

# OPENING A NEW CHAPTER FOR A 10-YEAR PARTNERSHIP

[ A report on academic e-book publication  
and use by TAEBCD and Springer ]



SPRINGER NATURE

# PREFACE

Given the high prices of foreign language books, universities in Taiwan were only able to purchase a few thousand books every year, which can hardly meet the needs of university teachers and students, putting our higher education at a disadvantage compared to our global peers. Considering that the model of separate purchases by individual universities can hardly bring in improved results in a short run, several universities jointly proposed to the Ministry of Education in Taiwan the Plan of Purchasing and Sharing Academic E-books by Taiwanese Universities in November 2007, which was launched in 2008. Thereafter, in support of the plan, efforts were made to integrate Chinese and foreign language e-books and databases to achieve joint purchasing and resource sharing, gradually leading to the formation of the Taiwan Academic Electronic Book & Database Consortium (TAEBDC).

The operation of TAEBDC is driven by a core group, consisting of the libraries of National Taiwan Normal University, National Taiwan University, National Chung Hsing University, National Cheng Kung University, National Yunlin University of Science and Technology, and National Kaohsiung University of Science and Technology. These six libraries are in charge of sorting out and integrating user demands, purchase, promotion, and administrative affairs. With grants from the Ministry of Education and self-raised funds from nearly a hundred TAEBDC members institutions, the core group has introduced a multitude of Chinese and foreign language e-books to members, using a diverse range of purchasing models, such as collection, pick & choose, and patron driven acquisition. By building a highly integrated and efficient operation model, TAEBDC runs effectively in fund raising, organization and operation, content selection, purchasing model, and promotion. It also facilitates cooperation amongst university libraries, particularly on building up quality digital resources and increasing utilization efficiency of e-books. The grant support from the education ministry has provided solid leverage, driving the stable and sustainable development of TAEBDC.

Over the past decade, TAEBDC purchased more than 10,000 e-book titles every year, amounting to more than 160,000 in total. Besides purchasing e-books, TAEBDC also holds educational training events, prepares collateral reading lists, hosts various promotional activities, such as Rewards for Citing e-books and E-book Reviews, and sends e-newsletters, all of which are designed to increase the utilization of e-books. After years of efforts, the proportion of readers from member libraries who have ever used e-books has increased from 40% to nearly 60%, with their overall satisfaction with e-books going up from 56% to 70%.

Apart from TAEBDC members, e-book publishers also play an integral role in the operation of TAEBDC. Libraries and e-book publishers are two key players in the industrial chain of knowledge asset, as the former cannot have quality collections unless the latter publishes quality books. TAEBDC works with many e-book publishers, among which, Springer stands out in terms of content, system, title category and usage statistics.

I am glad to know that Springer is producing a whitepaper, taking TAEBDC as a case study, to analyze how Taiwanese researchers use Springer e-books in a global context. The whitepaper will also explore how librarians from Taiwanese academic institutions envision the future of academic e-books, based on structured interviews and an overview of Springer's e-book publication landscape. ■

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## An introduction

# A 10-YEAR PARTNERSHIP OF ACADEMIC E-BOOK PUBLICATION AND USE

In today's ever changing digital era, the rapid development of electronic devices, from computers and tablets, to e-readers and smartphones, is re-shaping the world of publishing, writing and reading. Regardless of the general public or academic researchers, use of online resources and consumption of e-books are increasing.

As digital books are easily stored, shared and more accessible, libraries at academic institutions are expanding their e-book collections to offer students and researchers unlimited digital access to trusted research, promoting research resource sharing and collaboration. Academic publishers are also delving into digital publishing, delivering fully indexed e-book collections and allowing unlimited users, downloads and sharing more economically.

In Taiwan, a consortium was established in 2008 to promote the sharing of academic e-books and databases amongst libraries of Taiwanese universities and research institutions. Through the partnership, the consortium, Taiwan Academic E-Book & Database Consortium (TAEBDC) will negotiate with the digital book publishers in one voice and build purchasing mechanisms with them to quickly increase the volume of digital books catalogued at member institution libraries, enhancing research and education capacities of member institutions.

TAEBDC has been working with Springer eBook for 10 years. The latter offers the most complete collection of peer-

reviewed, academic e-book collections, spanning science, technology and medicine (STM), as well as humanities and social sciences (HSS), making every level of learning, education and research more accessible. TAEBDC primarily uses Springer eBook's contemporary academic e-book collections, rather than the archived ones that may date back to more than 100 years ago. Through TAEBDC, universities and research institutions in Taiwan benefit from increased access to a wide variety of quality academic e-books from around the world.

The 10 years' collaboration between TAEBDC and Springer eBook has witnessed a growing demand for academic e-books from Taiwanese researchers, as well as their increasing research capacities. TAEBDC users' consumption of Springer eBook's content has been increasing at a speed much higher than the global one. Meanwhile, Taiwanese researchers have also published a growing number of academic books at Springer, making larger and larger contributions to Springer eBook's collections.

In celebration of the 10-year anniversary of TAEBDC and Springer eBook partnership, this report will focus on e-book usage and authorship by Taiwanese researchers, attempting to illustrate the subject-specific demand for e-books and research contributions by Taiwanese researchers, by using Springer eBook data from 2008 to 2017. Following an introduction, chapter 2 will

examine e-book usage by TAEBDC users, including annual chapter downloads in total and by subject, most used book titles, numbers of total and by-subject denials, and the changing cost per downloads. The patterns observed will be compared with those of the global to better understand where Taiwan stands in the changing global context.

Chapter 3 will look at e-book publications by Taiwanese researchers, analyzing the volume of annual publications and how Taiwanese authors' e-books are consumed by Springer eBook users worldwide, including the numbers of citations, downloads, mentions, readers, and reviews for e-books published by Taiwanese authors. Again, these patterns will be understood in a global context.

Interviews with librarians of Taiwanese universities or research institutions are conducted to get a perspective from Taiwanese users and to facilitate a better understanding of the e-book usage and publication patterns observed. Based on the qualitative data, needs and expectations of Taiwanese librarians are summarized in chapter 4, with an outlook into the future of e-books.

Digitalization is the inevitable trend with the development of technologies. It is the expectations of academic book publishers, as well as individual and institutional users that technologies will be employed to better address users' needs and broadens dissemination of research works, boosting the impacts of quality research. ■

# TAEBDC E-book Usage A STORY OF GROWTH

The increasing demand of knowledge consumption means that a growing number of books are published and read. Globally, the growth of electronic books is an inevitable trend. In the world of academic publishing, according to data tracked by Springer, use of its e-books has been increasing in the past 10 years. So has the use of e-books by TAEBDC. With the increased e-book usage, unmet e-book needs are addressed and the cost of usage is coming down, making e-book consumption more cost-efficient.

