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https://hdl.handle.net/2324/4479592

Usage of E-books During the COVID-19 Pandemic: A Case Study of Kyushu University Library, Japan

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Abstract. The COVID-19 pandemic has had an impact on education and research in universities throughout the world. Many academic libraries have been closed, and users have had to use e-books instead of printed books in libraries. As e-books are not yet commonly used in Japan, this paper examines the impact of the pandemic on the use of e-books in academic libraries in Japan. As a case study, the usage data for each e-book platform in Kyushu University in Japan were analyzed, and the overall trends in each period before and during the pandemic were revealed. The access counts of e-books from January to June 2019 and those for 2020 were examined. The number of total access counts in 2020 was higher than that in 2019 on all nine platforms. The platform that saw the highest access count growth rate was JSTOR, with an 846% increase. The usage of e-books in the Maruzen eBook Library, which holds many Japanese textbooks, was examined in detail. E-books on mathematics, medical science, and programming languages were in constant use both before and during the pandemic. E-books in law and economics started to be used during the pandemic. These results indicate that the pandemic has evoked new needs for e-books in certain fields.

Keywords: Usage of e-books, COVID-19, academic libraries.

1 Introduction

According to a survey conducted in 2015, 94% of public libraries in the United States provide e-books to their users [1]. However, a survey conducted in 2020 showed that only 7.2% of Japanese public libraries provide electronic library services, including e-book lending [2]. It can thus be said that Japanese libraries are lagging behind with regard to the provision of e-books.

Various measures have been taken around the world due to the COVID-19 pandemic. Many universities in Japan closed their campuses and introduced online education. Following a nationwide state of emergency issued on April 16, the start of the semester, which normally begins in April, was postponed.

We focus on the impact of the pandemic on the use of e-books in university libraries. As a case study, we analyzed the use of e-books in Kyushu University, which is a national research university and has 18,566 students and 2,088 faculty members as of May 1, 2020 [3]. Kyushu University postponed the start of the spring quarter from April 8 to May 7 and decided to introduce online education.

Many university libraries were also closed or provided limited services following the lockdown of university campuses. According to a survey conducted by saveMLAK, 74 of the 86 national university libraries were closed as of May 1 [4]. Various types of information and services were provided via library websites. Kyushu University Library was closed from April 11 to the end of May, with limited service resuming after June. While the library was closed, they provided a service to send faculty members, graduate students, and senior undergraduate students books and copies of articles on request. In addition, the library launched a new website, "Library Response to Novel Coronavirus (COVID-19)," to provide information.

Many providers and publishers, including KinoDen, EBSCO, and Oxford University Press (OUP), provided special trials and free access for a limited period. It has been difficult to use materials in libraries in the usual way due to the pandemic. As many journal articles were already provided online and Kyushu University provides remote access services, it would be expected that the impact of library closures on electronic journals would be small. However, we can assume that there has been an impact on the use of books, as when the library is closed, only e-books are available. This could be a turning point in the transition from the use of printed books to e-books. Forecasts say that online education and remote learning will continue after the end of the pandemic. By analyzing the usage of e-books under these circumstances, this paper hopes to contribute to creating a comfortable and useful environment for student learning.

In this paper, we analyze the usage data of each e-book platform and clarify the overall trends in each period before and during the pandemic using usage data from Kyushu University Library. We also examine implicit and explicit needs by analyzing the usage data for e-books on specific platforms.

2   Related Works

Digital content, including e-books, has already been used in higher education institutions in the US. In 2019, *Library Journal* conducted a survey of 199 faculty members in higher education institutions in the US who were engaged in a wide range of research fields [5]. The results showed that 84% of faculty members used some digital resources (e-books, 54%) for education. The result indicated that many faculty members in the US use digital content such as e-books for their courses.

However, the introduction of e-books in Japanese educational institutions has been delayed. According to a survey conducted by the Ministry of Education, Culture, Sports, Science and Technology in 2019, the total cost of library materials in Japanese universities was 70.8 billion yen, of which only 1.5 billion (2.2%) was spent on e-books [6].

The use of e-books for education is not progressing in Japan. For example, we examined how many courses included links to e-books in their 2020 syllabi on the "Syllabus at Kyushu University" website [7]. We obtained 612 results by searching for the keyword "http" and examined each link in the search results to confirm whether e-books or other resources. There were only 35 courses that had links to e-books. The total number of courses on this site in 2020 was 6,507. Few textbooks or reference books were explicitly indicated as being available as e-books in the syllabi.

Three Japanese national university libraries conducted a survey of patron-driven acquisitions using the Maruzen eBook Library (MeL) e-book platform in 2015 [8]. The survey aimed to provide user-oriented Japanese book content, as there has been a delay in the digitization of books in Japan. At these universities, the ratio of Japanese e-books was very low. The results for Ochanomizu University showed that e-books on science, especially mathematics and information science, were mainly used.

3 Analysis of the E-book Usage Data of each Publisher's Platform

We submitted an application to Kyushu University Library to obtain usage data for two terms (before and during the pandemic). On approval of our application, we obtained usage data for nine e-book platforms in 2019 and 2020. In addition, data on library circulation from the same period and a list of textbooks referred to in the 2019/2020 syllabi were also obtained.

