Effect of Social Media on Knowledge Work

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Abstract—This paper examines the impact of social media on knowledge work. It discloses and highlights which specific aspects, areas and tasks of knowledge work can be improved by the use of social media. Moreover, the study includes a survey about higher education students' viewpoints in regard to the use of social media as a means to enhance knowledge work and knowledge sharing. The analysis has been conducted based both on empirical data and on discussions about the sources dealing with knowledge work and how it can be enhanced by using social media. The results show that social media can improve knowledge work, knowledge building and maintenance tasks in which communication, information sharing and collaboration play a vital role. Additionally, by using social media, personal, collaborative and supplementary work activities can be enhanced. Based on the results of the study, we suggest how knowledge work can be enhanced when using the contemporary information and communications technologies (ICTs) of the 21st century and recommend future directions towards improving knowledge work.

Keywords—Knowledge work, social media, social media services, improving work performance.

I. INTRODUCTION

NOWADAYS, knowledge work is the leading type of work in developed countries. Davenport [6] defined knowledge as the core of knowledge work and claimed that based on this capital knowledge, workers can generate additional knowledge as their major outputs. Teachers, lawyers, engineers, and accountants are some examples of typical knowledge workers. Moreover, the main aim of knowledge work is to generate additional knowledge for people, organizations and markets. The competitive advantage of a knowledge organization is based on the skills and performance of knowledge workers [25].

Social media have increased our capability of communicating, coordinating and cooperating with others. It is one of the main sources when aiming at improving knowledge work productivity. According to [23], knowledge work and knowledge in general are directly connected to organizational performance. The use of social media has drastically expanded over the last decade. More specifically, social media constitute an integral part of modern society as they surmount distance and time barriers and have tremendously changed the way people interact, communicate, share content and carry on with their everyday lives [20]. There is evidence that social media and computing have a positive impact on knowledge work [3]. However, more detailed information is needed in order to better understand how social computing and social media support knowledge work.

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The main aim of this study is to examine how social media have affected the different aspects of knowledge work. This study provides information in regard to the basic areas of knowledge work in which social media can be utilized. In addition, it reveals and highlights in which of these specific areas the use of social media can have the most positive impact and achieve more benefits.

In the following sections, we present the background of this study, describe the concept of knowledge work and go over relevant literature. Further below, we analyze the process of our study, the conduct of our experiment and the methodology followed and the structure of our questionnaire and our sample. Finally, we analyze and present our results and in the discussion section we suggest ways and tools to enhance and maximize the performance of knowledge work.

II. KNOWLEDGE WORK

Knowledge can be described as the fuel for innovation [24] and as the main focus of the third wave of human socio-economic development [29]. It is an elusive concept and every discipline realizes knowledge in its own way [31]. More specifically, knowledge is the ability of each individual to make distinctions in a collective action domain to deal with material or social phenomena, based on a given context, theory, a subject matter and/or a set of principles [4], [30]. Since knowledge is essential in order to achieve enhancement of organization efficiency and innovation, knowledge management is of great significance and highly connected to the business value. Knowledge management refers to the business value that organizations can generate by improving the ways in which they create, retrieve, store, transfer and effectively apply knowledge [21]. Knowledge management can be related to three dimensions of knowledge work namely processes, enabling contexts and content [22].

Drucker [10] coined the term knowledge work in his book "Landmarks of Tomorrow". According to [17], the definition of knowledge work is not clear since it can be described with at least three thematic definitions that is i) as a profession, ii) as an individual characteristic and iii) as an individual activity. In addition, they suggest that knowledge work is best understood as a dimension of work. Knowledge work focuses on non-routine problem solving which requires both convergent and divergent thinking which is based on discriminations which are established on an individual's knowledge, crowd wisdom, ongoing practices or the observed connections in a dataset [21], [27]. Moreover, [11] described today's employees as "knowledge workers" who primarily work with knowledge and information to generate new knowledge, theories and concepts in the workplace. Due to the fact that knowledge workers have high degrees of expertise,