## INCREASED E-BOOK USAGE

Unlike traditional books in print, digital books can be purchased and consumed by chapters, and chapter download becomes a good measure of their usage. The past 10 years have seen a significant growth of e-book use. For all the e-books published by Springer, the number of chapter downloads around the world was about 375.6 million in 2008, which grew to 685.8 million in 2017, with a compound annual growth rate (CAGR) of approximately 7%.

In Taiwan, the increase of e-book usage is prominently higher than that of the global

usage, with a compound annual growth rate of 36% in the past 10 years, a growth rate more than five times that of the global. The number of chapter downloads by TAEBDC users grew from 0.54 million in 2008, only 0.1% of the global usage, to 8.27 million in 2017, accounting for 1.2% of the global total (see **Figure 1**). TAEBDC is increasingly becoming an important player among Springer's global pool of e-book user groups.

A sharp growth was seen in 2013, when chapter downloads by TAEBDC rocketed from 1.53 million in the previous year to 5.95 million, nearly quadrupled, and its share of global usage peaked at 2.3%. The sharp growth continued in 2014, with chapter downloads nearly doubling to 10.15 million, a historical high. But as the total number of chapter downloads worldwide also saw a tremendous increase in 2014, TAEBDC's share of the global e-book usage slightly dropped to 2.2% in 2014.

The growth trajectory suggests that the boost of e-book usage by TAEBDC predated the global growth. This is because in 2013 Springer reshuffled its e-book offerings by adding and regrouping many subject collections, and offered a free trial to TAEBDC (and in the first quarter of 2014). The boost



of chapter downloads during the free trial period shows a strong demand for Springer e-books and a warm acceptance of the reorganized e-book packages. "I think the packages are comprehensive and complete," said an interviewed librarian. "The collections are very successful."

The increase of TAEBDC's e-book chapter downloads levelled off since 2015, entering a stage of steady growth. Such a development is a global trend, indicating the maturing of e-book offerings and platforms.

The growth story also demonstrates the recognition of Springer's e-book content by TAEBDC users. "Many of the book titles are classic and they are irreplaceable," said an interviewed librarian. "The high usage demonstrates its value and the quality of its book offerings." Interviewed librarians from TAEBDC member institutions also applauded the user-friendly platforms of Springer EBook. With such high quality content and platforms, the growth of e-book usage is expected to continue.

## E-BOOK USE BY SUBJECT AREAS

The e-book package in medicine accounts for most of TAEBDC's chapter download increase in the past five years, having seen a doubling from approximately 542,000 in 2013 to nearly 1.06 million in 2017 (see **Figure 2**). This is followed by packages in engineering and computer science, which have seen download volume increases of approximately 494,000 and 484,000 from 2013 to 2017 respectively, a 59% and 32% increase respectively.

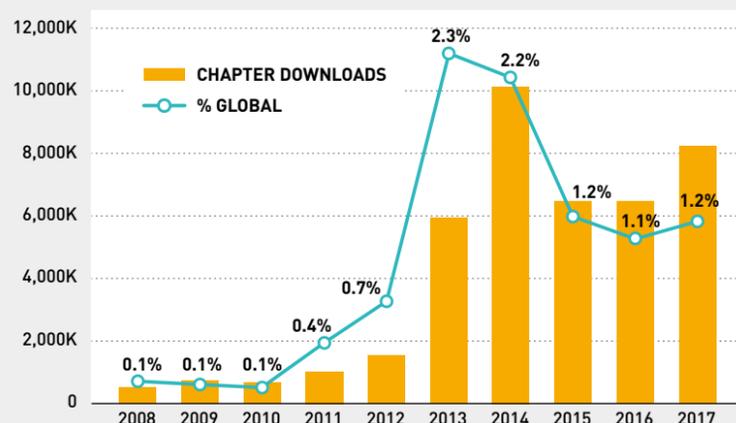
Worldwide, computer science

“Ten years ago, there were not that many choices when choosing academic e-book products, and many platforms were not mature, with limited functions. In these 10 years, the development of e-books is maturing, with more available products, and platform systems are more advanced and stable after mergers and reorganizations amongst publishers ... Also, e-books were mainly available for online viewing before and there were many limitations for downloading or printing ... As for now, more and more academic e-books are available for download. This is a good change in the function of the platforms.”

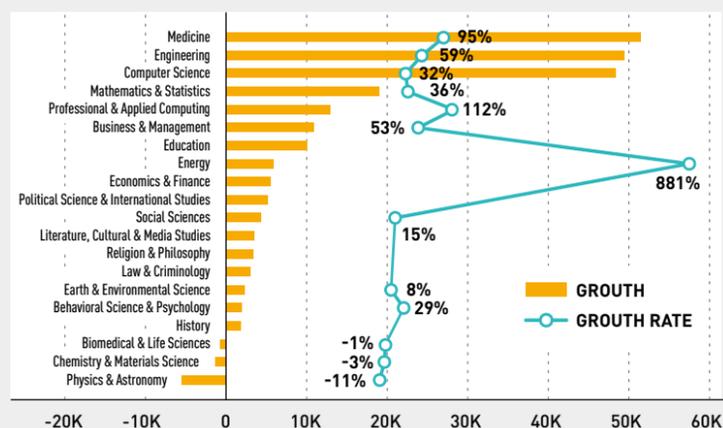
A librarian from TAEBDC member institution



**FIGURE 1 | TAEBDC CHAPTER DOWNLOADS AND PERCENTAGE OF GLOBAL USAGE, 2008-2017**



**FIGURE 2 | TAEBDC CHAPTER DOWNLOAD GROWTH BY SUBJECT, 2013-2017**



dominates the landscape of academic e-book usage. This is not surprising, as it is estimated that globally, more than 70% of new works in science, technology, engineering and medicine (STEM) are in computer science, given the flourishing of the emerging areas such as artificial intelligence (AI) and big data. Also, unlike some natural science areas where journals

are the major platforms for publishing research results, for computer science, a large number of academic conferences means that conference proceedings, usually included in e-book collections, are the main outlets for research results sharing. Similarly, engineering and medicine, another two disciplines falling on the applied side of science, are also strong in

e-book publications. E-book collections in these subjects, including not only monographs, but also handbooks, reference works, and books for professional training, are increasingly on demand.

However, computer science's share of the total number of chapter downloads by TAEBDC users declined slightly from 25.3% in 2013 to 24.1% in 2017. This is largely a result of more diversified usage of e-books on different subjects. Particularly, the use of some HSS collections, such as economics and finance, political science, or literature, which were newly added or regrouped in 2013, grew from none to tens of thousands chapter downloads in 2017. The most prominent is the growth of education collection, increasing from zero in 2013 to more than 100,000 chapter downloads in 2017, accounting for 1.2% of the total number of downloads by TAEBDC. Books in business & management also increase by more than 100,000 in the past five years.

Looking at growth rates, e-books in energy have the highest increase in usage, with number of chapter downloads increasing more than eight-fold from 2013 to 2017 (see Figure 2). Books in professional and applied computing follow, with a growth rate of 112.17% in the past five years. Their shares of TAEBDC total downloads have also grown in the past five years, suggesting the growing popularity of these subject areas among users. Other subject areas that have seen high growth rates of chapter downloads from 2013 to 2017 (excluding medicine, engineering, and computer science, which were mentioned earlier) include business and management (52.68%), mathematics and statistics (35.98%), as well as behavioural science & psychology (28.88%).

