

Database statistics applied to investigate the effects of electronic information services on publication of academic research – a comparative study covering Austria, Germany and Switzerland

Datenbankstatistiken angewandt zur Effekterforschung der Informationsservice auf die Veröffentlichung akademischer Publikationen – eine vergleichende Studie Österreich, Deutschland und die Schweiz betreffend

Abstract

In this study, estimations of the effects of electronic information services on academic research as made in 2004, are confronted with the actual situation. For this purpose database statistics on session length per user session, the role of “Referrers” and number of Full Text Articles requested per user session are analysed. The effect of a larger content offering is studied by analysing the relationship between subscribed titles and Full Text Articles requested. Finally a possible relationship between R&D spend, subscription spend and article publication is sought. This study found that time spent on Browse/scan and Search is increasing, possibly caused by a broader penetration amongst less trained users. This study further clearly showed that a larger content offering coincides with a dramatic increase in Full Text Article requests, and an increase in Full Text Article requests, after about 2 years, coincides with increased article publication.

Keywords: database statistics, larger content offering, increased article publication

Zusammenfassung

In dieser Studie wird die Schätzung der Auswirkungen, die die elektronischen Informationsdienste auf die Forschung hat, aus dem Jahr 2004 den tatsächlichen gegenüber gestellt. Dazu sind Datenbankstatistiken über die Dauer der Datenbanksuche, die Rolle von “Referrers” und die Zahl der Volltextartikel pro Benutzerabschnitt analysiert worden. Der Effekt des größeren Inhaltsangebots wurde untersucht, indem man das Verhältnis zwischen abonnierten Titeln und gefragten Volltextartikeln analysierte. Schließlich ist gesucht nach einem Zusammenhang zwischen R&D-Ausgaben, Subskriptionsausgaben und der Anzahl der publizierten Artikel. In dieser Studie hat sich herausgestellt, dass die Zeit, die mit Browser/Scan und Suche verbracht wird, zunimmt, möglicherweise durch einen größeren Zugriff weniger datenbankgeschulter Benutzer. Außerdem zeigt diese Studie deutlich, dass ein größeres Inhaltsangebot gepaart geht mit einer drastischen Zunahme der Volltextartikelanträge und diese wiederum, nach ungefähr 2 Jahren, korrespondieren mit einer ebenso erhöhten Artikelpublikation.

Schlüsselwörter: Datenbankstatistiken, erweitertes Zeitschriftenangebot, erhöhte Artikelpublikation

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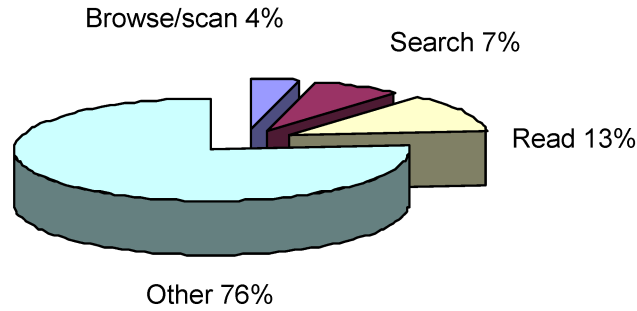


