

# Developing a cost/benefit financial model for hybrid libraries

This article describes the development of a model for academic libraries that is used to give detailed insight in the library's current financial structure and to quantify the impact of the transition to a digital environment. Moving forward, certain library services, activities and costs will decrease whereas others will increase. How will this affect the library budget? The project gave all participants detailed insight into library costs before and after such a transition, and showed that the added value of library services increases. The model is a co-operation of the libraries of the universities of Utrecht in the Netherlands, Luleå in Sweden and Bremen in Germany. Elsevier commissioned this project; Atos KPMG Consulting delivered the methodology (Rapid Activity Based Costing) and financial expertise.



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## Introduction

Libraries and scientific publishers are investing considerable amounts of energy and money in developing the 'digital' library services that researchers demand. All parties involved are confident that this is the right direction. A hurdle in the transition to a digital environment is that many librarians have budgetary constraints placed upon them in recent years; and investments in libraries are substantially lower than investments in R&D<sup>1</sup>. Another obstacle is that there is little information available on how digital library services will affect library finances. Hansen Montgomery<sup>2</sup> is doing research on this subject, as have King and Tenopir<sup>3</sup> in the recent past.

The goal of the project is to develop a financial model that gives insight into, and compares the costs of, current and future (digitalised) library services. It supports the library management's decision-making process by taking away uncertainty. In addition it supports the library budgeting process. A better understanding allows Elsevier to offer tailor-made solutions and have an improved relationships with its customers. Atos KPMG Consulting is the principal designer of the model; they subsequently acted as a 'trusted third party' that enhanced the credibility and objectivity of the model.

The model was developed at three academic libraries (in order of workshops executed):

1. Library of the University of Utrecht, Netherlands
2. Library of the University of Luleå, Sweden
3. Library of the University of Bremen, Germany

## Method

The financial model is developed in a rapid prototyping workshop mode, where participants with different positions and backgrounds combine their ideas and expectations and jointly take the most important modelling decisions. This approach stimulates high-level thinking and tends to avoid lengthy discussions on minor details. Participants in this style of workshop easily accept the need to make estimates where precise cost information is not available, because they can see the impact of their estimates quickly and adjust where necessary. The estimates are based on expert consensus. The method used is 'Activity Based Costing'<sup>4</sup>. Atos KPMG Consulting's experience is that the outcome of this rapid prototyping process has an accuracy of at least 80% if compared to a detailed, longer lasting Activity Based Costing analysis.

Each workshop was held during two consecutive days. During the first day we

Key indicators	Bremen	Utrecht <sup>1)</sup>	Luleå
Total annual costs	€ 16.9 million	€ 15.1 million	€ 3.4 million
Number of total books in the collection	3,500,000	6,000,000	250,000
Number of total paper periodicals in the collection	10,500	10,500	400
Number of total full text periodicals available	3,100	4,500	5,600
Number of library personnel	153	170	30
Number of library users	35,000 <sup>2)</sup>	13,000	12,000
• number of students	26,000	11,000	11,000
• number of researchers	2,100	1,000	350
• number of teachers	850	1,000	650
Library surface (m <sup>2</sup> )	27,000	20,000	7,000

