Patterns of e-journal use within the Anatolian University Library Consortium

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With the establishment of the Anatolian University Library Consortium (ANKOS), the number of accessible databases and the usage of electronic journals has increased rapidly. Due to the diversity of the universities, diferences in usage for various subject collections are observed. In this study, a comparison between the research activity in Turkey and electronic journal usage through ANKOS has been carried out. The data on the total and subject-based full-text article usage indicates a strong correlation between the number of published articles and their usage. Additionally, a rank analysis was conducted to establish similarities and differences between each institution's usage and the aggregated consortium usage.

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ANKOS and the higher education system of Turkey

The Anatolian University Library Consortium (ANKOS) was founded in 2001. The development of the consortium up to 2005 has been documented in two recent articles[1,2]. The majority of ANKOS members are universities; but membership is also open to special (research) libraries. ANKOS is an opt-in consortium; all contracts allow new members to join later on the agreed conditions such as CIBER[3] and NESLI. Over time, joining the consortium has become the only option for many libraries which want to access electronic databases.

Turkish universities are organized under the Council of Higher Education, which is the fully autonomous supreme corporate public body responsible for the planning, co-ordination, governance and supervision of higher education. ANKOS is a voluntary association working since 2006 under the Inter-university Council, which is an academic advisory body of the Council of Higher Education comprising the rectors. ANKOS is responsible for all administrative and financial work and for subscriptions, renewals and national site licensing of electronic databases on behalf of all Turkish universities.

In the Turkish higher education system there are 93 universities. Of these, 68 are state funded and 25 are private universities. Sixteen of these universities were founded in 2006. The higher education institutions had about 1.6 million students and academic staff in the 2005–2006 academic year. The university population in 2005–2006 consisted of 55% undergraduate, 31% vocational, 7% master and 2% PhD students. The proportion of academic staff is 5% of the total university population. Although 27% of the universities are private universities, these have only 7% of the total university population.

The FTE (full-time equivalent) of the universities varied from 1,000 to over 50,000. The library collection expenditures varied in 2006 between $200,000 and $3,000,000. Under these extremely diverse conditions it was a challenge to build up a successful consortium within a few years.

The number of members participating in the consortium has been growing continuously as indicated in Figure 1. In 2006 ANKOS members had access to 31 major e-journal packages, reference and bibliographic databases and e-book collections. Seventeen of these are from commercial
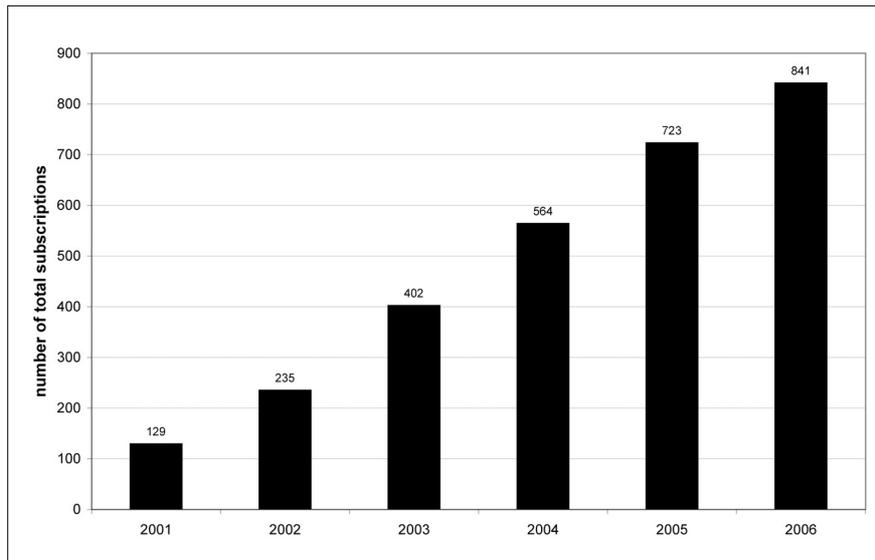
Figure 1. Growth of ANKOS

publishers, nine from society publishers, three from aggregator databases and two are electronic book collections. The average number of ANKOS contracts per member library increased from 5.4 in 2003 to 9.9 in 2006. As this data shows, Turkish academic and research libraries are still trying to enrich their electronic collections to satisfy the increasing need for scientific information. All licence agreements have an e-only option. The number of universities moving to e-only has increased significantly in recent years.

Figure 1 indicates that despite insufficient financial resources, Turkish academic and research libraries are still enriching their electronic collections. Usage statistics for full-text databases also monitored rapid growth, as shown in Table 1. The total number of full-text downloads was approximately 7.8 million in 2005, and with the inclusion of the aggregator databases, over 10 million.