Figure 1: Time spend in a research project

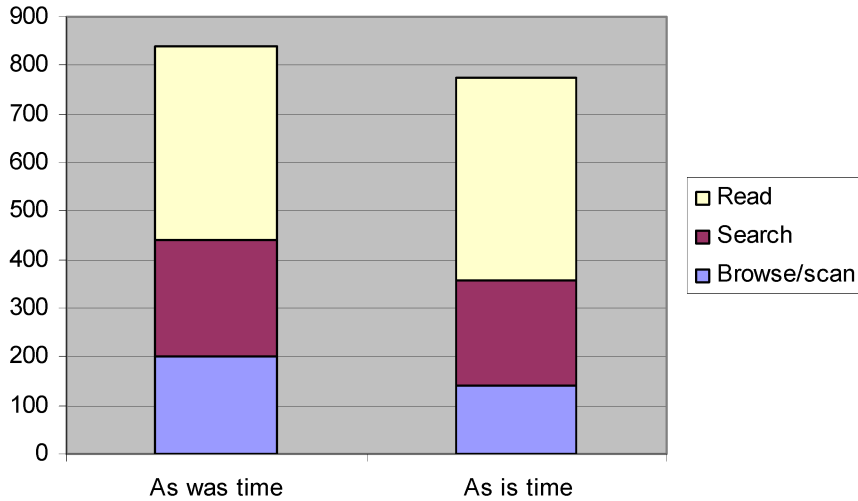


Figure 2: Developments in content related time spend

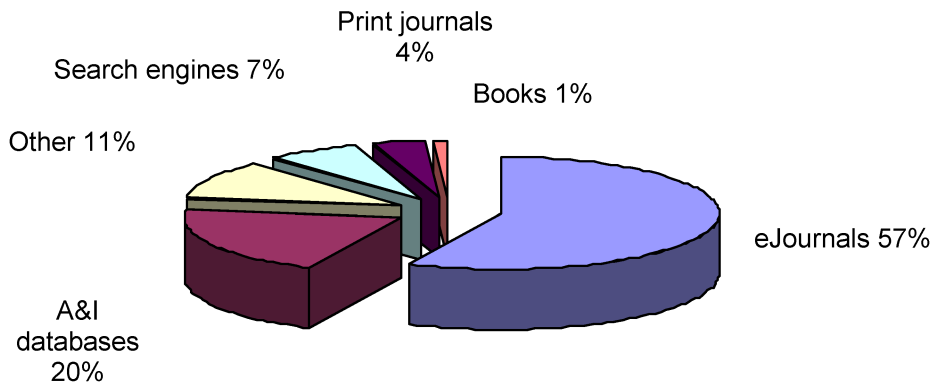


Figure 3: Time spend on various content types

Introduction

In an study by Elsevier, undertaken in 2004 in cooperation with the Biochemistry Department of the University of Utrecht in The Netherlands, participants were requested to estimate the effects of electronic information services on academic research [1]. Participants estimated that content related activities account for about a quarter of all time spend in a research project, as given in Figure 1.

The participants in the study further estimated that at that time slightly less time was spent on content related activities in total, but that within the content related

activities, researchers spent significantly less time on Browse/scan (-/-30%) and on Search (-/-10%), and slightly more time on Read (+5%), as given in Figure 2.

Estimations were further that most time spend on Content was spent on eJournals, followed by Abstract & Indexing (A&I) databases, as shown in Figure 3.

A correlation between the number of Full Text Articles requested and article production could not be derived from this study: the amount of Full Text Articles requested grew in the period 2000 trough 2003 with about 100% annually, whereas the average article production in the period 1996 trough 2002 increased with a modest 3% annually as given in Figure 4.

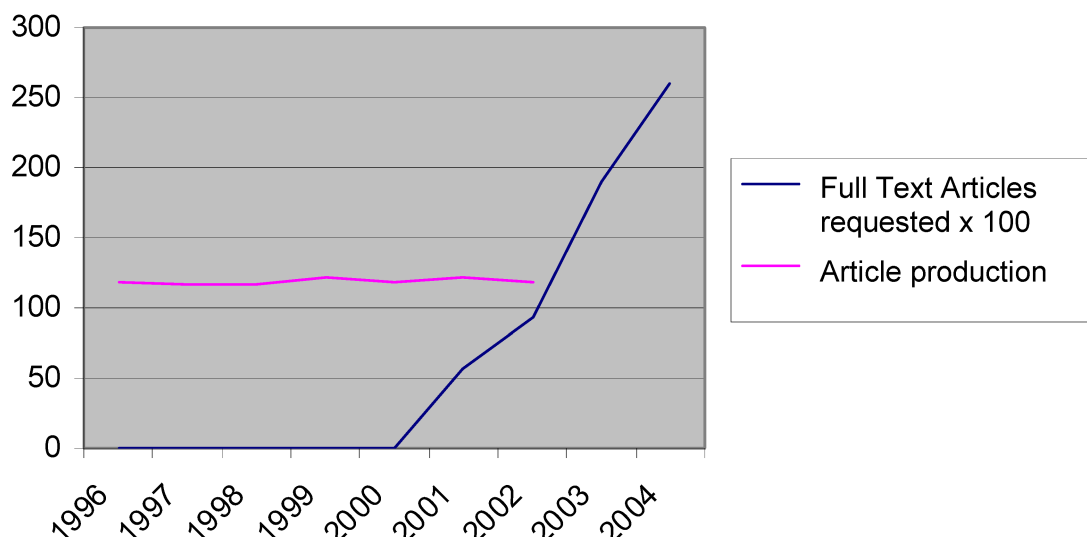


Figure 4: Full Text Articles requested and article production at Biochemistry Department of the University of Utrecht, The Netherlands

Aim of this study

Aim of this study is to confront the estimations as made in 2004 with actual measurements. First, this study is looking for evidence for the assumption that improved access leads to more reading. Following, this study is looking for evidence that a larger content offering is leading to more reading and finally, this study is looking for a possible correlation between increased reading and increased article production.