With the growing usage of HSS collections, the landscape of academic e-book usage is transforming, becoming more diversified, though the STEM collections may continue to play a dominant role, at least in a short run.

**POPULAR E-BOOK TITLES**

Looking at the usage of specific e-book titles, an engineering book, *Springer Handbook of Robotics*, 2016 edition, is the most popular for both TAEBDC, as well as global users in 2017, with 855,491 chapter downloads globally and 13,492 in Taiwan. The book also has a 2008 edition that is among the global top 5 most used e-books. Actually, five out of the top 10 most used e-books in 2017 globally are in the engineering collection. Other popular titles are spread in biomedical and life sciences, computer science, medicine and social science collections, and are normally handbooks or encyclopaedias.

In contrast, among the top 10 most used e-books by TAEBDC users in 2017, five are in the computer science package, including different editions of the book *Medical Image Computing and Computer-assisted Intervention*. The book's 2017 edition is also the only computer science title included in the global top 10 e-books list. Other titles included in TAEBDC's top 10 list are generally in STEM collections, with only one in the social science package.

Interviews with selected librarians of TAEBDC suggest that users are impressed with the comprehensive inclusion of the variety of subject areas in Springer's e-book collections and are satisfied with the user-friendly online interface guiding one through the various subject collections. "Springer's e-book collections are comprehensive and the platform is great, offering many useful tools," said a senior librarian of TAEBDC. "It has a wide coverage, with a variety of topics," added another.

**DECREASED COST OF E-BOOK USAGE**

The growing amount of e-book usage means the decreasing cost per use. Sold in packages to TAEBDC at a lump-sum price each year, Springer e-books are available for all students and researchers of TAEBDC member institutions to use. While the total

“*Springer eBooks do not necessarily increase their package price every year. The price increase is based on the increase of the quantity of books in the package ... Sometimes with the help of TAEBDC we can enjoy a few hundred more book titles without any additional fee. And the earlier you buy, the more you can use them, making it more cost efficient. As unlike journals, a books usage can continue increasing ... Usually the peak time of its usage doesn't come until after 10 years of its publication.*”



**A librarian from TAEBDC member institution**

package price may increase over the years, given the change of the market price, the increasing charge of adding new titles, and the management cost of maintaining the platform and existing titles, the cost per chapter download of Springer e-books has significantly decreased for TAEBDC in the past 10 years. It has dropped from 3.46 euros per download in 2008 to 0.22 euros in 2017, a 94% decrease (see Figure 3).

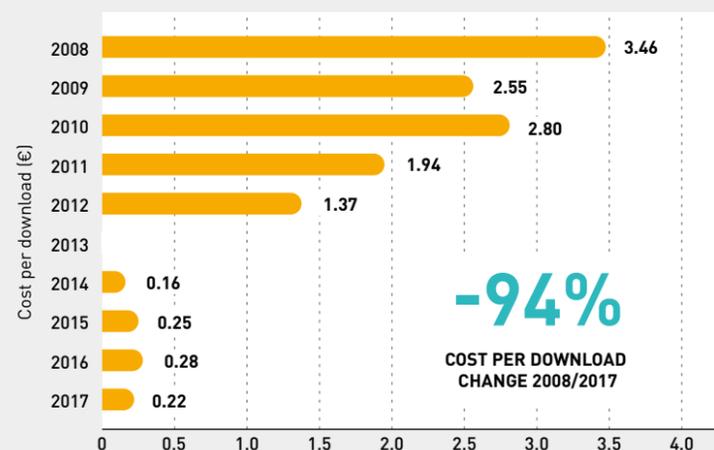
The reducing cost per use is largely associated with the increasing usage. Except for 2013, when TAEBDC made no purchase of Springer e-book database and rather, experienced a free trial, cost per download was the lowest in 2014, at only 0.16 euros. It was a year when the volume of chapter download was the highest. In the five years from 2008 to 2012, cost per download saw a steady downward trend, decreasing by 60%, except for a small bump in 2010 when the usage decreased.

A big drop in cost was actually in 2015, which saw an 82% decrease from 1.37 euros per download in 2012 to only 0.25 euros (excluding 2014 when the usage data was boosted because of the free trial). This cost reduction is also attributable to the reshuffling of Springer e-book offerings, which also included an adjustment of total package price lower than that of 2012. Since 2015, TAEBDC maintained the cost per download at a low value of less than 0.3 euros, achieving high cost efficiency.

"We didn't purchase Springer eBook collections for one year, mainly due to the concern of the high cost," said one interviewed librarian. "But since then, the price Springer offered to TAEBDC is very reasonable and we can see that it is trying to help." With the ever-enriching offering of Springer's e-book collections and expected continued growth of usage, TAEBDC may achieve even lower cost per use.

Indeed, TAEBDC played an important role in maintaining such high cost efficiency in e-book usage. By negotiating with academic publishers, it helps achieving a lower package price for all its

**FIGURE 3 | TAEBDC COST PER CHAPTER DOWNLOAD, 2008-2017**



members, saving the cost for individual member institutions, whose users can access all the offerings in the packages.

Interviewed librarians also suggested a way to achieve greater cost efficiency by purchasing e-book packages in a multiple-year deal, rather than making annual purchases. This way, more consistent offering and services can be guaranteed for users and a more favourable purchasing price can be negotiated. However, the possible high cost and limited budget for this are the big concerns that hold back such a longer-term purchasing model.

Some librarians proposed purchasing a larger package that also includes all the data bases. “We hope TAEBDC will not just offer e-book collections, but also purchase data bases in bundle, including journals and other offerings,” said an interviewed librarian. “This might be more efficient and better benefit users.”

**DECREASING DENIALS IN USAGE**

As TAEBDC has not purchased all of Springer’s e-book collections, users may experience denials when using Springer’s

e-book data base, namely, the books or book chapters the user requests is not accessible, as they are not included in the packages purchased by TAEBDC. Such denials may reflect the unmet needs by users.

Computer science, engineering, and biomedical and life science e-book packages, while were the most used by TAEBDC in 2013, unsurprisingly, also account for the majority of denials experienced by TAEBDC users accumulatively from 2013 to 2017 (see Figure 4). They are followed by packages in physics and astronomy, and chemistry and materials science. Medicine, and mathematics and statistics collections, while are also among the highly used, with big increases in chapter downloads, have seen relatively fewer number of denials. It suggests that current Springer eBook offerings to TAEBDC have generally met the needs of users in these subject areas.