In order to increase scientific activity, the Turkish government has invested a lot in higher education in the last 15 years. The percentage of R&D expenditure performed by universities is 64.3%, by private institutions 28.7% and by public institutions 7%. Several universities have PhD programmes to meet the need for young faculty in the newly established universities. TUBITAK (Turkish Scientific and Research Council) offers many PhD and postdoctoral grants, and supports many projects between the universities and industry. All this activity gained further momentum with Turkey's decision to apply for EU membership.

Turkey participated in the 6th Framework of the EU and will participate in the 7th. There are 27,000 full-time equivalent researchers (1.2 for every 1,000). Of these, 73% are employed in higher education institutions, 16% in the private sector and 11% in the public sector. This is far below the EU average which is 5.7 in 1,000 population. What is more, the number of PhD candidates (0.05 in 1,000 population aged 25 to 34) is ten times less than the EU average. Another fact is that research activity is concentrated in only a few universities. Because of this, half the PhD students are in just seven universities. All of these situations are reflected in the uneven full-text journal usage of universities.

Databases	Number of total downloads for the consortium
ACS	161,327
AIP	67,585
Blackwell	542,613
CUP	33,469
Emerald	53,734
IEL	528,499
IOP	48,234
OUP	222,646
Ovid	233,458
ScienceDirect	5,212,721
Springer	37,5302
Wiley	27,2125
Total	**7,751,713**

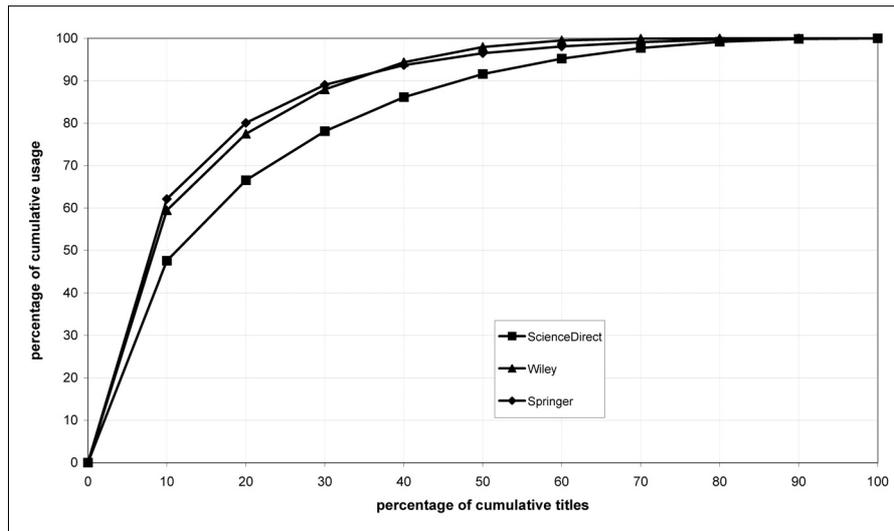*Table 1. Number of full-text downloads in 2005*

Figure 2. Cumulative usage of journal titles

Usage and research activities

Based on the 'big deal' agreements, many of the licences within ANKOS serve a full package of content to all members. The measurement based on title usage of the overall consortium is therefore important. A significant increase in the number of electronic resources in terms of the big deal agreements has led to a steady increase in usage. Full-text journal article usage statistics of COUNTER-compliant databases show that ANKOS members heavily utilized the benefits of the consortium.

Recently, more attention has been given in the literature to title-based usage and patterns of institutional usage within the consortium[5,6] Title-based usage statistics show the distribution of the journals used within the consortium. Figure 2

shows the number and percentage of journals by usage percentage for three major electronic journal packages (ScienceDirect, Springer and Wiley) subscribed by ANKOS. Thus the majority of titles are used infrequently and a small number of core journals satisfy a significant proportion of the usage in the ANKOS Consortium, as in all other consortia (see for example[4,5]). These results are consistent with Bradford's Law and the 80/20 rule, with slight variations.

