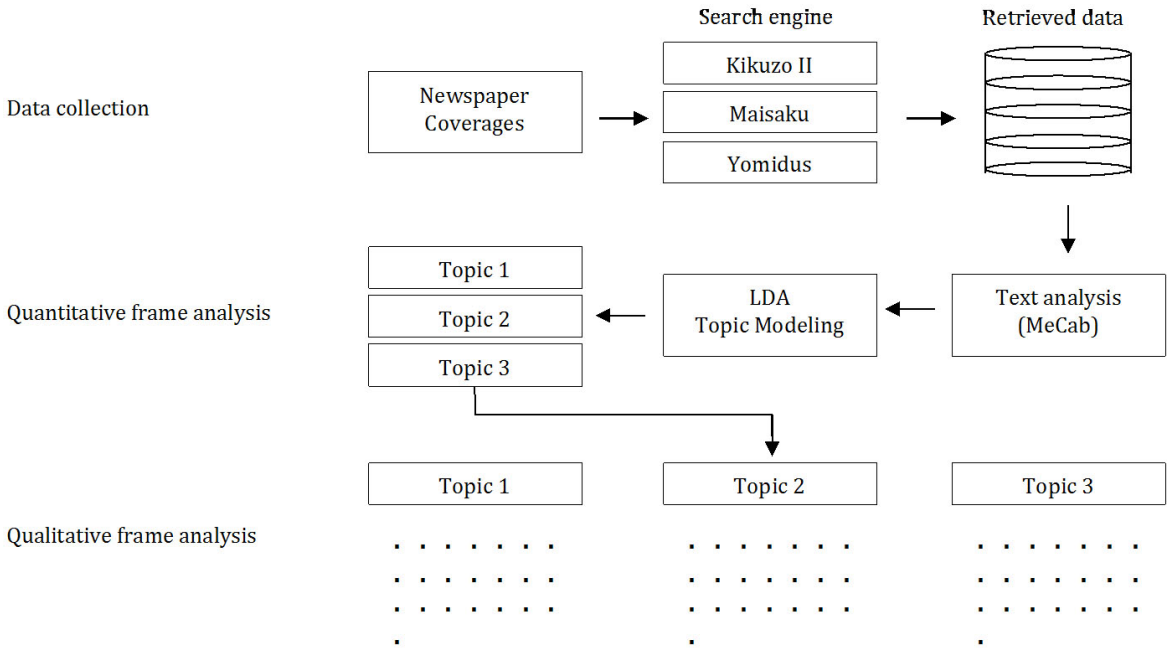

Figure 1. Analytical procedure for quantitative and qualitative analysis

Figure 1: Analytical procedure for quantitative and qualitative analysis

as principles of selection, emphasis, and presentation composed of less tacit theories on objects, events, and importance [18]. The second intends to refer to what frames generally do, such as defining problems, making moral judgments, and supporting remedies [18]. This study focuses on the first definition to analyze aspects considered important by citizen regarding AI and manpower issues.

This study developed a method for applying qualitative and quantitative analyses to address the topics framed by subscribers. Figure 1 presents the analytical procedure for qualitative and quantitative analyses. In general, the analytical method was applied to qualitative or quantitative analysis, but not both. Qualitative and quantitative analysis have their pros and cons. For example, the pros of qualitative analysis are that it provided detailed information, whereas its cons are the lack of understanding of comprehensive pictures. Conversely, this study applied the topic model for quantitative analysis. The pros of the method are that it can enable the analysis of the potential meaning of entire documents based on the frequency of words in the document. The disadvantage is that it is extremely compressed such that it loses the detailed story underlying the document. Therefore, this study initially examines quantitative analysis to delineate the entire picture and uses qualitative analysis as a supplement to provide detailed information. Specifically, in quantitative analysis, this study applied topic model analysis to obtain the opinions of subscribers regarding AI and manpower issues. Next, qualitative analysis identifies key features of frames on the basis of quotes from subscribers.