education or experience, their jobs involve creating, distributing and applying knowledge to come up with the innovations and devise the strategies that keep their organization competitive [7]. Furthermore, according to [8], knowledge work consists of job specific tasks, knowledge building and maintenance tasks, as well as work management tasks. Job specific tasks are a knowledge worker's core tasks according to a work contract or a superior's guidance. Knowledge building and maintenance tasks are tasks in which an individual creates value for herself/himself and maintains existing knowledge. The purpose of work management tasks is to ensure that mental work resources are efficiently allocated to right tasks in reference to the overall work plan. Moreover, they divided job specific tasks into four activities. These activities are knowledge acquisition, designing, decision making, and communicating. Moreover, they divided collaboration tasks into four activities that are coordinating and scheduling work, sharing information among group members, managing concurrent activities, and incorporating work. Finally, they also divided supplementary work into four activities namely creating input data, formatting documents output data, filing and retrieving documents and data, and receiving and distributing information. They also developed a model in which major constraints on knowledge work were presented and they suggested which strategies should be followed in order to overcome them [9]. The suggested strategies aim at improving knowledge work efficiency by trying to reduce specific constrains (see Table I).

TABLE I
EFFICIENCY-BASED PRODUCTIVITY IMPROVEMENT

Interface time and errors
Process learning time and dual processing losses
Time and effort to structure tasks and format outputs
Nonproductive expansion of work
Data and knowledge search and storage time and costs
Communication and coordination time and costs
Losses caused by human information overload

III. LITERATURE REVIEW

Due to the tools social media offers and with the widespread rise of its popularity, many studies are carried out looking into the ways social media can affect and improve knowledge work, management and sharing.

Hemsley and Mason [15] quoted that the dominant knowledge management paradigms and models need to be revised as they are not suitable and efficient for the knowledge environment owing to the widespread rise of social media. In their study, they examined the impact of social media on three dimensions of knowledge management as well as how social media can change the way organizations think and value knowledge, knowledge management and knowledge management systems. Additionally, to disclose the roles of social media in the knowledge creation-dissemination process, they used and analyzed viral information and events. Furthermore, their study showcased that social media can promote and facilitate knowledge creation, selection,

acquisition and sharing helping, thus, create a new dynamic knowledge ecosystem within which organizations should operate. Finally, they highlighted that viral events may be the stimulus to forming and maintaining interest networks and suggested that structuration theory may be an especially fruitful approach to understand the dynamic interrelation among social media, knowledge, sense making and social networks. Roblek et al. [28] examined the importance of social media and Web 2.0 for improving organizational development, facilitating the adaptation to an ever-changing business environment and enhancing operation management. Moreover, they investigated critical factors that influence the role of social media in organizational change and proposed a model to generate value in knowledge-based industries which was based on the concepts of innovative economy, social media and knowledge management. Finally, they went over when and why knowledge-based industries prefer using the inexpensive and increasingly more popular social media to using traditional media. Ferro and Zachry [14] investigated how the use of publicly available online services such as social media, forums etc. affected knowledge workers' engagement and involvement in communicative practices outside their workplaces. According to their results, the majority of knowledge workers had been using social media and other publicly available online services for at least some part of their work. Thus, it is evident that these services used to accomplish work tasks have become an established work practice. Leonardi [19] went over the importance of implementing the emerging theory of communication visibility in the knowledge economy. With a view to exploring how knowledge sharing in organizations might be formed by increasing communication visibility, he conducted a qualitative study on the implementation of a new enterprise social networking site in a large financial services organization. The results of the study demonstrated that the increased communication visibility associated with the social networking site enabled users to become more aware of what and whom their coworkers knew. In addition, this led to the decrease of work duplication, the development of more innovative ideas and the enactment of fundamental changes regarding work activities. Finally, he highlighted the need to shift from a problematic search to a more proactive aggregation of content. Razmerita et al. [26] examined how social media can support the management of two dimensions of knowledge, namely personal and collective, as well as their potential synergy through the adoption of social media. The findings of this study indicated that even though social media can support both dimensions of knowledge, its deployment and adoption in an organizational context remain a challenging task due to organizational and individual factors. In order to investigate how internal or external social media technologies are being used for knowledge sharing during work or for professional development, [12] conducted an exploratory survey. In total, 299 individuals from enterprises and institutions operating in Hungary participated in their online questionnaire. Based on their results, the usage of external social media was not a first option for the Hungarian