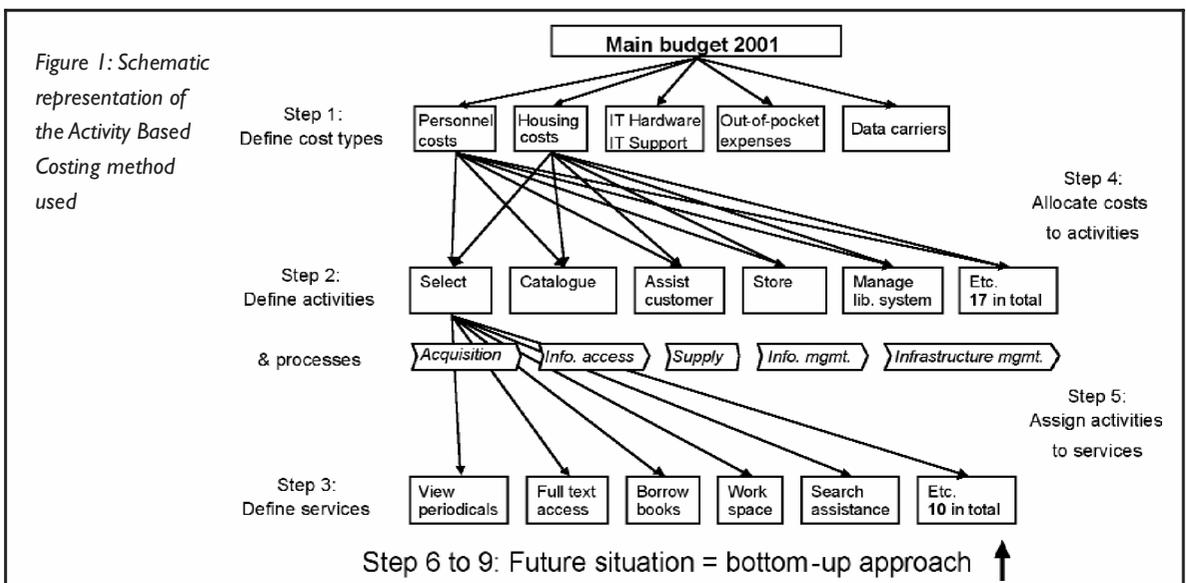
Table 1: Key indicators of the three different academic libraries. 1) The model for Utrecht is not developed for the complete university library; the libraries for Arts & History, Law and some small branch libraries have been excluded. Reason is that these branches are more or less independent of the Central Library. 2) Including non-university users

modelled the current situation, and during the second day we estimated the future costs of the library. 'Future costs' are defined as the costs of the desired and expected library with a horizon of five to six years ahead. For the future costs the estimated volume, price and efficiency effects were taken into account. We did not correct for inflation; a euro today has the same value as a euro in the future. During the three workshop sessions the 'management team' of the library – around four to seven people with positions as Director, Financial Controller, (Electronic) Reference Librarian, IT Manager and others – participated.

Current costs were described in five steps:

1. Define the major cost types and costs of the library
  2. Define the major processes and activities of the libraries' staff
  3. Define the library services or products that are offered to the users
  4. Allocate the costs to the activities
  5. Assign the activities to the products.
- Future costs were estimated in four steps:
6. Estimate the changes in volume of the current library services or products
  7. Estimate the changes in costs per activity
  8. Determine the changes in costs
  9. Introduce new library services or products.

The example given here is of the Library of the University of Utrecht, The Netherlands.



**Results**

First we defined the cost types, activities and services of the library of the University of Utrecht and showed the differences to the other two libraries. Then the impact of the transition to digital library services was described.

**Cost types**

1. Personnel costs
2. Housing costs
3. Data Carriers costs (costs of purchasing content)
4. IT hardware & software costs
5. Out-of-pocket expenses

The cost types are the same in all three libraries.

**Processes and activities**

Economic definition of an activity: a set of repeating tasks which corresponds to uniform skills (not necessarily from one department) and which leads to a clear result. Activities that belong together can be grouped in processes. The graphs in this article show changes of processes; grouped activities.

Acquisition

1. Select
2. Purchase-to-pay

Information access

3. Catalogue
4. Subject catalogue
5. Index

Locate

Supply

7. Alert personally
8. Assist customer
9. Order-to-deliver/access
10. Inform & instruct

Information management

11. Preserve
12. Store

Infrastructure management

13. Manage library system
14. Manage workspaces
15. Human Resource Management
16. Facilities and Administrative (F&A)
17. Infrastructural services

In Luleå the activity ‘Index’ is not relevant. A process ‘Teaching’, consisting of the activities ‘Develop course material’, ‘Run the course’ and ‘Manage the course’, was added.

In Bremen the activities ‘Deliver documents’, ‘Interlibrary loans’, ‘Teaching’, ‘Manage department’ and ‘Manage library’ were added.