The number of publications in Turkey increased far above the world average of 3.5% per year as seen in East Asia and India. According to the number of publications, Turkey moved from 32nd place in 1996 to 19th place in 2005. Furthermore, Turkey's share in world publications increased over the same period from 0.374 to 1.323. This development can be seen in Figure 3.
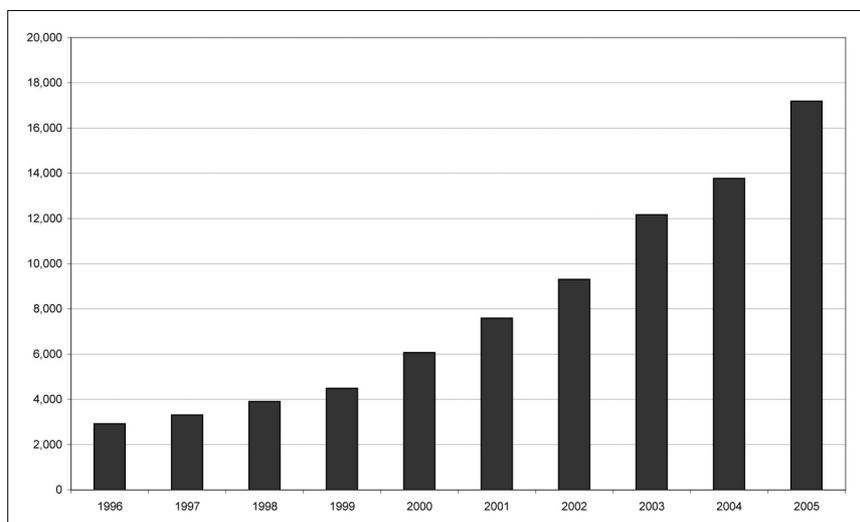

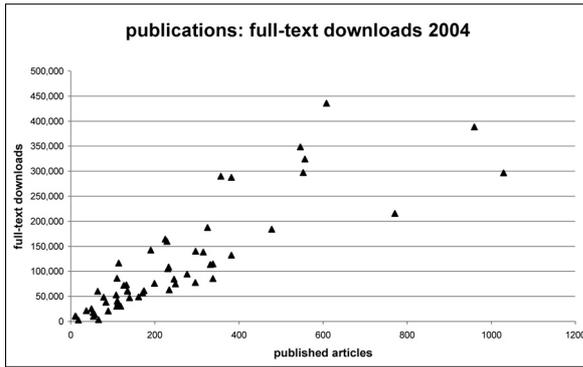*Figure 3. Growth in number of scientific publications in Turkey*

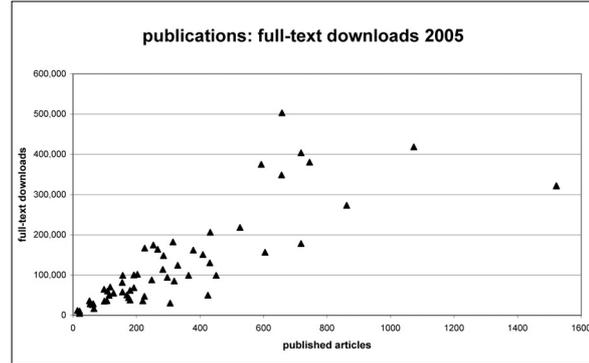Figure 4. Correlation of publications and full-text downloads in 2004

Figure 5. Correlation of publications and full-text downloads in 2005

In order to see how effectively the databases are used within the institutions, it is important to show the relationship between the cumulative usage of databases and the number of published articles. In general there is a positive correlation between the usage of databases and publications by the universities within ANKOS. This shows the importance of the consortium for providing scientific information for the research community.

The next two graphs, Figures 4 and 5, show the relationship between the number of published articles and full-text downloads of databases listed in Table 1 for each university. The calculated Pearson correlation coefficient for the year 2004 is 0.88 and for 2005 it is 0.81. Taking out the two outliers, the Pearson correlation coefficient becomes 0.87 for 2005. All these indicate a strong relationship between the usage and research activity that is consistent over the two years.

A comparison of publications to usage with respect to subject areas also reveals another type of correlation. In order to see how the usage of e-journals is distributed among the subject areas, we have taken the full-text downloads in the 15 subject categories of ScienceDirect and compared them with the published articles in 2001–2005 in Turkey according to Web of Science subject categories. Because the ScienceDirect collection is a highly interdisciplinary journal collection, the subject areas of ScienceDirect and Web of Science do not match completely. Furthermore, one can observe a strong correlation between the usage and published articles in the areas of medicine, chemistry, engineering and biology. In some areas, like neuroscience, economics and management, the usage is higher than the number of publications. This is due to the fact that the number of researchers in these areas is not as high as in others. It can be

expected from this data that within the next five years the usage and number of publications will correlate more strongly (see Table 2).

In a consortium, similarities in title-based usage between the universities can be measured by the correlation analysis. Based on the rank order of usage by title, similarities between the universities and the consortium as a total can be measured using the Spearman correlation coefficient. By using this correlation coefficient, one can find the similarities and differences between journal titles in use for all consortium members[6]. Ranked from –1 and 1, the Spearman correlation coefficient determines an institution's degree of similarity with other universities and the total consortium. Figure 4 shows a correlation coefficient of universities with total consortium usage for three major full-text journal packages.