organizations but a high proportion of employees utilized the specific tools when they were allowed to do so. Finally, they provided recommendations for applying social media for work purposes in order to enhance knowledge sharing and foster employees' motivation. Zhang et al. [33] analyzed the challenges and opportunities that social media bring for organizational learning, how social media support knowledge management as well as the importance of transition from e-learning to social-learning. They aimed at describing the fast-changing and long-developed studies on social media and knowledge management. Particularly, they used CiteSpace to map out relevant studies and the important references which played a major role in leading the trends of social media-supported knowledge management development. They quoted that organizations, which utilized social media, would facilitate and improve their knowledge management process and encourage employees to promote collaborative learning behaviors by using social media. With a view to identifying employees' intentions of adopting social media for knowledge sharing, [5] conducted a study to detect and measure relevant factors which were based on expectancy theory and technology acceptance model. A total of 315 employees within one organization participated in their survey. Based on their results, self-efficacy is significant for usage intention and knowledge sharing is improved by using social media. Moreover, to assess the importance of knowledge exchange into decision making while adopting social media tools, individual differences should be taken into consideration. Finally, they recommended that individual assessments should be carried out and according to their existing knowledge and skills, and needs tailor training sessions should be organized. Wang et al. [34] explored the social media underlying mechanisms that can offer value at the workplace as well as how employees' work performance is influenced by the use of social media, when media synchronicity and the social capital theory are being integrated. They quoted that social media can improve knowledge transfer and work performance by facilitating the promotion and formation of employees' social capital which is based on network ties, shared vision and trust. Finally, they quantified social media benefits for organizations and provided guidelines for its implementation in the workplace. In their systematic literature review, [1] went over the current state of research in regard to the use of social media for knowledge sharing. More specifically, they identified and analyzed 103 relevant studies over a period of six years from 2010 to 2016. They studied various social media activities that can be used for knowledge sharing, the different contexts in which they can be applied as well as the theoretical approaches of their application. In addition, they went over the various challenges and limitations that can arise in these cases.

IV. STUDY

A. Experiment

We conducted our experiment based on the framework created by [8]. Thus, our basic research questions were:

- How do you rate the improvement of work productivity in general when you use social media services?
- How do you rate the improvement of your basic work productivity when you use social media services?
- How do you rate the improvement of knowledge building and maintenance tasks (learning) when you use social media services?
- How do you rate the improvement of work management tasks when you use social media services?

Respondents answered these questions according to the Likert scale (1 to 5), in which 1 was unimportant (or extremely bad) and 5 was very important (or extremely good). In addition, with a view to achieving deeper understanding, we asked the following two open-ended questions:

- Describe your experiences about good and bad productivity when you use social media services.
- How do these services improve or reduce knowledge work productivity?

We also studied the basic work activities through the following questions:

- How do you rate the improvement of acquiring knowledge when you use social media services?
- How do you rate the improvement of designing activity when you use social media services?
- How do you rate the improvement of the decision-making activity when you use social media services?
- How do you rate the improvement of the communicating activity when you use social media services?

Regarding the study of collaborative work activities, the research questions were as follows:

- How do you rate the improvement of coordinating and scheduling work activities when you use social media services?
- How do you rate the improvement in sharing information among group members when you use social media services?
- How do you rate the improvement in incorporating work with other people when you use social media services?

Finally, we asked our respondents to answer some additional questions so as to rate supplementary work activities. The questions were as follows:

- How do you rate the improvement of creating input data (writing a letter, a report etc.) when you use social media services?
- How do you rate the improvement of formatting documents output data (formatting layout of documents and presentations for example) when you use social media services?
- How do you rate the improvement of filing and retrieving documents and data (document management on your own computer or server or cloud) when you use social media services?
- How do you rate the improvement of receiving and distributing information (communication through email for example) when you use social media services?

B. Questionnaire Structure and Sample

For this study, we created a questionnaire which contained four major items from the knowledge work character which the respondents rated based on the Likert scale. In addition, in order to acquire deeper understanding of their reasoning, the two above mentioned open-ended questions were set. In total, 59 higher education students (21 females and 37 males) whose mean age was 25 (range 18-49 years old) participated in the survey. The sample consisted of 59 students of both bachelor (n = 29) and master level students (n = 30), out of which 14 students were from Greece and 45 from Finland.

C. Results

The Kolmogorov test showed that based on the students' responses concerning the variables in our study, the data agree with the normal distribution. Thus, the T-Test was appropriate for data statistical analysis when comparing the means of variables. Table II shows the means of the responses concerning the general variables.