**Services**

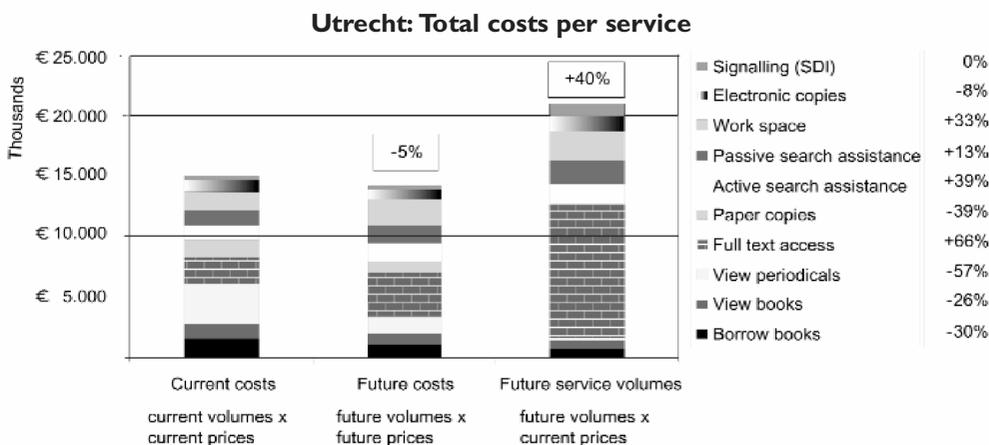
Economic definition of a service/product: an item delivered to a client, which can be counted and for which a ‘recipe’ of costs and activities can be defined.

1. Borrow books
2. View books
3. View periodicals
4. Full text access (FTA)
5. Paper copies
6. Electronic copies
7. Active search assistance
8. Passive search assistance
9. Signalling (SDI)
10. Work space

In Luleå the services ‘Electronic copies’ and ‘Signalling’ are not relevant. The service ‘Teaching’ was added.

In Bremen the service ‘Signalling’ is not relevant. The services ‘Paper copies’ and ‘Electronic copies’ are combined in one service: ‘Document delivery’. The services ‘Teaching’, ‘Exhibitions and events’ and ‘Regional library services’ was added.

**Current costs compared to future costs in Utrecht – Change in library services**



The first column 'Current costs' in chart 1 shows that the ten current services defined by Utrecht add up to an annual budget of 15.1 million euro. The third column 'Future service volumes' shows the estimated volume increases of each library service at constant prices. For instance, the volume of the library service 'Full text access' is estimated to increase by 400%. If we assume that all activities are 100% variable and we refrain from adding effects of price then the cost of 'Full text access' will also quadruple. Overall volumes increase by 40% to a (hypothetical) annual budget of 21.1 million euro. Naturally it is not realistic to assume that all activities are 100% variable and to refrain from adding effects of price. In the second column 'Future costs' the estimated changes in costs per activity and costs per cost type have been incorporated. This shows that for instance the costs of 'Full text access' will not increase by 400%, but by only 57%. Total costs decrease by 5% to an annual budget of 14.3 million euro. Overall, the added value of Utrecht for its users increases by 45% (40% more volume at 5% lower costs), representing an additional added value of 6.8 million euro. The reasons for this increase are given below.

Given the estimated changes in volumes per library service Utrecht expects the following changes in costs per activity:

The costs of the process 'Acquisition' decrease significantly, because fewer paper books and periodicals are being purchased, and larger contracts with more titles are being negotiated with the publishers.

The costs of the process 'Information access' decrease significantly, because there are fewer paper books and periodicals and less mutations due to the larger deals. Furthermore, electronic content comes with URL links, and advanced software helps with indexing.

The costs of the process 'Information supply' increase slightly. As advanced software will enable users to perform more activities themselves, more time will be spent on consulting, informing and instructing the users.

The costs of the process 'Information management' decrease slightly: less storage space and binding offsets the investments in digital archives and server space.

The costs of the process 'Infrastructure management' increase, mainly because of an investment in a new content management system.