Methods

To get insight in the development of researcher's time spending on content, Browse/scan and Search, an analysis of the average session duration in the Abstract & Citation database Scopus and in the Full Text repository ScienceDirect is made. To get insight in the development of researcher's time spending on Read, an analysis of the average number of Full Text Article requests in ScienceDirect is made using database statistics derived from this platform. ScienceDirect is covering a total of about 2000 active journal titles, contributing in one single repository 24% of the world's digital STM journal literature. Because of this are the findings derived from ScienceDirect regarded as representative.

The influence of offering a larger content collection on the number of Full Text Articles requested and subsequently on Read is investigated in 2 case studies, including major German consortia. The consortium members had access to 4 journal collection categories: titles which were unique for the institute (Subscribed at institute only), titles to which also other consortium members subscribed to (Subscribed both at institute and via UTL), titles which were only subscribed to by other members of the consortium (Subscribed via UTL only), and titles to which none of the consortium members previously subscribed (Not in UTL and not in subscribed list = Freedom

Collection). The members of consortium "A" were offered access during 6 months, and members of consortium "B" during 2 months, to the Freedom Collection only.

A possible correlation between content use and article production is investigated by analysing and extrapolating the number of Full Text Articles requested from ScienceDirect and the number of articles published, as captured in the Scopus database, over time. Because Scopus is the world's largest Abstract & Citation database, the findings from the Scopus database are regarded as representative. This approach is based on the assumption that for the "High performance Research Engine" assets/laboratories, resources and researchers, and content are equally important.

Results

An analysis of the session length per user session in the Abstract & Citation database Scopus for Austria, Germany and Switzerland shows that all countries follow more or less the same pattern as given in Figure 5. As can be seen from the figure, in the period June 2006 through October 2007 the average session length per user session in Austria and Germany varied between about 11 and 15 minutes and in Switzerland between about 10 and 13 minutes. In the period October 2006 through October 2007, the average session length for all three countries increased significantly from about 11 minutes to about 14 minutes (27%).

In order to see the Full Text of the retrieved articles, users must be guided to Full Text repositories e.g. ScienceDirect. Abstract & Citation databases like Scopus, search engines like Google and other web platforms which guide users to full text repositories are "Referrers". The major referrers in Austria, Germany and Switzerland are PubMed, Google and the EZB (Regensburg), as shown in Figure 6.

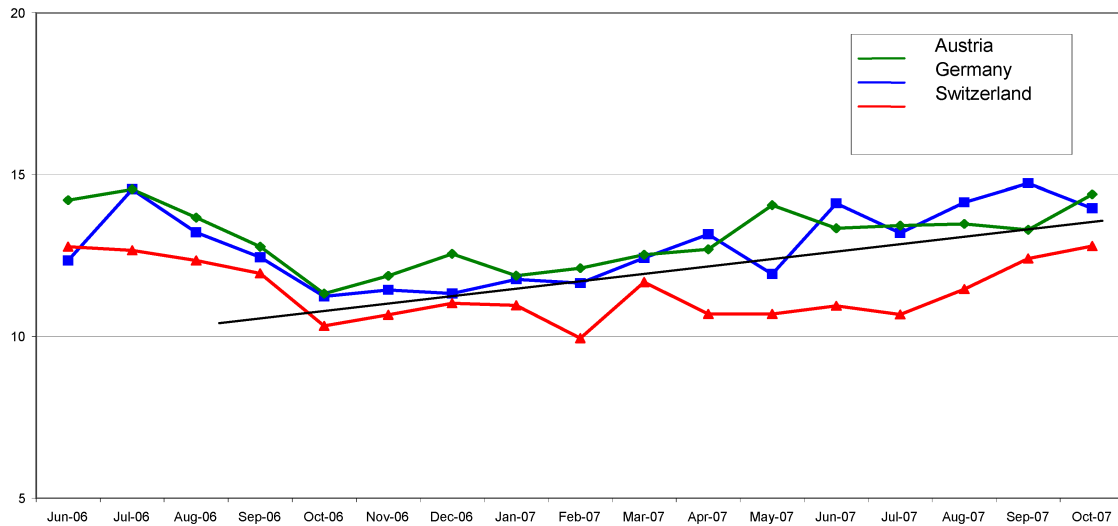
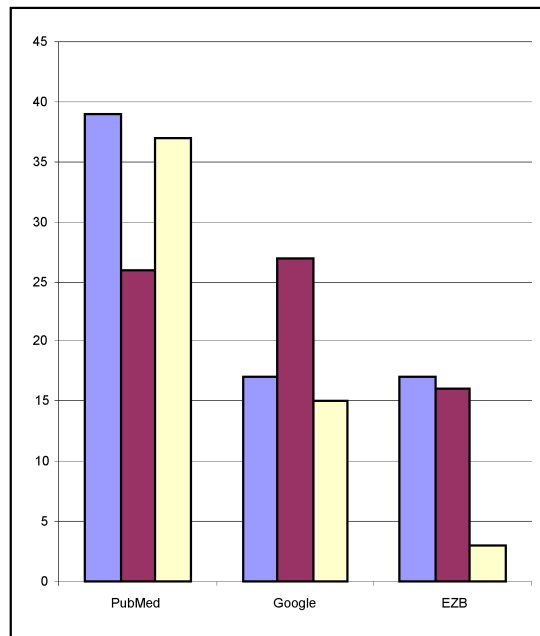