TABLE II
RESPONSES' MEAN VALUE REGARDING GENERAL VARIABLES

Variables	Mean
1) How do you rate the improvement of work productivity in general when you use social media services?	3.28
2) How do you rate the improvement of your basic work's productivity when you use social media services?	3.12
3) How do you rate the improvement of knowledge building and maintenance tasks (learning) when you use social media services?	3.51
4) How do you rate the improvement of work management tasks when you use social media services?	3.30

In general, social media appear to have a slightly positive impact on knowledge work. Based on the results of Table II, the improvement of knowledge work is most positive in knowledge building and maintenance. Furthermore, by using T-tests, we compared variable 2 to variable 3 resulting in p = 0.037, variable 2 to variable 4 which resulted in p = 0.372 and variable 3 to variable 4 resulting in p = 0.223. The T-tests showed that the importance of social media is slightly significant in the improvement of knowledge building and maintenance.

In this survey, we also used two open-ended questions in order to acquire deeper understanding of the impact of social media on knowledge work. Furthermore, we summarized and categorized the responses and the notable findings based on either their positive or negative impact on knowledge work productivity.

The notable findings based on the responses that suggest that social media use can increase knowledge work productivity were:

- In 10 responses, the respondents emphasized that social media make communication in knowledge work easier.
- In nine responses, the respondents reported that social media make personal knowledge work easier.
- Six respondents stressed the significance of social media in marketing work.
- Both entertainment and information retrieval were mentioned in one response.

The notable findings based on the responses that suggest that social media use can reduce knowledge work productivity were as follows:

- In 10 responses, the use of social media was mentioned as a distraction from daily work tasks.
- In five responses, respondents claimed that social media do not affect the effectiveness of knowledge work.
- Four respondents argued that fake news, information and profiles impair productivity while using social media.
- In one response, it was mentioned that social media use is time consuming.
- In one response, impairment in communication was mentioned.

The notable result was that social media can also be helpful in personal basic knowledge work. The respondents experienced personal knowledge work as follows:

- "When you need inspiration, social media can help."
- "In general, web services and mostly forum applications help a lot, both in the productivity of the individual but also in sharpening, and hopefully, improving the weak points of the knowledge and the practical work index of the individual. That is a plus, to my mind. In conclusion, social media and web services like forum threads, blogs, video viewing platforms and etc. help you to become even more productive and knowledgeable, in your work and non-work environment."
- "It helps me take a break and start again. Sometimes ideas can be born while using social media."
- "Sometimes a good ad or post can really inspire the user or give him/her motivation to search, learn and copy. In conclusion, creators might inspire you to take action by posting something."
- "For example, if you use for example LinkedIn you know that you do not waste your time because you can talk with companies and read their news or you can find lectures to increase your knowledge."
- "They cover up way more information about what you want to learn."
- "The use of YouTube helps me learn new skills in software development."
- "In general, social media may improve productivity if the user's work position requires the masses' opinion about a subject. For example, if a user works as a manager in a clothing store, he/she should use social media to observe and ask about fashion."

Table III shows the means of the responses concerning the personal work activities variables.

By using T-tests, we compared variable 1 to 2 resulting in p = 0.228, variable 1 to 3 which resulted in p = 0.012, variable 1 to variable 4 resulting in p = 0.022, variable 2 to variable 3 resulting p = 0.162, variable 2 to variable 4 with p value less than 0.001 and finally variable 3 to variable 4 with p value less than 0.001. The p values show that improvement of the communicating activity can be improved more than any other activity by using social media. Table IV shows the means of the responses concerning collaborative activities variables.

TABLE III
RESPONSES' MEAN VALUE REGARDING PERSONAL WORK ACTIVITY VARIABLES

Variables	Mean
1) How do you rate the improvement of acquiring knowledge (getting knowledge) when you use social media services?	3.63
2) How do you rate the improvement of designing activity when you use social media services?	3.40
3) How do you rate the improvement of decision-making activity when you use social media services?	3.12
4) How do you rate the improvement of communicating activity when you use social media services?	4.05

TABLE IV
RESPONSES' MEAN VALUE REGARDING COLLABORATIVE ACTIVITY VARIABLES

Variables	Mean
1) How do you rate the improvement of coordinating and scheduling work activity when you use social media services	3.65
2) How do you rate the improvement in sharing information among group members when you use social media services?	4.32
3) How do you rate the improvement in integrating (incorporating) work with other people when you use social media services?	3.70

By using T-tests, we compared variable 1 to 2 with p value less than .001, variable 1 to 3 resulting in p = 0.768, and variable 2 to 3 with p value less than 0.001. The p values show that when using social media, the sharing activity can be enhanced more than any other activity. Table V shows the means of the responses concerning supplementary work activities variables.