3.2 Data collection

This study retrieved data regarding the opinions of subscribers to Asahi Shinbun, Mainichi Shinbun, and Yomiuri Shinbun, which national newspaper has different political tones. Specifically, Asahi Shinbun is relatively viewed as a liberal newspaper company, whereas the Yomiuri Shinbun is more conservative than others. The Mainichi Shinbun lies in the middle between Asahi and Mainichi. This study integrated the three newspapers to collect data and used Boolean search using the search words “AI” AND “labor,” and “AI” AND “unemployment.” The search period was set from 2013 to 2021. During this period, people have increasingly paid attention because of third AI boom. In Asahi Shinbun, opinions of subscribers are published under the category “opinion,” which consists of opinions from lay people, professionals, and news-paper editors. In this case, professionals are mainly university professors and executives in companies; however, the abovementioned issues are mostly outside their scope of expertise. Therefore, this study collected data from lay people and professionals. Only opinions from subscribers to Yomiuri and Mainichi were retrieved as data.

3.3 Basic Information

Table 1 is a summary of the basic information about the retrieved data. The total number of retrieved data was 68. The major contributors (n>=2) were university professors (n=20), Table 1 is a summary of the basic information about the retrieved data. The total number of retrieved data was 68. The major contributors (n>=2) were university professors (n=20), businessmen and businesswomen (n=10), inoccupation (n=8), housewives (n=3), writers (n=3), high school students (n=2), and part-time workers (n=2). The ratio of the subscribers according to gender was 25% (female) and 75% (male). The average age was 55.2 years. Figure 2 presents the change in the number of retrieved data from 2013 to 2021.

Table 1: Basic statistics

	Value
The number of retrieved data	68
The major contributors	
University professors	20
Businesswomen and businessmen	10
Inoccupation	8
Housewives	3
Writers	3
High school students	2
Part-time workers	2
Others	20
Gender	
Female	25%
Male	75%
The average age	55.2

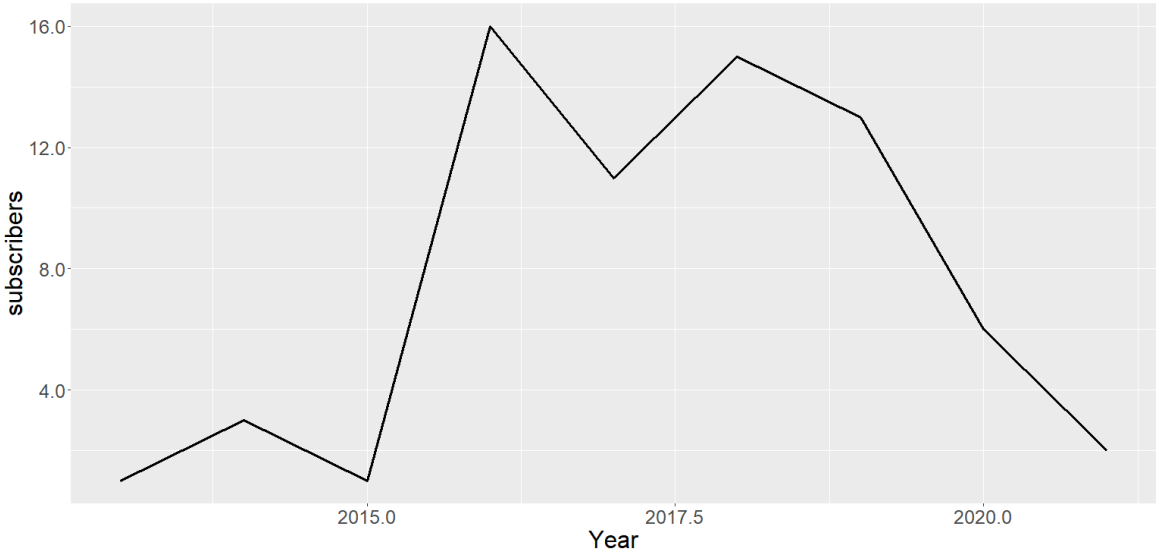

Figure 2: Number of opinions from subscribers

The figure indicated that the highest number of opinion of subscribers is 16 for 2016, because Yomiuri Shinbun released a special issue on AI and labor. Since 2019, the number of opinions from citizens rapidly decrease. This change was anticipated due to changes in the interests of editors and citizens from AI to the pandemic.