Figure 5: Scopus session length in minutes per user session in Austria, Germany and Switzerland in the period June 2006 trough October 2007



Blue=Austria, Pink=Germany and White=Switzerland

Figure 6: Contribution in % of the total referring by the major Referrer sites in Austria, Germany and Switzerland

An analysis of the session length per user session in the Full Text repository ScienceDirect shows that Germany and Switzerland follow more or less the same pattern, whereas Austria shows a different pattern as given in Figure 7. As can be seen from the figure is the average session length per user session in Switzerland and Germany between 5 and 6 minutes, and in Austria between 6 and 8 minutes. With the exception for Austria in the period 2004, show none of the countries a significant change in average session length per user session over the 4 year period.

Also show none of the countries a significant change in average number of Full Text Articles requested per user session in ScienceDirect in the period January 2006 trough December 2007, as given in Figure 8. As can be

seen from the figure, varied the average number of Full Text Article requests per user session in Austria and Switzerland between 2 and 2.5 and in Germany between 1.5 and 2.

An analysis of the origin of the Full Text Articles requested by the libraries participating in two major German consortia shows that less than half of all Full Text Article requests involved the institute's own collection. The majority of all Full Text Articles requested involved journals to which the institute had only gained access because of participation in the consortium! The relative number of Full Text Articles requested from each of the 4 sub-collections is given in Table 1. As can be seen from the table, only a median percentage of 45% of all Full Text Articles requested were from journals to which the institute sub-