Change in processes

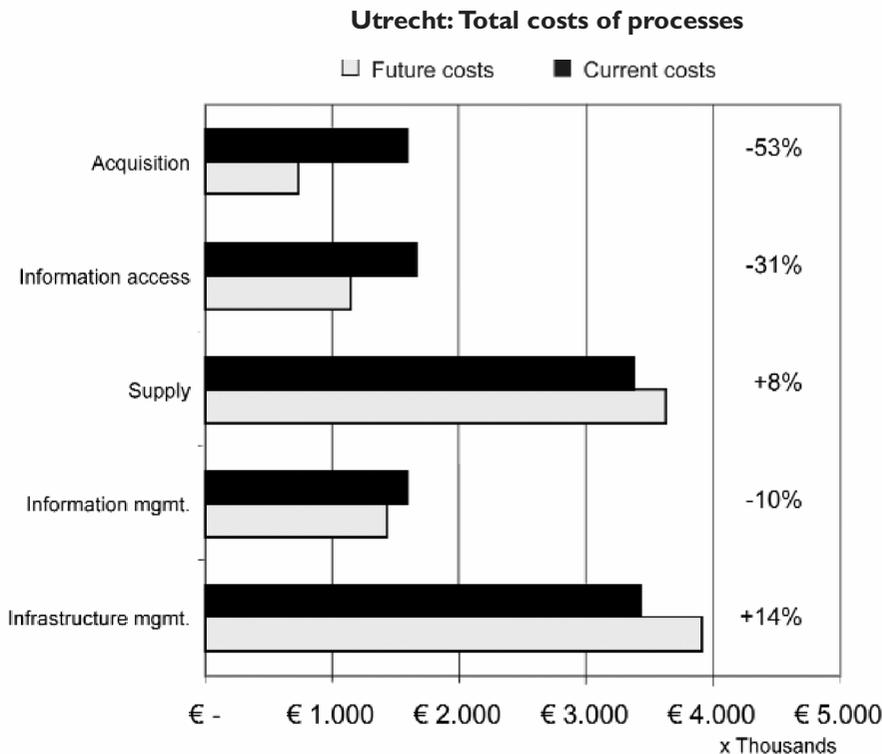


Chart 2: Current and future process costs in Utrecht

Change in data carriers

Utrecht: Data carriers

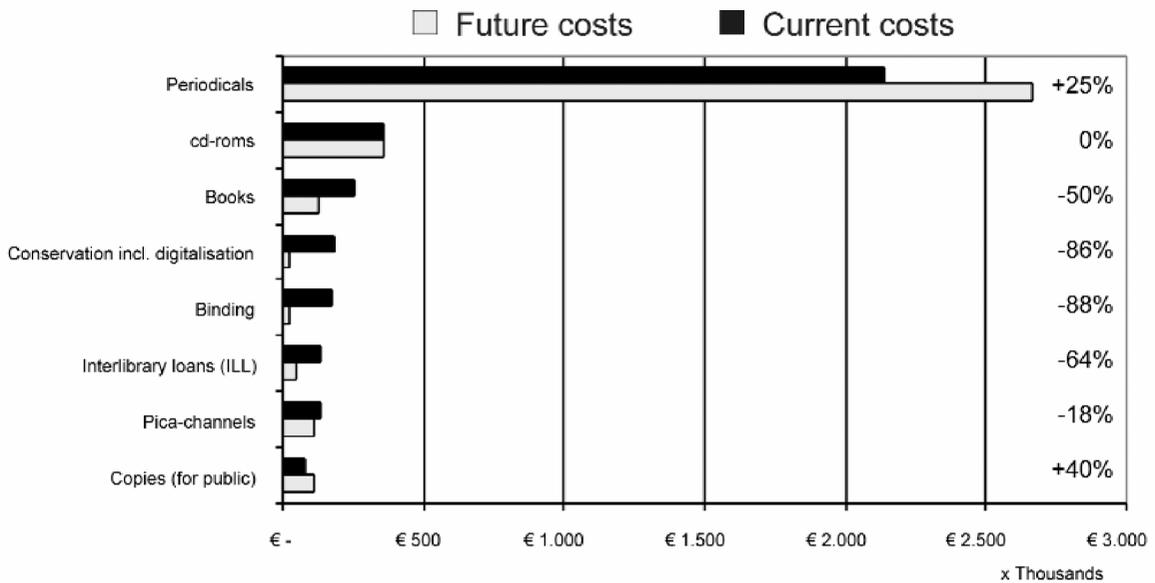


Chart 3: Current and future data carrier costs in Utrecht

Given the estimated changes in volumes per library service, Utrecht expects data carrier costs to remain almost the same. It is expected that on the one hand the costs of paper books will decrease by 50% and the costs of binding and conservation of print material decrease by more than 80%, but on the other hand the costs of periodicals are increasing because of more electronic access, including back files.

Changes in cost types

Given the estimated changes in volumes per library service, costs per activity and cost per data

carrier, Utrecht expects the following changes in costs per cost type:

Personnel costs will decrease 12%. It is expected that the number of personnel will decrease by 20% and that the average wage per employee will increase by 10% as personnel need to be more highly qualified.