3.1 Overview

Table 1 shows the number of e-books accessed and the number of total accesses in 2019/2020 for each platform and other kinds of information. The OUP access statistics are for the period from January to May 2019/2020, those of MeL are from January to July 2019/2020, and others are from January to June in 2019/2020. The column "Language" indicates the language(s) of the e-books held by each platform. "Trials" means whether each publisher provided special trials to Kyushu University during the pandemic. "Data Format" is the format that has been used in each platform to count the number of e-books and accesses. The way of counting the number of e-books differs depending on the data format, but the number of e-books in this table shows the number of e-books that have been used, even once, during these periods [9]. "Number of total accesses" indicates the total number of times e-books were accessed. Japan Knowledge Lib and MeL count access to each e-book. However, on platforms using COUNTER5 and ProQuest Central, access to sections (e.g., chapters and encyclopedia entries) in each e-book was counted [10][11]. The way of counting the number of accesses is different, but we apply the same method for each platform in 2019 and 2020. "YoY growth rate" is calculated by dividing "Number of total accesses in 2020" by "Number of total accesses in 2019".

The number of total accesses in 2020 was higher than that in 2019 on all platforms. The growth rate of JSTOR (846%) was the highest among all platforms. The number

of accesses to foreign e-books increased considerably. In platforms holding Japanese e-books, the growth rate of MeL (268%) was the highest. In general, Japanese books are used for textbooks in many courses. We are also interested in the impact of online education on the usage of e-books. We analyze access data for MeL in detail in the next section.

Table 1. Number of e-books accessed and total number of accesses on each platform.

Platform	Language	Trials	Number of e-books accessed		Number of total accesses		YoY growth rate	Data format
			2019	2020	2019	2020		
Elsevier Science Direct		✓	300	408	1,524	4,558	299%	
JSTOR		✓	112	433	364	3,080	846%	
Springer Link	Foreign	✓	4,676	4,578	9,763	10,392	106%	COUNTER5
OUP		✓	108	422	692	3,552	513%	
Wiley Online Library		-	189	223	3,254	3,263	100%	
Maruzen eBook Library	Foreign / Japanese	✓	2,816	5,751	11,588	31,010	268%	
JapanKnowledge Lib		-	81	86	58,715	69,256	118%	COUNTER4
ProQuest Central	Foreign	✓	68	140	1,841	5,813	316%	
EBSCO e-book Collection	Foreign / Japanese	✓	501	655	1,918	2,363	123%	Own

3.2 Analysis of MeL Access Data

The Top 10 Most Accessed E-books in 2019
Table 2 shows the top 10 most accessed e-books in 2019. We show only the "Simplified title (English)," which is a simplified translation of the Japanese title provided by the author. "Total access in 2019/2020" is the total number of accesses of each e-book in 2019. "Total accesses in 2019" is shown as a comparison. "Circulation" is the number of times printed books were borrowed from the library in 2019/2020. "Subject" is extracted from the classes of the Nippon Decimal Classification (NDC), which is widely used in Japanese libraries. "Syllabus" is whether this printed book or e-book was referred to in any syllabus. We examined the list of books referred to in the 2019 syllabi obtained from Kyushu University Library and the Kyushu University syllabus site. As the syllabus for some schools is not included in the site, we also searched for syllabi using the Kyushu University website full-text search form, using book titles as keywords. In this search, we checked only the top ten ranked search results.

As shown in Table 2, e-books in the "Mathematics," "Medical science," and "General works" fields were often used. Both of the e-books in the "General works" field (top 6 and 10) were about programming (information science). This result supports the results of Ochanomizu University's survey [8]. In addition, e-books in the "Medical science" field use colored graphical explanations or videos; as medical and pharmacy students prefer multimedia resources, this is an advantage of e-books. As a result, there was a trend toward e-book usage before the pandemic (normal situation). We identified a demand for books on mathematics, medical science, and programming languages in normal situations.

As supplementary information, the printed book circulation counts for 2019 and 2020 are shown in the table. There is no correlation between the number of accesses of e-books and printed book circulation counts. This indicates that analyzing e-book usage data is an effective way of determining the need for e-books.

Table 2. Top 10 Most Accessed E-books in 2019.