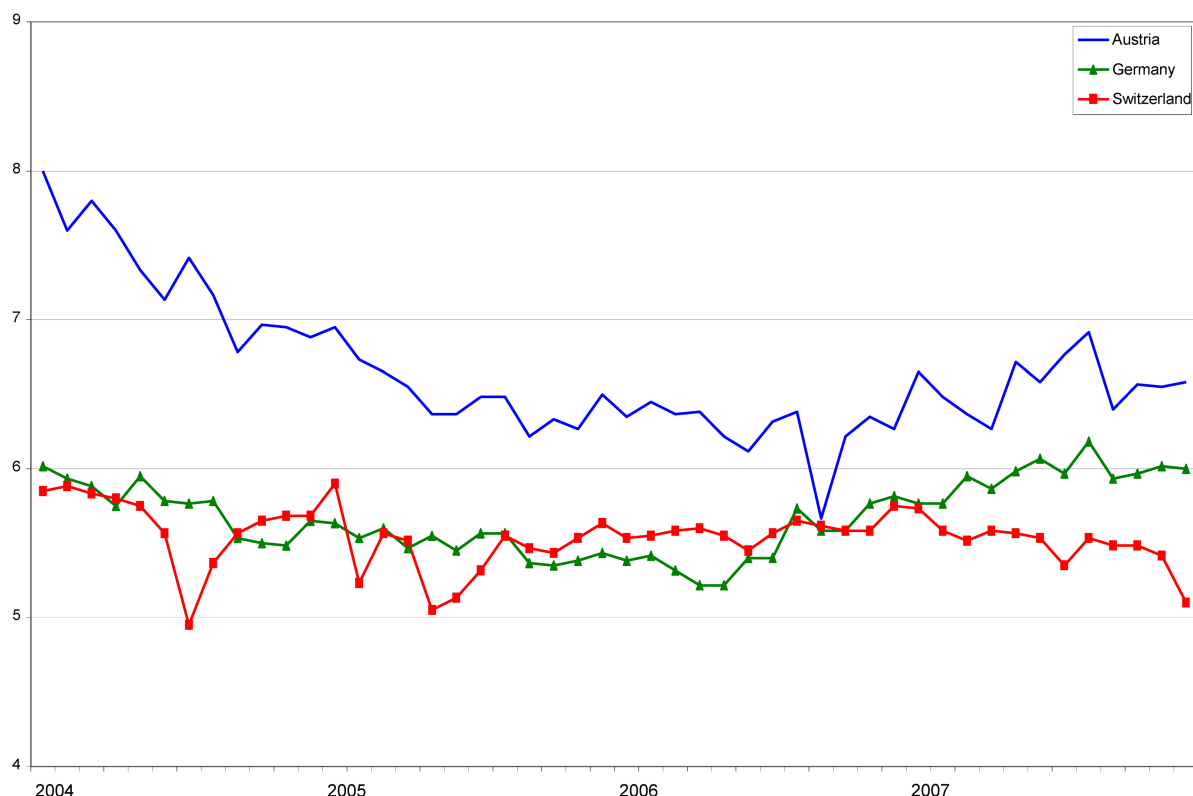


Figure 7: ScienceDirect session length in minutes per user session in Austria, Germany and Switzerland in the period January 2004 trough December 2007

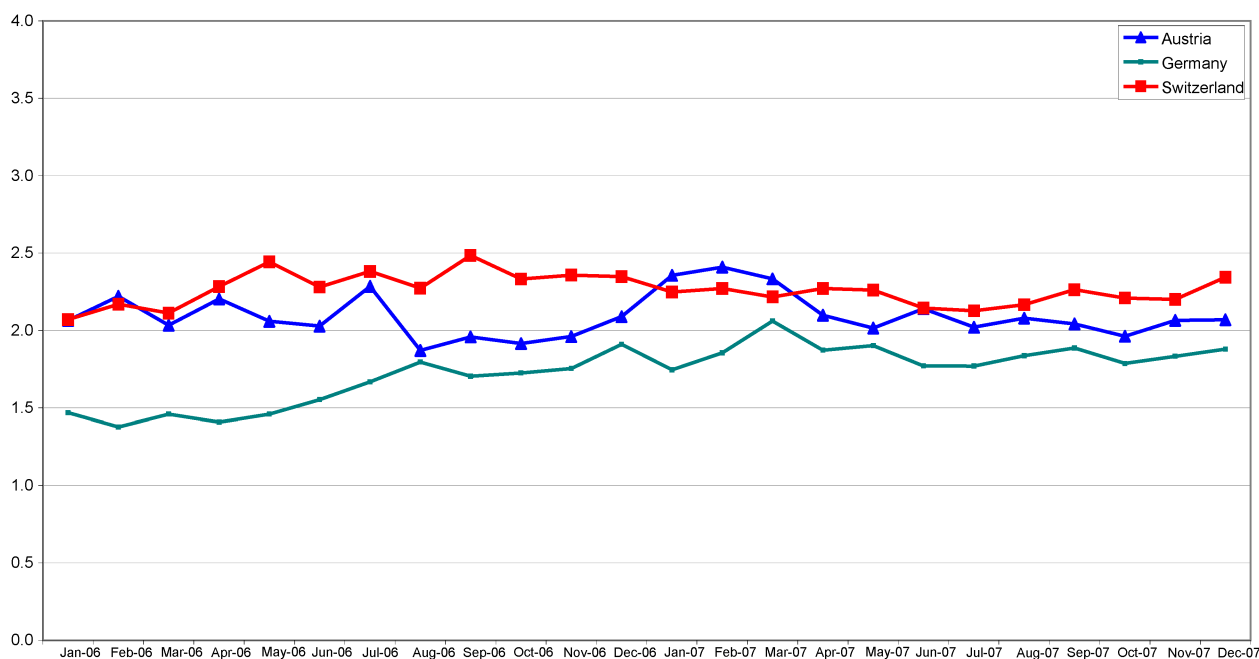


Figure 8: Number of Full Text Articles requested per ScienceDirect user session

scribed. A further median percentage of 39% of all Full Text Articles requested was from journals to which only the other consortium members subscribed. In addition, a median percentage of 17% of the Full Text Articles requested was from journals to which none of the consortium members subscribed.

The effect over time of a larger content offering for Consortium "A" is further investigated and given in Table 2. As can be seen from the table, the growth in usage of the institute's own journals collection (SDOS), decreased after the initial year. After migration to the SDOL platform (with UTL), the number of Full Text Articles requested increased dramatically.