4 RESULTS AND DISCUSSION

4.1 Quantitative and qualitative frame analysis

This study applied the topic model to analyze opinions from subscribers regarding AI and manpower issues in newspaper coverages. This study uses MeCab for Japanese text analysis. MeCab is an opensource morphological analysis engine, which was developed by Taku Kudou [19]. Topic model is a generative statistical model used for sets of observations to be explained by unobserved groups that describe why some portions of data are like others [10]. Especially, the Latent Dirichlet Allocation (LDA) denotes a mixed method approach that requires to set the parameter, which was based on the perplexity analysis. Saitoh (2018) noted that a low perplexity indicates a good probabilistic model [21]. Therefore, on the basis on perplexity analysis, this study set the parameter to k=3. Figure 3 presents the results of the topic model. This study identified three frames that relatively indicate the opinions of subscribers about AI and manpower. The following texts provide a summary of the interpretations of the three frames:

Topic 1: Humanity

Topic 2: Society

Topic 3: Robotics

Next, this study then examines qualitative frame analysis to discuss the opinions of subscribers regarding AI and manpower

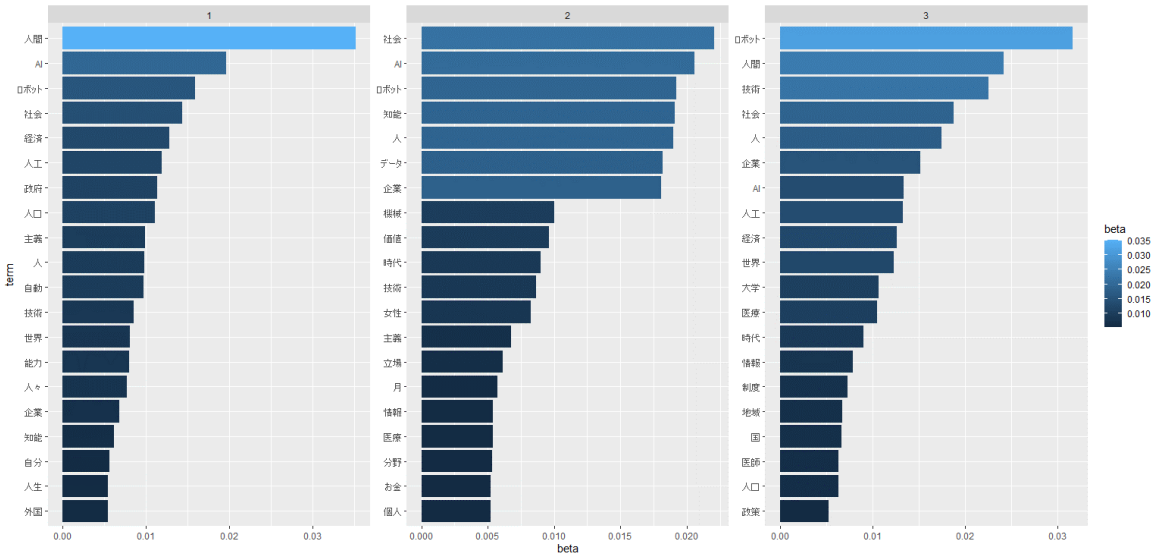

Figure 3: The results of topic model

issues. Then, this section conducts an qualitative analysis based on the results of the topic model, that is, humanity, society, and robotics.

Topic 1: Humanity

Understanding about AI, robotics, and automation is inextricably linked to the understanding of humanity. The advancement of AI has provided opportunities for thinking about philosophical questions such as real meaning behind being human, the role of humanity in the machine era, the capability of humans, and co-existence machine. Although IT workers are fully engaged at every stage of designing an AI current system, several readers are concerned that AI will soon develop by itself without human intervention. Additionally, other readers expressed that AI issues are related to the principles of human dignity. AI technology enables the revelation of individual personalities; moreover, standing in the way of mass surveillance is crucial. Below are opinions of subscribers related to humanity issues in newspaper coverage.