TABLE V
RESPONSES' MEAN VALUE REGARDING SUPPLEMENTARY WORK ACTIVITY VARIABLES

Variables	Mean
1) How do you rate the improvement of creating input data (writing a letter, a report etc.) when you use social media services?	3.45
2) How do you rate the improvement of formatting documents output data (formatting layout of documents and presentations for example) when you use social media services?	3.70
3) How do you rate the improvement of filing and retrieving documents and data (document management on your own computer or server or cloud) when you use social media services?	3.54
4) How do you rate the improvement of receiving and distributing information (communication on email for example) when you use social media services?	3.73

By using T-tests, we compared variable 1 to 2 resulting in p = 0.168, variable 1 to variable 3 resulting in p = 0.631, variable 1 to variable 4 which resulted in p = 0.138, variable 2 to variable 3 resulting in p = 0.701, variable 2 to variable 4 with p value less than 0.165 and finally, variable 3 to variable 4 with p value less than 0.277. The p values show that all areas of supplementary work activities are equally important while using social media. No significant differences were found among these variables.

V. DISCUSSION

Based on the results, we can infer that social media supports learning in knowledge work. The statistical significance of social media in both basic knowledge work and in supplementary work is less important. However, our results from open-ended questions revealed the potential of social media to support personal knowledge work. The results emphasized that information retrieval is the most significant benefit for personal knowledge work.

We suggest activities which make use of contemporary 21st century online tools to maximize performance of knowledge work. According to Gartner's list, the ICT trends of 2020 are [13]:

1. Hyperautomation: Facilitates the automation of processes and the augmentation of humans by applying robotic process automation (RPA) and advanced technologies, such as artificial intelligence (AI) and machine learning, thus minimizing human errors and providing higher analyzing capacity and information visualization.

2. Multiexperience: Focuses on people-literate technology. More specifically, it involves the way people perceive, interact and control the digital world through a wide variety of multi-sensory and multi-touchpoint devices and interfaces. It can help in service tasks, information visualization as well as training and simulation.

3. Democratization: Aims at creating a simplified model which will offer users easier and prompt access to digital systems, information and to business or technical data and expertise without intensive training being required. The democratization of application development, data and analytics, design and knowledge are its main aspects.

4. Human augmentation: Explores how the use of technology can enhance humans' physical and cognitive capabilities and experiences. More specifically, physical augmentation focuses on improving humans' physical capability by implanting or hosting a device within or on the body, while cognitive augmentation aims at improving humans' ability to think critically and constructively.

5. Transparency and traceability: Emphasizes on data privacy and security, digital ethics and operational principles in order to promote and enhance trust by increasing the critical elements of data traceability and transparency.

6. The empowered edge: Capitalizes on the increasing volume of sensors and devices which are connected to people, digital services and other devices as well as on the capabilities of edge devices to support AI and to collect, store, process and computer large volumes of data. In the big data and Internet of Things (IoT) era in which data volumes increase exponentially day by day, the main aim of the empowered edge is to reduce latency, promote autonomy, exploit the cutting-edge capabilities and process data closer to the end user devices.

7. The distributed cloud: is the next stage of cloud computing in which tools, applications, services, platforms etc., will shift from a centralized data center model to distributed public cloud providers. It allows data centers to be located virtually anywhere and it supports continuously and intermittently connected cloud services. Hence, it enables services to be distributed and delivered at the specific points of need such as edge devices or customer data centers. Edge devices provide access to an enterprise's internal network

8. Autonomous things: Explores the physical devices such as

robots, drones, vehicles etc. and aims at enhancing their capabilities to manipulate the spaces around people with various levels of autonomy, collaboration and human guidance. Additionally, these AI-driven devices will not only exist in controlled environments but also in open public spaces.

9. Practical blockchain: Emphasizes on how blockchain can be leveraged in practical enterprise and organization use cases to bring about more trust in transactions involving individuals and enterprises and improve security and privacy in digital environments without requiring a centralized authority. In addition, blockchain renders trustworthy and transparent transactions feasible since it allows assets to be traced back to their origin.