Table 1: Relative number of Full Text Articles requested per sub-collection

Sub-collection	Consortium "A" (%)	Consortium "B" (%)
Subscribed at institute only	10	29
Subscribed both at institute and via UTL	31	20
Subscribed via UTL only	41	37
Not in UTL and not in subscribed list	18	15

UTL=unique title list e.g. titles to which only other consortium members subscribe

Table 2: Effect in time of a larger content offering

Year	Subscribed at institute only via SDOS (in%)	Subscribed both at institute and UTL via SDOL (in%)	Total (in%)
2001->2002	112		112
2002->2003	-/-14		-/-13
2003->2004	-/-3	153	-/-1
2004->2005	-/-10	49	-/-7
2005->2006	-/-47	1033	32
2006->2007		183	78

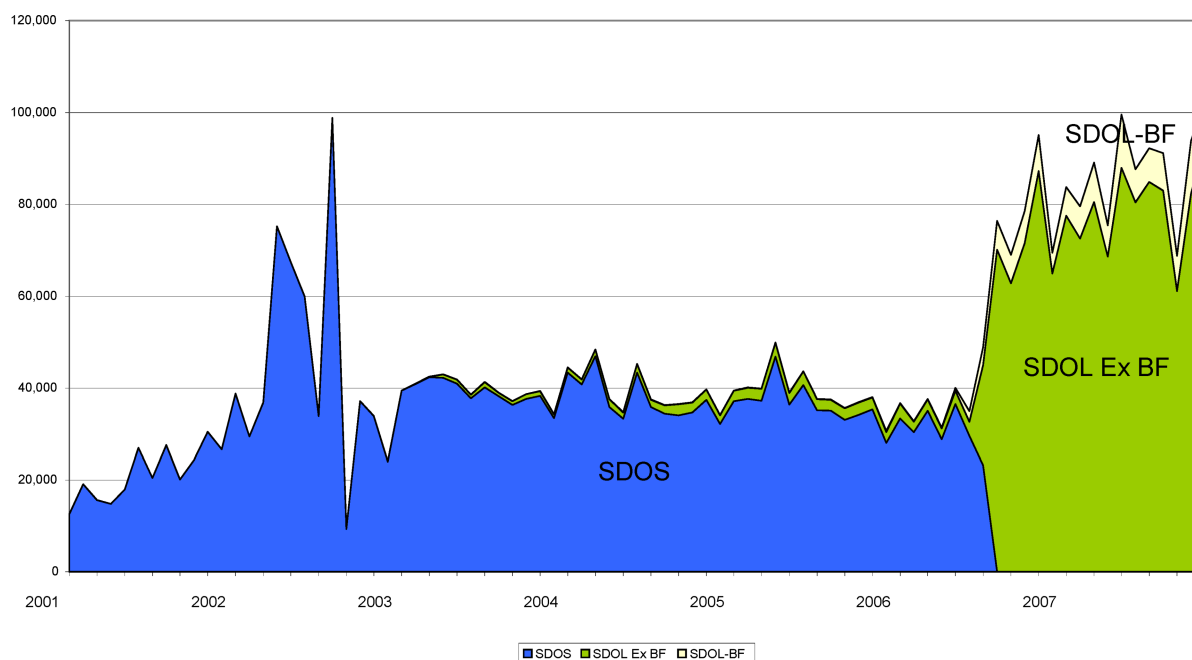
**Figure 9: Full Text Articles requested for consortium "A" for the period January 2001 through November 2007**

Figure 9 shows the Full Text Articles requested for consortium "A" for the period January 2001 through November 2007. Since November 2002 there was already very modest usage of SDOL, whereas the full migration from SDOS (with access to subscribed titles only) to SDOL (with additional access to the UTL) took place in July 2006. As can be seen from the figure, after the migration to a larger content offering via SDOL has the number of Full Text Articles requested almost doubled and continues to in-

crease. Also is shown in the figure that the nationwide offering of access to the back files has only a modest effect on the total increase of the number of Full Text Articles requested.

A larger content offering requires a larger spend on content and is likely depending on macro economic factors. An overview of the resources for Research & Development in Austria, Germany and Switzerland (DACH) is given in Table 3. As can be seen from the table, the GDP per

Table 3: Available budgetary resources in the DACH countries

	Austria	Germany	Switzerland
GDP (xMio)	283	2872	256
R&D spending (xMio)	6.8	65.8	7.4
Pop. (xMio)	8.1	82.4	7.5
GDP/Capita (xThousand)	35	32	34
R&D spending/Capita	839	798	988
R&D spending in % of GDP	2.4%	2.5%	2.9%

Sources: CIA World Book of Facts 2007, UNESCO

Table 4: Estimation of spending on subscriptions

	Austria	Germany	Switzerland
R&D spend (xMio)	6794	65,750	7410
Subscription spend (xMio)*	29	223	40
Subscription spend relative to R&D spend	0.4%	0.3%	0.5%
Subscription spend/researcher	1053	836	1523

Sources: CIA World Book of Facts 2007, UNESCO

*estimation

Table 5: Research performance indicators in the DACH countries

	Austria	Germany	Switzerland
# Researchers (x 1000)	28	267	26
# Articles published (x 1000)	11	90	20
# Articles/researcher	0.4	0.3	0.8

Sources: UNESCO, Scopus

Capita is highest in Austria, but the R&D spending per capita and relative to GDP is highest in Switzerland.