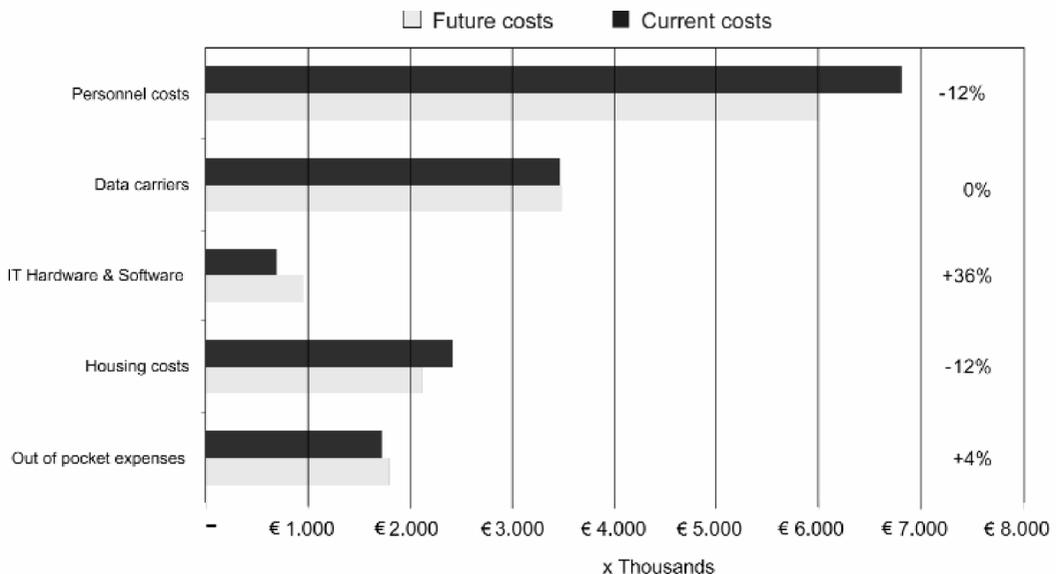
Data carrier costs remain almost the same.

IT costs will increase by 36% due to specific IT investments.

Housing costs decrease by 12%. Space gained by a decrease in paper books and periodicals is

Chart 4: Current and Future Total Costs per Cost Type in Utrecht

Utrecht: Total costs per type



partly transferred for use by students and scientists.

No major change is expected in out-of-pocket expenses (plus 4%).

**Current costs compared to future costs in Luleå**

*Change in library services*

and copied. Both ‘Teaching’ and ‘Active and Passive search assistance’ are estimated to increase as a result of more intense courses and the increased use of e-tools. Finally, the use of ‘Work spaces’ is expected to increase.

Given the estimated changes in volumes per library service, Luleå expects total costs to decrease by 5% to an annual budget of 3.3 million euro. This means an increase in

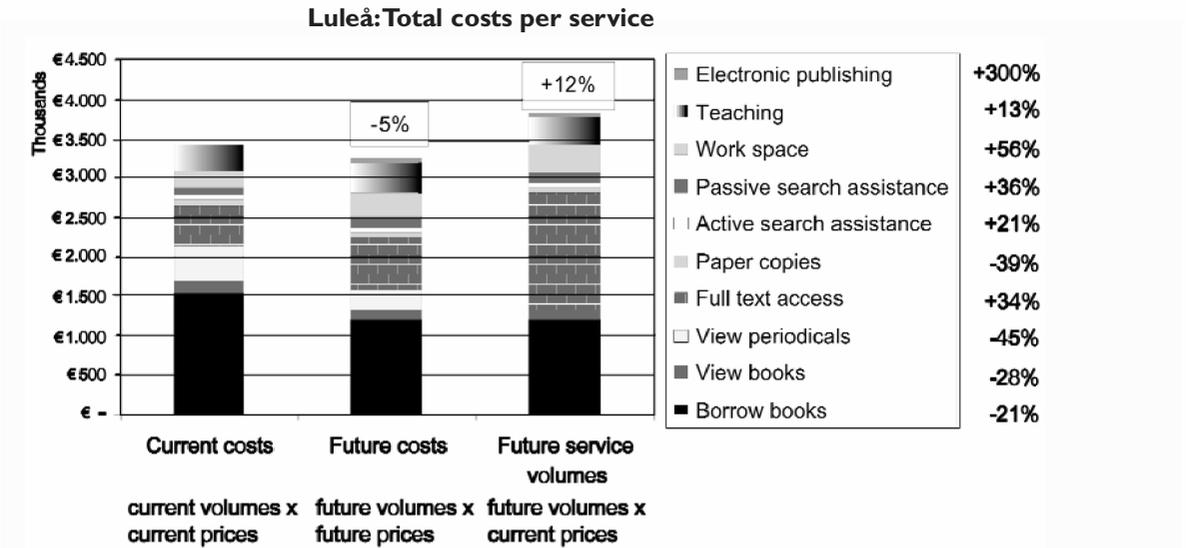


Chart 5: Current and future costs per service in Luleå and expected future services volumes