Figure 6 shows the rankings of each institution's usage compared with the total aggregated ANKOS usage. The differences in usage are due to the degree of the research activity and different research areas of the universities. According to Figure 6, the Spearman correlation coefficient of 20 universities for each database is above 0.7, indicating a strong relationship with the whole consortium usage. Large and research-intensive universities are, as expected, ranked more closely to the aggregated consortium usage. Compared with Wiley and Springer, more universities have similar usage pattern for ScienceDirect titles. A similar rank analysis was carried out on OhioLINK's usage data to evaluate the effect of the big deal on each institution's full-text usage[6]. There are other ways to analyze the usage by different institutions, such as a hierarchical cluster analysis, which can similarly classify institutions with the consortium based on journal title usage[5].

Usage Subject areas (SD)	%	Rank	Publication Subject areas (ISI)	%	Rank
medicine and dentistry	17	1	clinical medicine	40	1
chemistry and chemical engineering	11	2	chemistry	12	2
biochemistry, genetics and molecular biology	9	3	engineering	10	3
engineering	9	4	physics and space sciences	7	4
materials science	8	5	biology, biochemistry and molecular biology	6	5
agricultural and biological sciences	7	6	materials science	4	6
pharmacology, toxicology and pharmaceutical sciences	5	7	agricultural sciences	4	7
neuroscience	4	8	ecology/environment	3	8
economics, econometrics, finance, business, management and accounting	4	9	pharmacology	3	9
physics and astronomy	4	10	geosciences	2	10
environmental sciences	4	11	neuroscience	2	11
earth and planetary sciences	4	12	immunology and microbiology	2	12
social sciences	4	13	psychology & psychiatry	1	13
mathematics	3	14	social sciences	1	14
computer sciences	3	15	economics and business	1	15
immunology and microbiology	3	16	mathematics	1	16
psychology	2	17	computer sciences	1	17

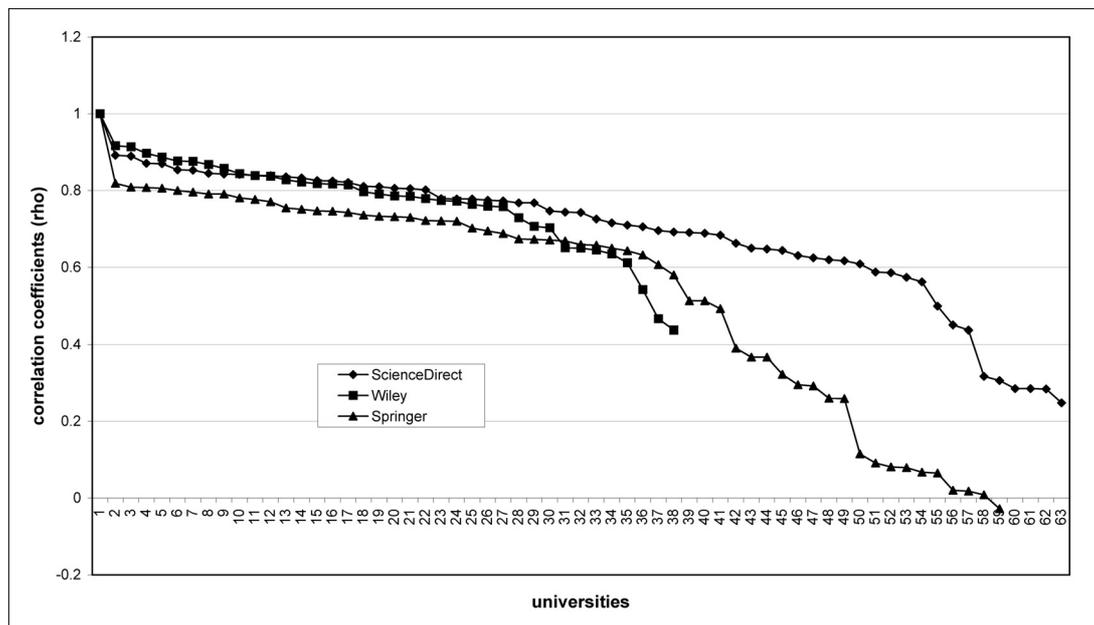*Table 2. Comparison of downloads and publications according to subject areas*

Figure 6. Rank-ordered correlations (using Spearman's rho)

Conclusions

The number of subscriptions to electronic databases in Turkish universities has experienced substantial growth since the foundation of ANKOS in 2001. The increasing usage has allowed the universities with insufficient financial resources wider access that would have otherwise been impossible.

The analysis of usage statistics shows a strong correlation between each institution's total usage, and the usage in different subject collections with

the research activity. A further detailed analysis of the usage statistics as recently reported[6,7], combined with a cost-benefit analysis, can be used in new negotiations with the publishers and for developing national strategies in accessing scientific information. This will give an opportunity for each institution to evaluate the benefits of the big deal more realistically.

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