An estimation of the spending on subscriptions in the DACH countries is given in Table 4. As can be seen from the table, Switzerland has the highest subscription spend relative to R&D spend.

An overview of some major research performance indicators for the DACH countries is given in Table 5. As can be seen from the table, Switzerland is leading in article production per researcher. The highest number of article production per researcher coincides with the highest R&D spending per capita and relative of GDP, as shown in Table 4.

An analysis of the number of Full Text Article requests per million inhabitants and the number of articles produced per million inhabitants for the DACH countries is given in Figure 10 and Figure 11.

As can be seen from Figure 10, Switzerland produces over the years about double the number of articles per Mio. inhabitants compared to Austria (see also Table 5). The uptake of Full Text Articles requested in Switzerland is much steeper than in Austria. About 2 years after the start of Full Text Article requests, there is a significant increase in article production in both countries, however, with a steeper increase in Switzerland compared to Austria.

As can be seen from Figure 11, the United Kingdom [with a R&D spending relative to GDP of 1.9% compared with a R&D spending relative to GDP of 2.5% in Germany] produces over the years significantly more articles per Mio. inhabitants compared to Germany. The uptake of Full Text Articles requested in the United Kingdom is much steeper than in Germany. About 2 years after the start of Full Text Article requests, there is a significant increase in article production in both countries.

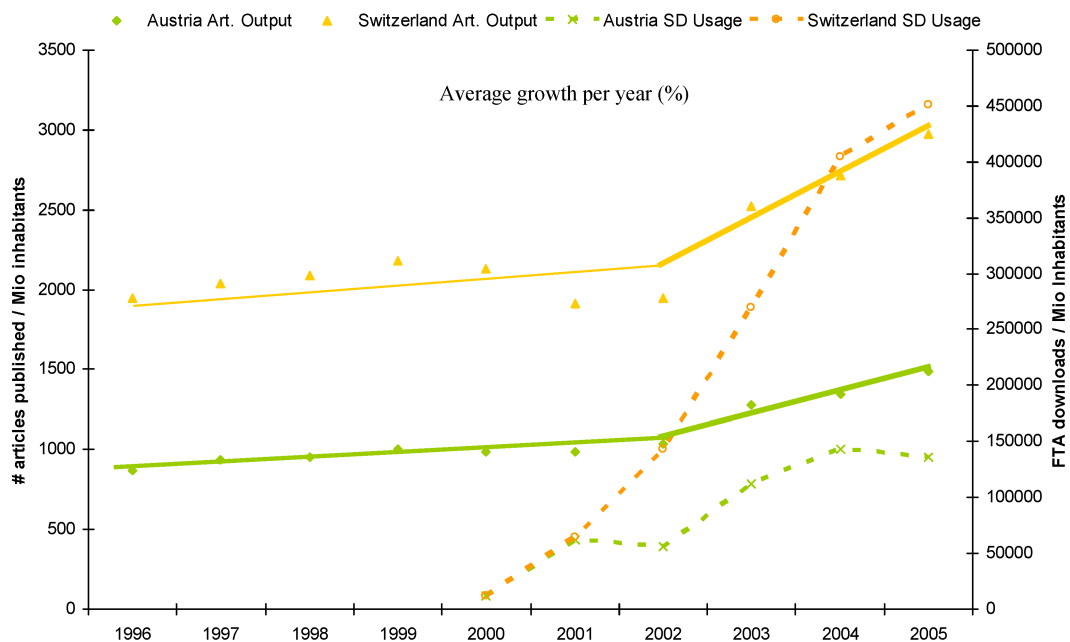


Figure 10: Number of Full Text Article requests and number of articles produced per million inhabitants for Austria and Switzerland