Luleå expects the total volume of library services to increase by 12%. It is estimated that there will be more supply of ‘Full text access’, which together with changing methods of teaching and lower number of students in Luleå leads to a decrease in paper content being borrowed, viewed

and copied. Both ‘Teaching’ and ‘Active and Passive search assistance’ are estimated to increase as a result of more intense courses and the increased use of e-tools. Finally, the use of ‘Work spaces’ is expected to increase.

*Change in cost types*

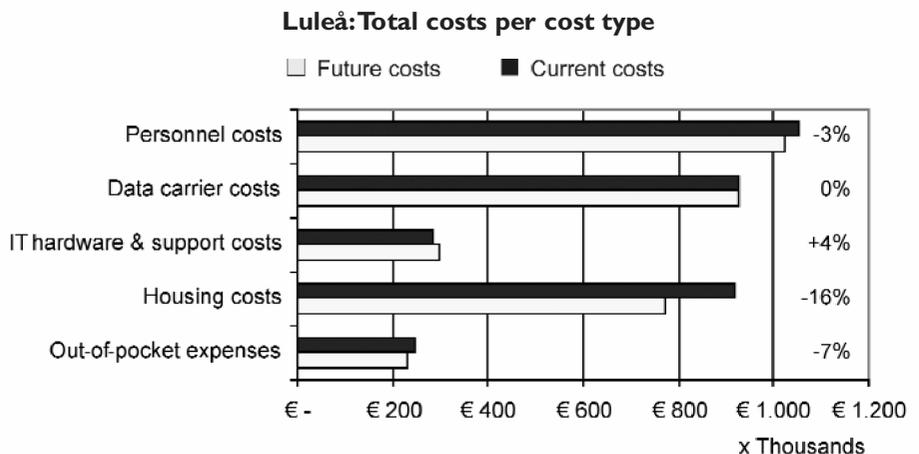


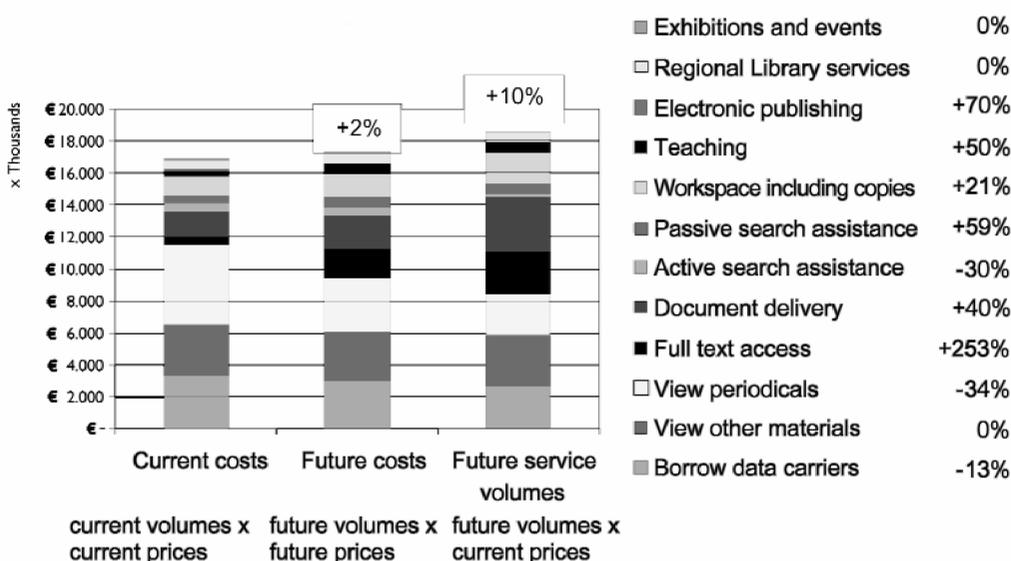
Chart 6: Current and future costs per cost type in Luleå

The decrease of 16% housing costs in Luleå is hypothetical; according to staff, it is not possible to decrease the dedicated library space allocated by the University, so no decrease in rent can be achieved. In general, housing savings are difficult to realise for libraries because their specific buildings cannot easily be converted to other uses; but some positive savings should be possible.