Interestingly, for more applied sciences, like engineering and computer science, denials are mainly seen in Springer eBook’s contemporary offerings. Whereas for biomedical and life sciences, physics and

astronomy, and chemistry and materials science, denials are mainly experienced when users request Springer Book Archives (SBA), an archive of around 120,000 e-books spanning 16 subject collections and dating from 2004 back to the 1840s, including some previously hard to find titles. This suggests the need to dig out the wisdom from some high-quality archived research content for some fundamental sciences. Also, for behavioural science and psychology, denials in SBA are high.

Consistent with insights collected from leading libraries around the world, users in Taiwan also find that an archive product like SBA might be valuable. “I think it’s a good function that the Springer eBook platform can also link to some older books,” said a librarian in life sciences. “Of course, it would be better if we can have SBA in the package,” added another. “We hope there’re opportunities for us to add it in future.”

**“We can say that our use of e-books is all through TAEBDC. If without it, given our limited budget, we really don’t know what to do ... This is a too big cost for us ... So we hope TAEBDC will continue; its existence should be long-term.”**

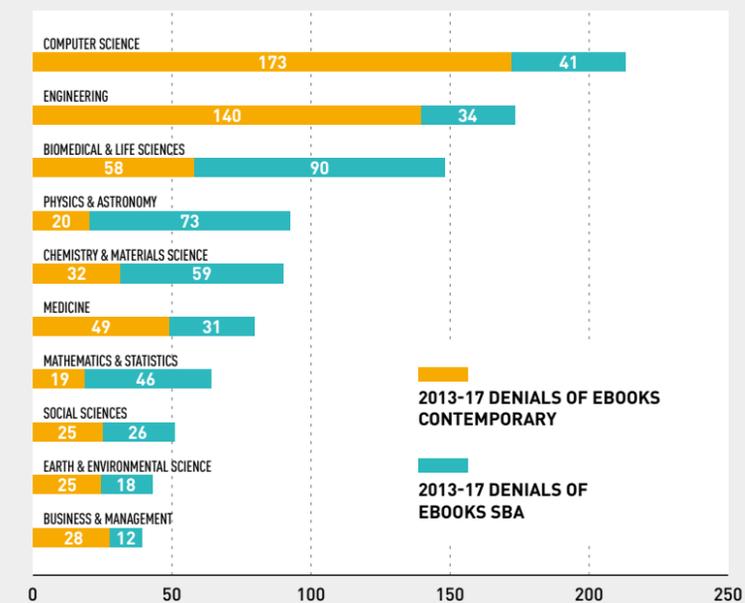
**A librarian from TAEBDC member institution**

For denials in contemporary collections, it is possible that the book cannot be accessed or downloaded, since it is to be published in the next year. For example, a librarian expressed his frustration in not being able to download a book with the copyright year of 2019 and wondered if it is only accessible when TAEBDC continue purchasing the package in 2019. But often times, a book that is put online may just have a Machine-Readable Cataloguing (MARC) record and not necessarily have the full PDF content available, which may still need the author’s final approval. It is common practice for publishers to put up MARC records for books planned to be published before they are finished, which may explain some denials experienced by users. Springer is thinking about marking such unfinished e-books to distinguish them from the fully accessible ones in the aim of optimising user experience.

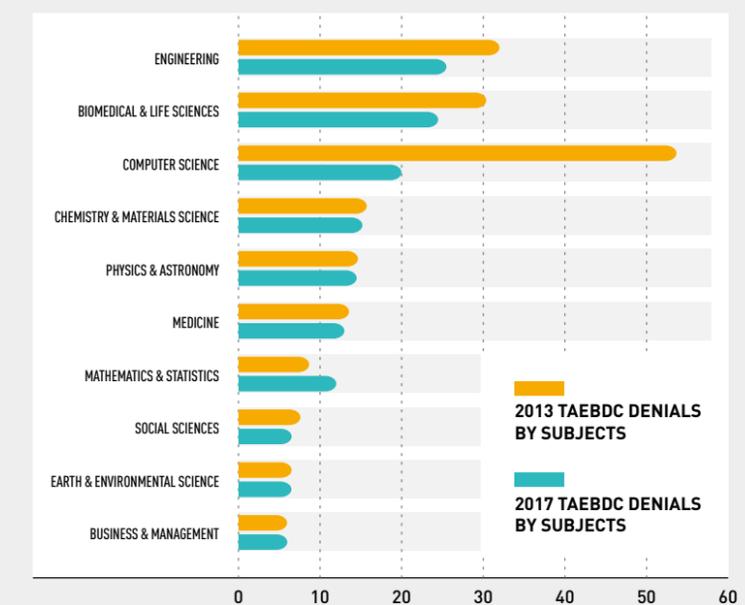
Over the past five years, with available subject-specific data on Springer e-book usage, denials experienced by TAEBDC users have been decreasing, from approximately 199,000 in 2013 to 150,000 in 2017. Most of the decreases can be attributable to computer science, the subject collection that dominates e-book usage, which has seen denials decreasing from around 55,000 in 2013 to 19,000 in 2017 (see Figure 5). The percentage of total denials it accounts for also dropped dramatically from 27.8% to only 12.8%. Denials in engineering, as well as biomedical and life sciences have also seen big decreases in 8,000-9,000, though their percentages of total denials did not change prominently.

Notably, denials in behavioural science and psychology, mathematics and statistics, as well as professional and applied computing have increased slightly, suggesting growing unmet needs in these subject areas. Springer eBook is enhancing its offerings to TAEBDC in these areas to better meet the research demands by TAEBDC users. ■

**FIGURE 4 | DENIALS EXPERIENCED BY TAEBDC USERS, BY SUBJECT**



**FIGURE 5 | DECREASES IN DENIALS, BY SUBJECT, 2013-2017**





# TAEBDC E-book authorship

# REFLECTIONS

# ON THE

# IMPACT

**F**or researchers, writing books is an important way to disseminate knowledge and communicate their research. Unlike journal papers, books may have fewer citations in a short-term range, but have longer life cycles and wider readership in a long run. Researchers would also be happy to know that their published books are used and that their research can make an impact.

Boosting research impacts of Taiwanese researchers is also on the agenda of TAEBDC. It aims to enhance the research capacity of its member institutions by working with academic publishers to promote the accessibility and sharing of research work produced by Taiwanese

researchers.

Since partnering with Springer 10 years ago, TAEBDC has seen an increasing number of books published by Taiwanese researchers. Based on the book usage data from Springer, we see that Taiwanese researchers have demonstrated their strengths in many fields, including some niche subject areas, with their e-books showing high popularity among global users.

#### IMPROVED RESEARCH PERFORMANCE IN BOOK PUBLICATIONS

From 2008 to 2017, the number of book titles Taiwanese researchers published with Springer increased five-folds, from

merely 10 to 53, though with some fluctuation (see figure 6). The 10-year CAGR of e-books published by Taiwanese authors was 20%, a much higher growth rate than that of the global book publication volume, which was only 8%.

As with the e-book usage by TAEBDC users, the peak year of book publication was 2014, when Springer published 69 book titles authored by Taiwanese researchers. The number declined the following year, but showed a steady growing trend since after 2015. Meanwhile, Taiwanese researchers are also making growing contribution to the volume of global book publication, authoring 0.43% of all the books published by Springer worldwide in 2017,

a substantial growth from only 0.16% in 2008 (see **Figure 6**).