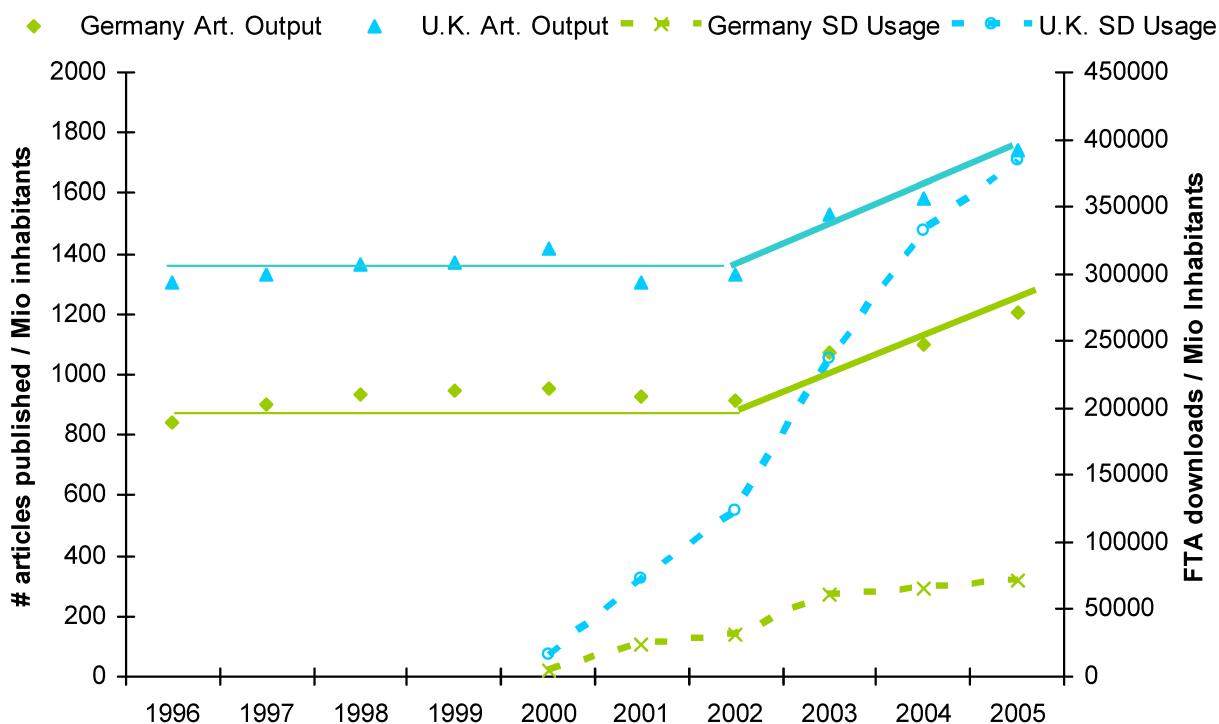


Figure 11: Number of Full Text Article requests and number of articles produced per million inhabitants for Germany and the United Kingdom

Discussion

Where in the study from 2004 [1] was estimated that time spend on Browse/scan and Search should decrease by resp. 30% and 10%, the findings in this study show rather the opposite, namely that the average session length in 1 year increased 27%. The cause of the increased session length could not be derived from this study. A possible cause could be the broader penetration

of searching amongst users who are less trained in online searching. If the estimations from 2004 [1] are correct, and content related activities account for about a quarter of all time spend in a research project, attending online searching training courses may prove an effective tool to significantly reduce time spend (on Browse/scan and Search) in research projects

The absence of an effect on average session length in Full Text Article repositories like ScienceDirect, due to a broader penetration of searching amongst users who are

less trained in searching, may be because requesting Full Text Articles from these repositories is far less complicated than searching Abstract & Citation databases and at many occasions guided to the full text by Referrers. The effect of a larger content offering was not included in the study from 2004 [1]. The findings in this study show that a larger content offering coincides with a dramatic increase of Full Text Article requests. This is possibly caused by the trend that research is increasingly becoming multidisciplinary. The modest contribution of Back Files to the total number of Full Text Articles requested is possibly caused by an increasing focus in some research areas on timely publication of results, which amongst others has led to pre-publication of Articles-in-Press via on-line services.

A possible correlation between Read and article publication was not included in the study of 2004 [1]. The findings in this study show that an increase in the number of Full Text Articles requested within about 2 years coincides with an increase in article publication in all countries included.

The effect of macroeconomic factors on time spend on content and on article publication was also not included in the study from 2004 [1]. The findings in this study show that the highest R&D spend per capita and relative to GDP and the highest subscription spend relative to R&D spend coincide with the highest number of article production per researcher.

Conclusions

This study did not find evidence that the average time spend on Browse/scan and Search is decreasing, on the contrary, this study found that time spent on Browse/scan and Search is increasing, possibly caused by a broader penetration amongst less trained users. This study further clearly showed that a larger content offering coincides with a dramatic increase in Full Text Article requests, and that the contribution of Back File material to the total number of Full Text Article requests is modest. Finally, this study showed that an increase in Full Text Article requests, after about 2 years, coincides with increased article publication.

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Definitions

Browse/scan: Browse, scan and document literature

Search: Search and document literature with more focus

Read: Read literature

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