**Current costs compared to future costs in Bremen**

*Change in library services*

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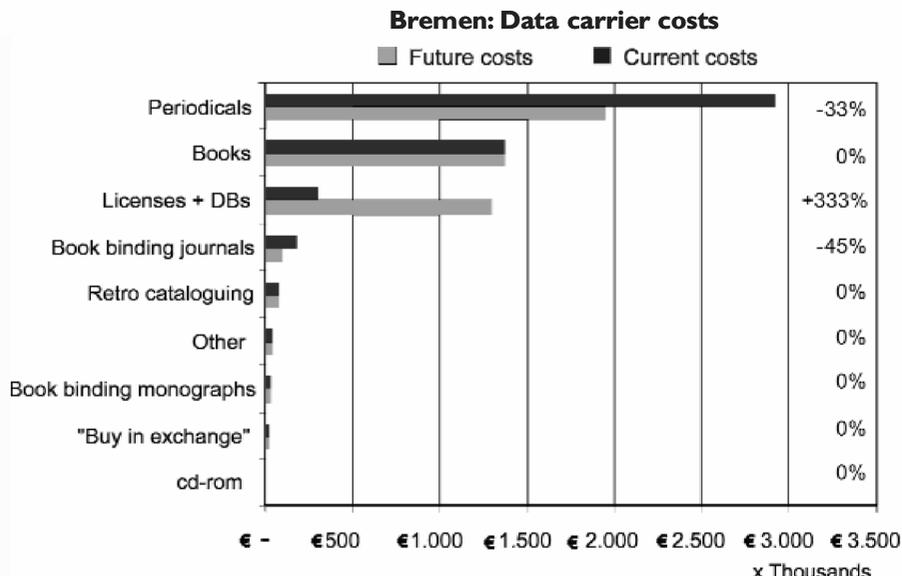
In Bremen volumes are expected to increase by 10%. However the combined volume of books and periodicals ('Borrow data carriers', 'View other materials', 'View periodicals', 'Full text access' and 'Regional library services') decreases by 9% -

the expected increase of 'Full text access' does not offset the expected decrease of 'Borrow data carriers' and 'View periodicals'. This reflects the more cautious attitude to digitisation in Bremen, where library management does not believe – as Utrecht and Luleå do – that more availability of FTA in combination with more advanced search tools will lead to more intensive use of the electronic journals than their paper predecessor. The exact reason for the expected decline in Bremen is not clear, however. Given the estimated changes in volumes, Bremen expects a slight cost increase of 2% to an annual budget of 17.3 million

euro. This means that the library's added value increases slightly with 8% (10% more volume at 2% higher costs) or 1.3 million euro.

*Change in data carriers*

Chart 8: Current and future data carrier costs in Bremen



Bremen expects a minor decrease in total data carrier costs (minus 1%), but a shift from paper periodicals to their electronic counterparts.

*Change in cost types*

structure, the existing digitisation in Luleå and, last but not least, the moderate number of different faculties that are served by the library (which results in a smaller collection, compared to the other two).