10. AI security: The advancements and applications of the contemporary technologies and the rise of the use of the Internet of Things (IoT), cloud computing, micro-services and highly-connected systems will change the ICT landscape and new potential security threats, attacks and vulnerabilities will also arise. AI security aims at dealing with and finding solutions to these new challenges and securing the AI-powered systems which are behind the people-centric trends by leveraging AI to improve the security defense levels.

According to [16], organizations should consider maximizing the use of machine learning, AI and robots. This is in line with the trend list provided by [13]. Moreover, enterprises that will manage to adopt and apply these technological advancements will transit to Industry 4.0 and reap its benefits more easily while simultaneously they will be able to stay ahead from competitors in the global market [18].

Based on the strategies presented by [9], knowledge work efficiency should be discussed while exploring the opportunities of social media in personal knowledge work. Hence, we present how personal knowledge work can be improved and how the related issues can be addressed by using the trends presented by [13] in Table VI.

TABLE VI
ADDRESSING KNOWLEDGE WORK ISSUES

Knowledge work issues	Trends to be used as potential solutions
Interface time and errors	Hyperautomation and practical blockchain
Process learning time and dual processing losses	Multiexperience, democratization and human augmentation
Time and effort to structure tasks and format outputs	Multiexperience
Nonproductive expansion of work	Hyperautomation, multiexperience, democratization and human augmentation.
Data and knowledge search and storage time and costs	Empowered edge, transparency and traceability and the distributed cloud
Communication and coordination time and costs	Distributed clouds and empowered edge
Losses from human information overload	Human augmentation

All in all, even though the support of social media for collaborative knowledge work is relatively good, it is wise to discuss how social media can support collaborative knowledge work even better while making use of the new technological

advancements. Ali et al. [2] emphasized the significance of knowledge management in the use of social media. Social media users discover knowledge as they exchange information, participate in discussions, ask questions, and leave comments and collaborate with each other. Based on our results, social media can be regarded as a useful complement to knowledge management and supports knowledge management practices. Social media is also likely to smooth the progress of knowledge sharing, harnessing collective wisdom and building trust. Social media may also help in overcoming knowledge barriers in multicultural environments with diverse national, organizational and team cultures.

VI. CONCLUSIONS

Knowledge is considered to be the core of knowledge work which in turn aims to generate additional knowledge for people, organizations and markets [6].

In this paper, we studied and analyzed the impact that the use of social media might have on knowledge, knowledge work, knowledge sharing, and learning. Particularly, we examined how social media affect different tasks and activities of knowledge work. The focus group of this study was higher education students and how they can create value for themselves and maintain existing value through knowledge building and maintenance tasks by using social media as described by [8]. In total, 59 higher education students participated in the survey of our study.

The results showcase that to some extent social media has a positive impact on knowledge work. Improvement of knowledge building and maintenance tasks (learning) was considered by the respondents to be the highest impact (with slight significance) of using social media services. Moreover, communication was considered as the most improved personal work activity when using social media, followed by knowledge acquisition, activities designing and decision making. Sharing information among group members was regarded as the main improvement of collaborative work activities when using social media, followed by integrating work with other people as well as coordinating and scheduling work activities. Finally, according to the respondents, the most enhanced supplementary work activity when using social media was the reception and distribution of information followed by formatting documents output data, filing and retrieving documents and data as well as creating input data.

The most considerable findings in this paper were that the respondents acknowledged that social media can substantially improve knowledge work activities, such as communication, knowledge sharing and information receiving and distribution (collaboration) which is in line with the foundations of social media, that is communication, information sharing and collaboration. Finally, our results are consistent with those of prior research and extend the significance of the perceived usefulness of social media in knowledge work and knowledge management; hence, also in the usefulness of social media in educational contexts.

The era of COVID-19 knowledge work has changed dramatically in spring 2020. Knowledge workers have become

online knowledge workers due to governments' restrictions world-wide. It is estimated that this change will be reforming the character of knowledge work permanently. One scenario is that the working life will change in the spirit of connectivism [32]. In learning based on connectivism, learning occurs in networks of people and knowledge is shared and obtained irrespective of time and other boundaries and limitations. The COVID-19 era of spring 2020 may change knowledge work in the same way and our future work will be built on this fact.

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