Computer science, which dominates the landscape of e-book publication worldwide, is the leading subject area in book authorship by Taiwanese researchers. The total number of books in computer science published at Springer by Taiwanese researchers from 2008 to 2017 amounts to 153, accounting for 38.8% of Taiwan's total book publications at Springer (394 book titles) in the past 10 years. Engineering follows as the second largest subject area in book publication, and with 80 titles, accounting for 20.3% of the total number of books published by Taiwanese authors in the past 10 years (see **Figure 7**). These two subject areas make up more than half of all the books published by Taiwanese researchers.

The number of books published in computer science and engineering accounts for 1.23% and 0.83% respectively of the total book publications in the relevant field worldwide, higher than the percentage contributed by Taiwanese authors to the total number of titles published at Springer worldwide. The two subjects clearly stand out as the strong areas of Taiwanese research in terms of book publishing.

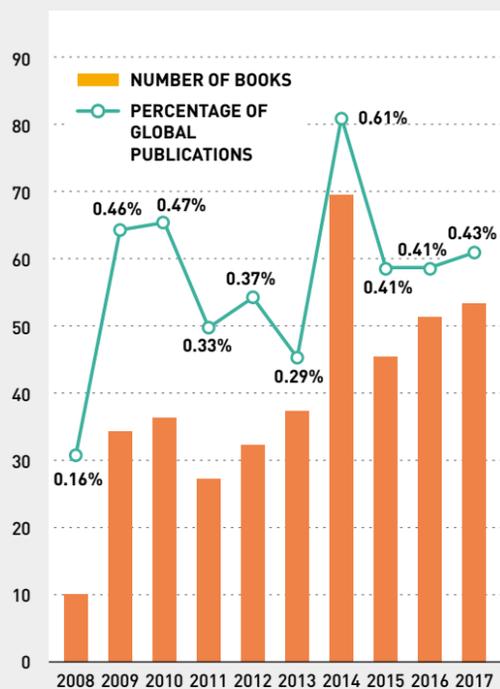
Two social science subjects, education and economics, follow as the third and fourth popular fields in academic book authorship by Taiwanese researchers. Book publication in these two fields grows tremendously in the past 10 years, respectively at a CAGR of 20% and 32%, much faster than the global growth rates.

### BOOK PUBLICATION PERFORMANCE

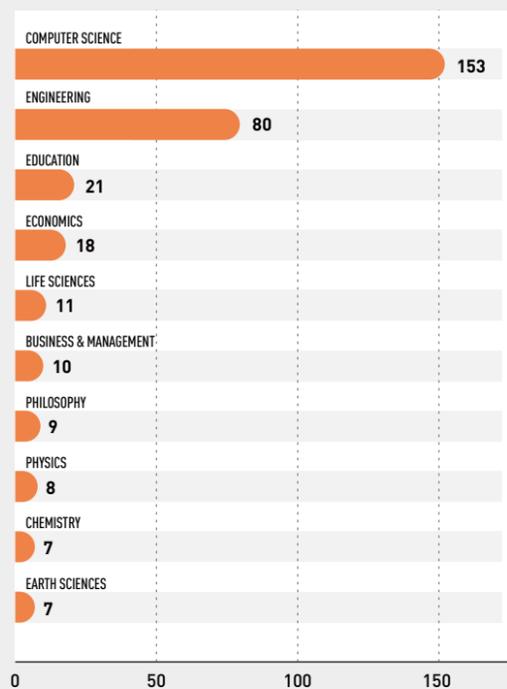
To better evaluate the reach, usage, and impact of published books, metrics are needed to compare Taiwanese researchers' book publication by subject, and to benchmark their performance against that of the global authors. To this end, Springer launched a new platform, Bookmetrix, in 2015 to capture how often an individual book or chapter is mentioned, shared, reviewed or read online.

Examination on the number of citations, downloads, mentions, readers and reviews in the past 10 years of books published with Springer has shown Taiwanese scholars' research strengths in a varied range of subject areas. Though the number of book titles published by Taiwanese researchers is not huge, particularly in some small, niche

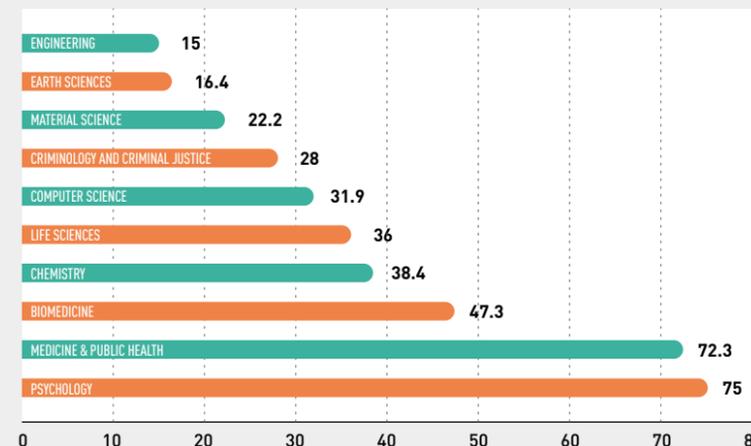
**FIGURE 6 | NUMBER OF BOOKS PUBLISHED WITH SPRINGER BY TAIWAN USERS, 2008-2017**



**FIGURE 7 | TOTAL NUMBER OF BOOKS PUBLISHED BY TAIWAN USERS 2008-2017, BY SUBJECT**



**FIGURE 8 | AVERAGE NUMBER OF CITATIONS OF BOOKS PUBLISHED BY TAIWAN RESEARCHERS 2008-2017, BY SUBJECT**



citations, suggesting global recognition of Taiwan's research in these subject areas.

As the total number of citations is largely shaped by the size of publications in a certain subject, average number of citations, as a normalized measure, offers a more accurate look at the impact of research in the specific subjects. Psychology, though only has one book title published in the past 10 years, with 75 average citations, tops the list. It is closely followed by medicine & public health, which has 72 citations per book title (see **Figure 8**). Average citations of books published by Taiwanese researchers are more than eight times those of the global average for medicine & public health, and six times for psychology, demonstrating Taiwan's strengths of research in these two subjects.

Biomedicine, chemistry, life sciences and computer science follow as the strong subjects in average citations. However, they do not show many advantageous edges in global comparisons. Three social science subjects, business & management, political science & international relations, and criminology & criminal justice follow as subjects standing out globally in research strengths. Their average numbers of citations are 336%, 238% and 232% of the global average respectively, showing Taiwan's comparative edge in these niche areas.