	Simplified title	Publisher	Total access		Circulation		Subject	Syllabus in 2019
			2019	2020	2019	2020		
1	Conquering the complex function for engineering students	Morikita	165	50	11	5	Mathematics	✓ printed
2	Electromagnetic field and vector calculus	Iwanami	107	14	21	3	Mathematics	✓ printed
3	Neuroanatomy lecture notes in colored graphic explanations	Kunpodo	104	145	5	5	Medical science	
4	Case study exercises written by Tokyo University students with 50 carefully selected frameworks	Toyo Keizai	81	11	6	2	Psychology	
5	Introduction to Economics for 99% of people (2nd ed.)	Otsuki	81	24	1	0	Economics	✓ e-book
6	An introduction to programming, starting with Python	Corona	76	11	4	1	General works	
7	Postoperative nursing【Video】	Institute of A-V Medical Education	74	23	0	0	Medical science	
8	An introduction to statistics for life sciences realized with R and graphs	Yodosha	70	11	0	0	Biology	
9	The world of labor law (12th ed.)	Yuhikaku	69	0	9	0	Sociology	
10	New deep learning textbooks learning with Python	Shoeisha	67	171	7	2	General works	

The Top 10 Most Accessed E-books in 2020

Table 3 shows the top 10 most accessed e-books in 2020. The number of accesses in 2020 increased significantly compared with that in 2019. Books in the "Construction. Civil engineering" and "General history of North America" fields did not appear in Table 2. Three e-books in "Economics" ranked in the top 10. None of the e-books apart from that ranked 9th were used in 2019. The access count in 2019 for eight of the ten books was 0. These books except for the second-ranked book were not referred to in syllabi, but we assume that they were mentioned by faculty in classrooms or seminars or were used for student assignments. These results indicate different trends of e-book usage during the pandemic.

Books in "Mathematics" and "Medical science," which were used frequently in 2019, do not appear in the table. The e-book on "Medical science," which was ranked in the top 3 in 2019, had 145 accesses in 2020. Although the e-book was used more during the pandemic, other books were accessed more than it in 2020, so it did not appear in the top 10 rankings. It can be said that the pandemic has evoked new needs.

Table 3. Top 10 Most Accessed E-books in 2020.

	Simplified title	Publisher	Total access		Circulation		Subject	Sylla-bus in 2020
			2019	2020	2019	2020		
1	International tax law (3rd ed.)	Univ. of Tokyo Press	0	350	1	0	Public finance	
2	Soil mechanics from basic to advanced level	Kyoritsu	0	315	7	1	Construction. Civil engineering	✓ printed
3	National Library of Medicine classification 2016, in Japanese	Japan Medical Library Association	0	302	0	0	Libraries, Library & information sciences	
4	American history: Study from society, culture and history (2nd ed.)	Keio Univ. Press	0	264	0	0	General history of North America	
5	Japanese economic history	Yuhikaku	N/A	259	4	3	Economics	
6	An introduction to international management	Yuhikaku	0	224	3	1	Economics	
7	A book to learn the basics of Java SE Bronze in 2 weeks	Impress R&D	0	215	0	0	General works	
8	Japanese economic history (2nd ed.)	Univ. of Tokyo Press	0	178	2	0	Economics	
9	New deep learning textbooks by Python	Shoeisha	67	171	7	2	General works	
10	Natural Language Processing	Kyoritsu	0	166	0	0	General works	

3.3   Subjects of E-books with the Top 100 Usage Growth Rates.

Table 4 shows the subjects of e-books that were among the top 100 e-books with the highest increases in usage and the number of e-books referred to in syllabi in 2020. The number of e-books is 106 because there were 8 e-books jointly ranked 99th. Note that the usage count for e-books that were not used in 2019 was considered as 1 to calculate the rate of increase.

"Law" dominates the rankings, followed by "Mathematics." In "Medical sciences," e-books were used, in spite of not having been referred to in the syllabi. E-books on "Mathematics" were used previously, as shown in Table 2, but their usage increased further under the pandemic. There is a stable demand for the mathematics field which is not affected by either normal or emergency situations.

According to the subject classifications of MeL, in the subject distribution of all 55,346 titles in their collection as of September 2020, 2% of e-books are in "General," 55% are in "Humanities and Social Sciences," and 43% are in "Science, Technology, and Medicine (STM)" [12]. Almost half of the e-books are in the "Humanities and Social Sciences." Compared to e-books on STM topics, they had been little used before. However, e-books on law, economics, and social sciences started to be used during the pandemic.

Table 4. Subjects of e-books with the top 100 growth rate of usage.

Subject	Number of e-books	Syllabus in 2020
Law	23	6
Mathematics	12	3
Medical sciences	10	0
Economics	10	3
General works	7	1
Social sciences	6	1
Physics	4	0
Electrical engineering	4	0
Others	30	4
	106	18

4   Conclusion

In this survey, e-books in STEM fields, especially mathematics, medical sciences, and programming languages that were normally used before the pandemic were further used during it. This shows that there is a constant and stable demand for e-books in these fields. The use of e-books on law and economics increased. Printed books in these fields have been used frequently. Library closures and online education have influenced this increase in demand for e-books. At this point, it can be said that the

potential need for e-books in the humanities and social sciences has also been indicated. Many e-books not listed on syllabi were also used. Faculty members might think of introducing them during classes. However, we were not able to identify the reasons users used those particular books from the usage data. In the future, we plan to conduct interviews with faculty members and students to inquire regarding the reasons.

We compared usage data from before and during the pandemic. In a future study, we plan to analyze the usage of e-books after the pandemic. Moreover, examining not only the number of accesses but also the characteristics of e-books can inform the selection and purchase of e-books adapted to the needs of courses and self-study. As a goal of this future study, we plan to design online research and learning environments, including a reasonable e-book collection.

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