**Bremen: Total costs per cost type**

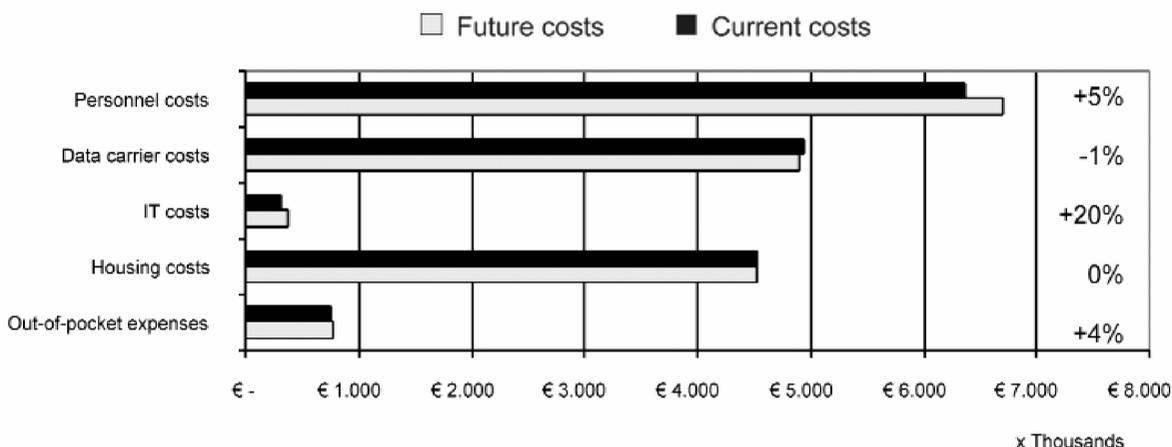


Chart 9: Current and future costs per cost type in Bremen

Given the estimated changes in volumes and costs per library service and costs per data carrier, Bremen estimates the number of personnel increasing by 5%, the housing costs remaining constant, and no change in the purchasing of printed books. Therefore only a slight decrease in data carrier costs is expected (minus 1%).

**Conclusions**

*Current situation*

On average 26% of the libraries’ budgets is spent on purchasing content (data carriers costs). Of this amount an average of 62% is spent on paper and electronic periodicals.

In all three libraries the combined costs of the four library services ‘Borrow books’/‘Borrow data carriers’, ‘View books’/‘View other materials’, ‘View periodicals’ and ‘Full text access’ account for the major part of total current costs (71% in Utrecht including paper and electronic copies, 71% in Bremen and 78% in Luleå). The mix of costs per library service, however, differs.

Compared to the other libraries Luleå shows considerably lower costs on a per unit basis, indicating that it is the most efficient of the three. Possible explanations for this outcome are the way Luleå is organised with a very flat organisation

*Future situation*

In all three libraries an overall volume increase of library services is expected (40% in Utrecht, 12% in Bremen and 10% in Luleå). The volumes of paper content being borrowed and viewed (the three library services ‘Borrow books’/‘Borrow data carriers’, ‘View books’/‘View other materials’ and ‘View periodicals’) decrease, while the volume of the library service ‘Full text access’ increases.

At the same time overall costs decrease by 5% in both Utrecht and Luleå and increase slightly by 2% in Bremen (not taking into account the introduction of new library services). This means that, after a transition from a paper based to a digital environment, the added value of library services increases. The main explanation for this development is that the most important digital product (full text articles) can be delivered with low variable costs.

Looking at cost types we can see an increase in IT costs and little to no change in out-of-pocket expenses and data carrier costs (there is however a significant shift to electronic content). In Utrecht and Luleå personnel costs and housing costs decrease; in Bremen personnel costs increase while housing costs remain constant. All three libraries are convinced that better qualified and subsequently higher paid personnel are necessary

to enable the transition.

The example of Luleå demonstrates that it is more efficient to exploit the digital library concept fully, thereby minimizing the paper-based services and related activities, than it is to maintain a hybrid library (print and electronic).

## Discussion

The financial model, which is based on three 'real life' cases, gives insight into the costs and benefits of digitalised library services. However we need to keep in mind that the future costs are based on estimates. It supports library management in its decision-making process, but does not predict the exact future costs of digital library services.

The variance in results indicates that a generic financial model for total library budgets will be difficult to attain. A generic model which focuses on the switch from paper content being borrowed and viewed to electronic content is more feasible. In our opinion such a generic model could be of great value to all (academic) libraries.

The expected degree of change, however, varies among the libraries. Corresponding to its current relative high level of digitisation, the volume increase of 'Full text access' in Luleå is lower than in Utrecht and Bremen: 150% in Luleå compared to 400% in both Utrecht and Bremen. Bremen estimates the decrease in paper content being borrowed and viewed more conservatively than in Utrecht: minus 28% in Bremen compared to minus 72% in Utrecht. In comparison Luleå estimated this decrease to be minus 27%. Expressed in volume units, the similar growth percentages of Utrecht and Bremen of 'Full text access' are somewhat misleading, because the estimated current volume of 'Full text access' is much higher in Utrecht than in Bremen. In absolute volume, the expected shift to electronic services in Bremen is most conservative.

It should be noted that most librarians were only moderately confident about their service volume estimates, both of current and of future usage rates. One important (though in this study

not quantified) benefit of electronic services is that their usage will be much easier to monitor, with more focused spending on material that is actually used as a potential advantage.

This is a quantitative study; we have examined changes in volumes, efficiency and prices but not in the quality of library services. As increased quality for users is a very important motivator for the transition, this is another subject worthy of more research.

Finally, we would like to thank everybody who co-operated in this interesting project.

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