### DOWNLOADS

Looking at the total number of chapter downloads in the past 10 years of books published by Taiwanese researchers, computer science and engineering, with 7.11 million and 2.68 million downloads respectively, again, are the leading subjects. They are followed by business and management, and education, with 0.35 million and 0.34 million downloads respectively. However, if looking at the percentage of chapter downloads of books written by Taiwanese authors out of the global total, history (2.06%) and criminology and criminal justice (1.78%) stand out with the highest percentages along with computer science (1.88%). They are followed by engineering (0.82%), statistics

areas, the impact is high when compared with the global average.

### CITATIONS

Unsurprisingly, subject areas with the most number of book publications in the past 10 years, like computer science and engineering, also have the largest number of citations. Total number of citations is 4,876 for computer science and 1,200 for engineering, substantially outnumbering those of the other subjects. They account for 1.32% and 1.06% of the total number of citations for books published worldwide in the respective subjects, slightly higher than the percentages of the total number of books published worldwide in the relative subjects by Taiwanese researchers.

Medicine & public health, life sciences, and chemistry follow as the subjects popular in citations, with 434, 396, and 269 citations respectively. But in terms of the shares of the total number of citations worldwide in the respective subjects, material science, medicine & public health, and criminology & criminal justice follow computer science and engineering as the top five subjects in

**“ It is important to let researchers know that their books are cited, reviewed, downloaded or twittered after publication. This will make them happy and by seeing the data, they can know the impact their books have made in the world. ”**

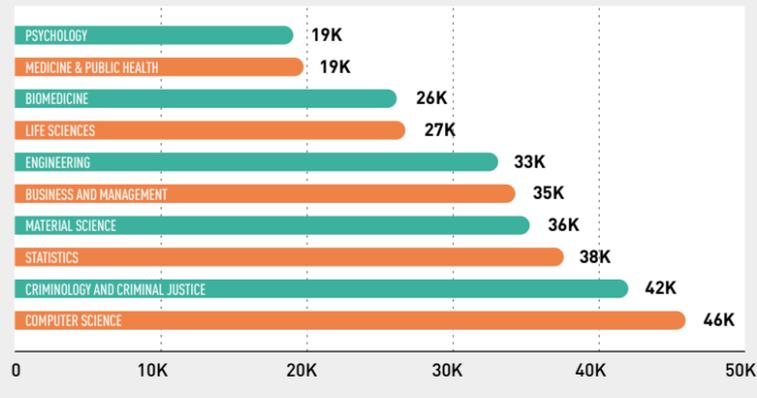
**A librarian from TAEBDC member institution**

(0.81%) and material science (0.81%). This suggests that Taiwan's book publication in some HSS areas, such as history and criminology, though not large in quantity, takes an important position globally in terms of usage by global readers.

Taiwanese researchers' books in computer science, criminology and criminal justice, and statistics, in order, have the top three highest number of average downloads. They are followed by books in material science and then, business and management (see **Figure 9**). However, in a global comparison, statistics is below the global average in chapter downloads. Criminology and criminal justice and history, which are 7.6 and 6.1 times of the global average respectively, become the leading subjects in chapter downloads. This reinforces the earlier finding about Taiwan's relative strength of research in these two subjects.

Other subject areas that are higher than the global average in chapter downloads are computer science, philosophy, material science, business and management, physics, and education. But except for computer science and philosophy, both of which are around 1.5 times of the global average, the relative advantage of the other subject areas in a global comparison is not salient.

**FIGURE 9 | AVERAGE NUMBER OF DOWNLOADS OF BOOKS PUBLISHED BY TAIWAN RESEARCHERS 2008-2017, BY SUBJECT**



**MENTIONS**

Another measure to evaluate book impact is the number of mentions, which uses Altmetric data to track the number of time the book is discussed or mentioned online in mainstream news outlets, public policy documents, blogs, and other social media platforms. It is a measure that shows the book's public reach and impact. Computer science, engineering and education,

respectively with 323, 134 and 78 mentions in the past 10 years, are Taiwan's leading subjects in terms of public dissemination. They are followed by books in life sciences and cultural and media studies, respectively with 59 and 41 mentions.

Engineering is the leading subject area in terms of Taiwan's share of the total of number of mentions globally, which accounts for 1.53% of all the mentions in the past 10 years for books published in this field globally. It is followed by computer science, education, and cultural and media studies, accounting for 0.87%, 0.62% and 0.58% of the global total respectively. These are generally consistent with the subject areas with the highest number of total mentions.

Computer science and engineering are no longer leading in terms of the average number of mentions. Cultural and media studies, a subject that is likely to arouse public interest, is leading, with 21 mentions on average, a large lead ahead of medicine and public health and literature, which follow with 6 mentions each (see **Figure 10**). The average number of mentions for books in cultural media studies is nearly five times that of the global average, showing the much great popularity of books published

by Taiwanese researchers than same-subject books published by global authors. Taiwan's books in medicine and public health, business and management, as well as engineering also have clear advantage in terms of public impact in a global comparison. Other subject areas with larger number of mentions than the global average are literature, education, and life sciences.

**READERS**

Readers is a measure on how many people have saved a book or its chapter in their Reference Manager, another way to show book usage. Looking at books published by Springer in the past 10 years from 2008 to 2017, computer science, with nearly 27,000 readers, is undoubtedly a leading subject of books published by Taiwanese authors in terms of usage. It is remotely followed by books in engineering and life sciences, with around 5,200 and 1,800 readers respectively. This is generally consistent with the global landscape of book usage by subject. For other subjects, the number of readers is less than 1,000 for books published in the past 10 years.

Computer science is also leading in terms of Taiwan's share of the total number of readers in this subject globally, accounting for 1.47% of the global total, slightly higher than Taiwan's share of the global total number of books published in this area. This suggests good performance of books in this subject by Taiwanese researchers. Criminology and criminal justice, with only 130 readers, accounts for 1.43% of the total number of readers in this subject globally, showing the great popularity of Taiwanese researchers' books in this small niche area. Number of readers for engineering books published by Taiwanese authors accounts for 0.94% of the global total, higher than the percentage of books published by Taiwanese authors out of the global total of books in the subject, suggesting relatively good performance of engineering books by Taiwanese authors.

Looking at the average number of readers, the leading edge of computer

science books disappears. Books in cultural and media studies, with 21 readers on average, are leading amongst all the subjects, though the number of books published by Taiwanese researchers in this area is small. Books in literature, as well as medicine and public health, each with six readers on average, tie as the second most popular subject area books in terms of reference usage. Books in life sciences follow in the fourth place (see **Figure 11**).

In a global comparison, books in criminology and criminal justice stand out again, with more than six times that of the global average in terms of the number of readers. Other two HSS subjects, business & management and history, though small in the volume of book publication, have about twice the number of readers of the global average respectively. They are followed by books in chemistry and cultural and media studies, with 1.5 and 1.3 times of the global average of the number of readers, respectively. Taiwanese authors' books in some major STEM subject areas, like computer science, engineering, and life sciences, are also above the global average in the number of readers.