If humans are extremely reliant on AI and robotics, people will no longer needed other by people, and the value of human existence and the meaning of life will diminish (High school student, 2016)

AI does not completely analyze humanity. AI profiling, which uses website history for prediction, jeopardizes individual dignity, which must be respected. Humans have the right to claim the results of AI analysis (University professor, 2016)

We have automated many tasks as a result of the quest for convenience, while we are humans who think for ourselves. I do not want AI to invade humanity (Inoccupation, 2017)

The important thing is to keep learning, not what you learn. AI will program by themselves. What does seem sure that future work will require even more humanity (University professor, 2018)

Topic 2: Society

AI and manpower issues are changing the meaning of value of work and the way people live. These provoke a discussion about what we delineate the future society. There are some debates about coping process of automation risks such as the introduction of a basic income, short term labor, a robotics tax, and educational improvements in various media. Furthermore, some subscribers argued for needs of ethics for users. Besides, the system cannot keep up with technological innovation. These topics are often discussed in mass media, but government rarely executed. Moreover, the ethics and institutional issues related to AI and manpower require national consensus as well as international consensus. Below are opinions of subscribers related to society issues in newspaper coverages.

Humans are anxious about AI, because human beings have never been threatened by other creatures with intelligence. AI is just a tool and only makes life more convenient. If AI does bad things, then humans are involved. Therefore, human ethics using AI becomes important (University professor, 2017).

There is growing concern that human work will eventually be replaced by AI and robots. We should rethink what we are paying for. If society recognizes the value of human work, then the opportunities for human work are protected (Café owner, 2018).

In the advancement of an aging society, the number of chronic patients is increasing, which is anticipated to lead to a serious shortage of medical doctors in rural areas. Introducing ICT and AI technologies are necessary to mitigate the inter-regional disparity of medical services (Medical doctor, 2018)

I suggested that AI tax should be collected as a purpose tax from companies and capitalists who are making profits using AI in order to use it as a financial resource for basic income (Lawyer, 2019)

Topic 3: Robotics

The use of robot clearly polarized the opinions of subscribers. Following Craig (2018) [21], Brennen et al. (2018) described media coverage associated with AI as the “utopian dreams of workless futures and eternal life, or dystopian nightmares of robot uprisings and the apocalypse” [14]. Based on the opinions of subscribers,

positive points mainly viewed the benefits of robots, such as addressing the shortage in labors, eliminating heavy labor, becoming friends with human beings, among others. Conversely, the negative opinions of subscribers associated with AI mainly suggested the fear that human workers will be replaced by AI, which can lead to unemployment. In addition, people are concerned about losing motivation in life because of losing a job. Another negative opinion was related to the psychological barrier of robots. In Japan, the rapid aging population has impacted labor shortage. Especially, elderly care service is one of the businesses that present problems. The government focused on care services that operate on AI and robotics, whereas people tend to resist care provided by robots. Below are opinions of subscribers related to robotics issues in newspaper coverages.

We hope that a robot can notice the subtle movements of physical condition, cognition, responds of users, and become a partner of care recipients and workers in welfare services (Caregiver, 2016)

It is necessary to use robots well to reduce the burden on workers in the fields of heavy labor and contribute to labor shortage such as healthcare, agriculture, and construction. (Businessman, 2016)

I think it is very important to have a relationship of trust with the person who is supposed to be the caregiver. The main body of elderly care should be a warm-hearted person, and the robot should play a supporting role (High school student, 2016)

I will be confused if a robot that stands as a cashier at the supermarket, I always go to say hello. The shopping calculation will not be wrong, but it seems that some sort of linkage will be weakened. No matter how good the robot is, I do not think we can communicate with each other (Housewife, 2016)

Currently, the acceptance of foreign workers is supported due to labor shortages, but I think the progress of AI and automation technology will lead to overwhelmed and unemployed workers in the future. I want to ask politics to revise policy decisions regarding the acceptance of foreign workers and not only look at the immediate future but also think of the far future (Businessman, 2019)

5 CONCLUSION

This study examined the framing of opinions of subscribers about AI and manpower issues in newspaper coverages. The results of the topic model in terms of quantitative analysis demonstrated that the opinions are framed along the topics of humanity, society, and robotics. The findings of humanity illustrated that subscribers are concerned about the violation of human dignity due to the implementation of AI. The findings of society suggested that subscribers discussed AI and the manner, in which it is changing the meaning of work. In terms of robotics, opinions were clearly polarized. The positive perspectives mainly point to the benefits of robots, whereas negative opinions refer not only to losing jobs, but also to the fear of motivation in life. This study suggested that the government employs the means of implementation to mitigate the sense of aversion of users against AI and robots. Additionally, the government delineate the future society toward co-existence and co-operation between machines and humans.

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