**REVIEWS**

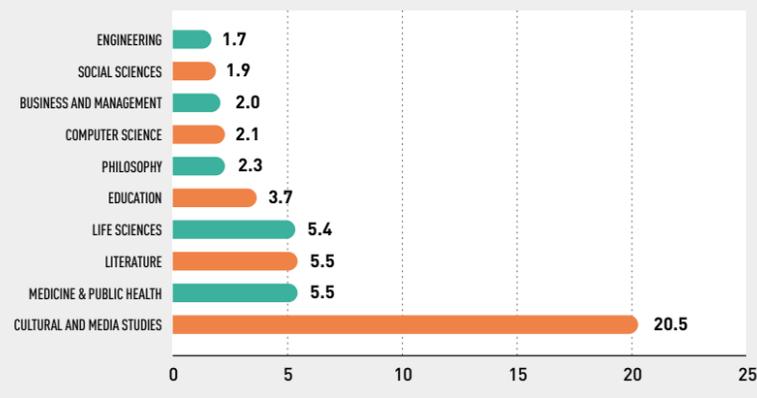
Another way to track book performance is to examine the number of published book reviews written on it. For books published by Taiwanese authors with Springer in the past 10 years from 2008 to 2017, engineering collection has the largest number of reviews, followed by books in computer science, which have four reviews. Their leading edge in the number of reviews may simply be a result of the large number of titles published in these two subjects. Books in medicine & public health, mathematics, history, and linguistics follow, with three reviews each.

Number of reviews for linguistics books published by Taiwanese researchers accounts for 1.05% of the global total for this subject, leading among books published by Taiwanese researchers in various subject areas. The multidisciplinary collection, with only one review, accounts for 0.82%

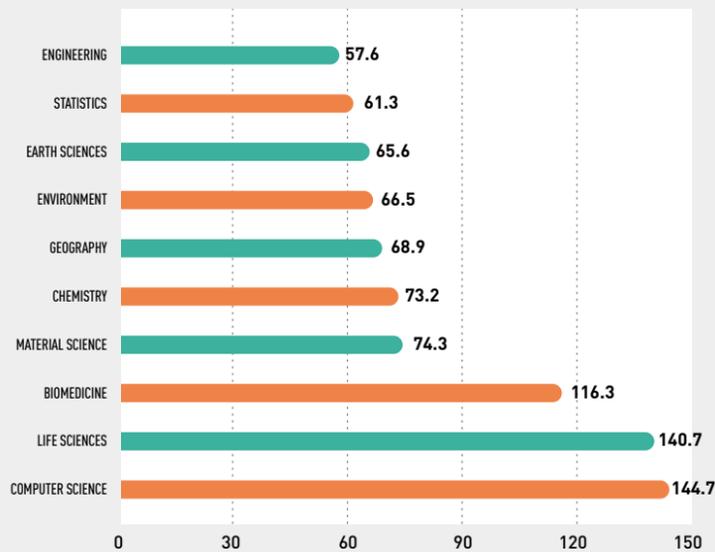
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*Sometimes, high level of usage does not necessarily mean a high quality of a book. Relatively speaking, it's probably safer to say that the book has higher quality when it has a larger number of citations. Say, for conference proceedings, they may have high volume of usage, but not necessarily high number of citations. Academic books are usually of high quality, but may not have high usage.*  
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A librarian from TAEBDC member institution

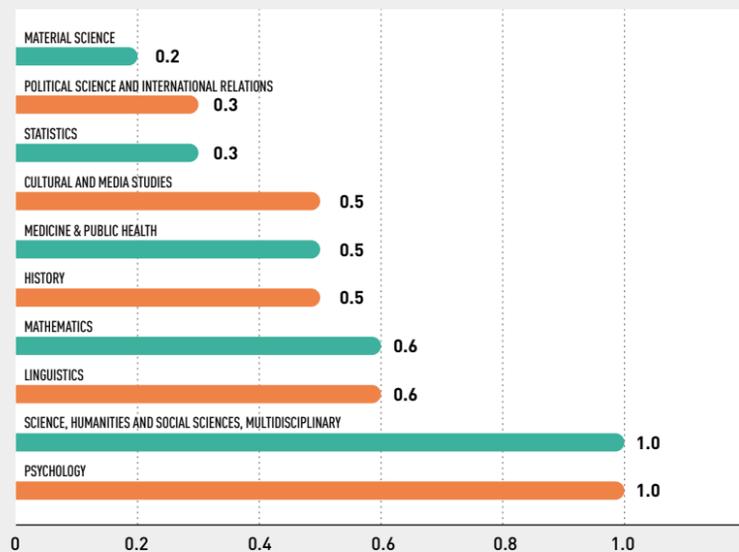
**FIGURE 10 | AVERAGE NUMBER OF MENTIONS OF BOOKS PUBLISHED BY TAIWAN RESEARCHERS 2008-2017, BY SUBJECT**



**FIGURE 11 | AVERAGE NUMBER OF READERS OF BOOKS PUBLISHED BY TAIWAN RESEARCHERS 2008-2017, BY SUBJECT**



**FIGURE 12 | AVERAGE NUMBER OF REVIEWS OF BOOKS PUBLISHED BY TAIWAN RESEARCHERS 2008-2017, BY SUBJECT**



of the global total for this subject, having the second largest share of the global sum of reviews. It is followed by the subject of material science, whose number of reviews accounts for 0.81% of the global number. The number of reviews for books in engineering and computer science only accounts for 0.47% and 0.2% of the global total respectively, suggesting relatively small impacts of Taiwanese authors' books in these subjects in a global comparison.

To downplay the effect of the volume of book titles published in a subject, average number of reviews is assessed. The multidisciplinary and psychology collections, though with only one book title published in the last 10 years respectively, each attracts one review, leading among all the subject areas in terms of the average number of reviews. Books in mathematics and linguistics follow with 0.6 reviews on average respectively. Medicine & public health, history, and cultural and media studies each has 0.5 reviews on average (see **Figure 12**).

Using the global average number of reviews as the benchmark, books in psychology, material science, the multidisciplinary subject of science, humanities and social science, as well as linguistics published by Taiwanese authors demonstrate strong performance. Psychology has 1.6 times the number of reviews of the global average, suggesting the quality and impact of the one book published by Taiwanese authors in this subject. Books in material science and the multidisciplinary category, with 1.4 and 1.3 times of the global average number of reviews respectively, also have shown their strengths in the global comparison.

In general, the results suggest that while Taiwanese authors books' in computer science, engineering and life sciences have shown their impact, given their volume of book titles, books in some niche HSS subjects stand out in global comparisons, demonstrating their quality and global reputation. ■



**A**cademic books primarily serve researchers in universities, research institutions, or governments and corporate R&D departments, providing them quality content to excel research and learning for them. Meeting the needs of researchers is a top priority for academic book publishers. The rapid development of digital technology has enabled faster and more tailored provision of innovative information, products and services to researchers, leading to improving electronic book offerings. To ensure that the improvement addresses users' needs, it is important to make the voices of the users heard.

Promoting the sharing of academic e-books and databases to boost research capacities of user institutions is the shared objective for TAEBDC and Springer eBook. To understand users' needs and expectations, Springer eBook conducted interviews with librarians from TAEBDC member institutions, who work closely with researchers. The results paint a picture of the future of academic e-books, with the use of metrics to measure book quality

and make quality content most needed by users easily found, along with technologies that further improve book accessibility and book consumption experience, boosting the impacts of academic books and enhancing their values.

**USE OF METRICS TO EVALUATE AND PROMOTE BOOKS**

To make books known to researchers, it is helpful to have an effective platform to introduce the books, accompanied with metrics to measure book quality and impacts. Working with Altmetric, a metrics provider that tracks online activity around research outputs, ranging from journal articles to books, Springer developed the Bookmetrix platform in 2015, offering title and chapter level metrics on current reach, usage, and broader impacts of books for all readers, authors and editors.

The Bookmetrix is welcomed by librarians from TAEBDC member institutions. "Bookmetrix is really nice and well designed. It helps us to know what and how much are discussed about the topic. I find it really helpful," said

**“**  
*It is still an issue encouraging scholars to use social media, like facebook, for an exchange of their opinions about books. It would be nice to have an online exchange about what they read, or how they perceive [a book]. It will benefit their research... An online platform will also help to link local researchers with their global peers, accelerating their research.*  
**”**

**A librarian from TAEBDC member institution** 

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**Authors would be happy to know about how many times their books are cited, downloaded or used in general after publication... They'll even see how many people have commented or reviewed their books worldwide, or how their books are twittered. This way, they can learn about the impacts their books have made in the world.**

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**A librarian from TAEBDC member institution**



one librarian. It is suggested that the metrics, when combined with social media platforms, can help make e-books more visible to researchers, who can learn about what are discussed in his or her research areas with the metrics and also get engaged in the discussion. However, while such an integration with social media platforms may work for young researchers, encouraging the older generation of researchers to use online metrics may remain a challenge.

It is also suggested that it would be great to display the metrics with the book or chapter abstract, so that users can easily learn about the key points discussed

in the book, having quantifiable measures and a qualitative picture of the content at the same time. Clearly, a more complete set of services is desired, which will support book promotion and use.

The metrics will benefit authors, helping them to learn how their books are received and perceived, linking them with readers. Such knowledge may motivate researchers to do more research, or explore new research projects, inspiring innovative ideas for them. This will, in turn, boost research capacities.

Particularly, books have much longer life cycles than journals, usually extending to 10 to 20 years, and cover broader topics. It is essential to have metrics to help with judging books' long-term impacts for authors, as well as for readers and other users.

In future, book metrics may also incorporate funding data or other measures of research input to help evaluate the cost-effectiveness of book writing and production. Such indicators can be compared with the equivalent indicators for journals, for instance, so that authors can judge whether it is more cost-effective or impactful to write a book than a journal article for a specific research topic.

Metrics will also help librarians in sorting out and identifying books needed for researchers in their institutions. With the data on a book, librarians will be able to better gauge researchers' interest in a book, and make book selections or recommendations accordingly. After all, as with academic book publishers, it is also the librarians' goal to promote books and encourage book use. Metrics on books facilitate such a process.

However, it also needs to be noted that high usage does not necessarily mean high quality. Normally, citation is used to indicate quality, but this is not always the case either. More diversified and comprehensive indicators are needed to evaluate book quality and to promote books to researchers.

#### **USE OF TECHNOLOGY TO ACCELERATE RESEARCH AND LEARNING**

The development of technology is reshaping our lives, including our research and learning experience. Digital books have already allowed easier storage and access to large volumes of titles. Technology can also enhance the reading experience.

Efforts are already made to incorporate video and audio into digital book offerings. Especially for reference or handbook type of academic books, videos will offer a more vivid illustration of a technique or an experiment procedure, and enhance

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**We've just had a meeting about how to use metrics, say, using Bookmetrix to promote books. With the metrics, we can tell the book's global usage, and can easily select the top 20 or top 50 to recommend to researchers ... We can also introduce to professors how to use the metrics to search for books based on their interest and needs.**

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**A librarian from TAEBDC member institution**



learning. Future attempts may even make use of the virtual reality (VR) technology to allow first-hand experience in learning.

It is also expected that technology will enable displaying book content on an electric wall, adding even more multimedia elements to enrich book content and the reading experience. Such a digital screen wall can also be used for displaying book introductions to facilitate searching and borrowing books. Searching through hundreds of thousands of e-books is not easy. Technology can be harnessed to improve the book search and use processes.

Apart from the display and multimedia technologies, the development of artificial intelligence (AI) or machine learning will also promote the advancement of e-books. One application is AI-facilitated translation. Machine learning is already used in translating books from other languages into English, or the other way

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**Let's see what will happen [in academic e-books] in five years. Maybe there will be significant change ... As long as you always make efforts to try, you will succeed eventually. If you don't keep up with the new technology development, you will fail.**

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**A librarian from TAEBDC member institution**



around, to promote the dissemination of knowledge to a global audience.

AI technology is also used to catalogue e-books, producing book or chapter abstracts. Machine learning will significantly speed up the process and allow more accurate key word searches, making books more easily found in searches and increasing book visibility. “I'm thinking, it will be great if we can use Bookmetrix and other data on books to build a search engine ... Using technology, we can make books more likely to be found,” suggested a library director from a TAEBDC member institution, for instance. AI can even be used to make reliable recommendations based on the users' interests, making e-book platform more user-friendly. It will also facilitate research and improve research efficiency by saving the time for information search and literature review.

Another use of technology is to support open-access to books. Interviewed librarians told that researchers would normally prefer a database model, that all the e-books are stored in a searchable database allowing them to read or download a certain chapter freely after key word search, without the need to check out the entire book to read and return after finishing it.

Indeed, open access will facilitate the dissemination of academic works, boosting the impact of research. It is expected that institutional or governmental funding will be provided to support the open-access efforts. Open access will also discourage the use of pirate copies, protecting the author's intellectual properties, as a librarian pointed out.

In addition to make books open access, it is also expected that reference information or data covered in a book will be made openly accessible. “I hope to be able to see the original data of the research, or at least know where to access them,” said a library director. “This can be a feature of e-books.” Digital technology will enable easier integration of all the information, making research more transparent and knowledge consumption more convenient.

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**After all, for researchers, the objectives of writing a book or a journal article is to make their research results known to others --- the more people will be able to use the content, the better. Digitalization has already allowed increased access, and it would be even better if we can have open access.**

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**A librarian from TAEBDC member institution**



Looking into the future, technology, with enhanced computing and data processing capacities, will improve academic e-book platforms and enhance book use and search experience. With richer data on books and improved measures to evaluate book quality and impacts, good content will be more effectively consumed and valued, as books are widely promoted. Eventually, these powerful tools will communicate research results to a wider group of people, boost impacts of research, and enhance research capacities. These are the shared goals for academic book publishers, authors, editors, librarians, and researchers in general, whether the books are published in print or digitally. ■

