Strategic planning and customer intelligence in academic libraries

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Abstract

Purpose: The paper refers to a current discussion on the effectiveness and efficiency of Bielefeld University Library and concentrates on requirements and conditions of implementing customer intelligence in academic libraries. Moreover, a conceptual framework for a library management information system based on a data warehouse that links external and internal data to support strategic planning processes is introduced.

Design/methodology/approach: Content-related and technical aspects of customer intelligence in academic libraries are outlined and analogies are drawn to commercial enterprises to motivate the conceptual reflections. The paper closes with two examples that demonstrate how multifaceted the data pool for customer intelligence can be in librarianship.

Findings: The paper sensitizes to the advantages of systematically generating customer knowledge in academic libraries for strategic planning and customer orientation.

Practical implications: The suggested approach can serve as a basis for the development of data-based decision support systems focusing on the tracking of the usage of library services and customer preferences over time.

Originality/value: Up to now the discussion of customer intelligence as a foundation of strategic planning in academic libraries has been almost a blank space in the literature. The paper contributes to fill this gap.

Keywords: Intelligence, Library management, Strategic planning, Academic libraries

Paper type: Conceptual paper

Introduction

Though it is almost a truism that libraries have to rethink their services and their position in the Internet age, there are some obvious reasons to concentrate on strategic planning issues based on customer intelligence in the following article. Since nowadays information seems to be at everyone's fingertips very easily, the role of libraries in the information chain is no longer accepted without question. Even the patrons of academic libraries do not generally realize that scientific e-journals available through the university's intranet are not for free. Only a few customers are really aware of the financial efforts and know-how which are necessary to build up state-of-the-art information systems that seamlessly integrate bibliographic records, electronic full texts, and document delivery services, all of which stem from various sources. This diminishing awareness of libraries could even be seen as a positive aspect of an adequate but not obtrusive service. However, it becomes crucial with respect to actual budgetary constraints as well as with respect to modernistic but not always appropriate attempts to reorganize the information, communication, and media services of a university (Hanson, 2005).

Today, budgetary decisions are based on an input-output orientation. So, libraries have to supply evidence that their contribution to the output of the university as a whole, i.e. to progress in teaching and research, at least matches their consumption of resources. This, of course, is difficult, because the input is measured in Euros, but the output is not. Moreover, since the budgetary decisions are made by the customers, it has become evident that all strategic considerations of libraries have to aim at customer satisfaction and at the economical consumption of resources. Therefore, the effectiveness and efficiency of services are becoming a ubiquitous challenge in library service planning. The crucial question is whether advanced, but cost-intensive state-of the-art services should be provided in the future or whether traditional, but appropriate services have their place as well? Thus customer intelligence (Kelly, 2006) becomes an essential part of strategic planning. This recognition is not really new. In fact, “user research” has a long tradition in German libraries. But up to now, this was primarily done by public surveys focusing on existing services. Nowadays, there are also some more advanced approaches like the gap analysis of services, as supported by LibQUAL+ (Cook, 2002), or the prospective preference measurement by means of Conjoint Analysis (see below).

Strategic planning at Bielefeld University Library

Most customers have a rather traditional understanding of libraries and their services. Bielefeld University Library, for instance, is ranked high by its customers in general, but this often primarily results from its outstanding service hours, instead of being based on what is essential in our own understanding, particularly our leading role in developing and establishing advanced electronic library services. As an example, our academic search engine BASE – Bielefeld Academic Search Engine (Summann and Lossau, 2004), which is ranked highly by library experts, is graded rather low by our customers in comparison to more traditional retrieval instruments like the Online Public Access Catalogue (OPAC). This traditional view conflicts with the obvious integration of internet-based search engines like Google in every-day life. One reason for this contradiction might be insufficient information literacy on the part of the customers, who often cannot totally assess the completeness, the relevance, and the reliability of information “googled” from the Internet. Therefore, attitudes and opinions of customers regarding library services cannot be the only foundation for new service development, but have to be accompanied by alternative expertise and by convincing marketing activities.

Nowadays, management techniques like mission statements, catalogues of services, and service level agreements are already well-established in libraries for strengthening the overall service orientation. This is the way Bielefeld University Library has been following since 2004 for discussing its effectiveness. For pragmatic reasons, we are doing without an explicit mission statement for the moment, but we refer to an idea by Schelsky (1967), who stated as an essential for Bielefeld University and its library that the value of a library is not measured by the bulk of books on the shelves, but by the speed the customer can be supplied with the books he is really needing (p. 65). We are strongly convinced that this formerly provocative idea can still be adequately interpreted in the Internet age. Therefore, it is taken as the mission idea underlying the catalogue of services developed for Bielefeld University Library.

Service orientation cannot really be strengthened by management directive, but rather takes effect only through the involvement of all employees. For this reason, Bielefeld University Library started the discussion by screening the library environment for new service ideas, e.g. using expertise from our employees, from external experts, and from the literature. A list of about 250 services ranked essential for the future constituted the basis of a comprehensive Conjoint Analysis study to measure the preferences of our customers (Decker and Hermelbracht, 2006). In addition, four internal working groups developed first drafts of detailed product sheets for library services, which should establish a catalogue of services later on. The whole process was based on detailed information and fruitful discussions during several staff meetings and it was coordinated by a steering group. The involvement of the Staff Council from the very beginning proved to be very helpful. Moreover, the outstanding engagement of a great number of our employees in these discussions was very encouraging. The outcome from the working groups was a set of about 200 drafts building a solid basis for strategic planning and the optimization of internal transactions. Then, the drafts were rearranged by an editorial group to some 50 product sheets, which were rated to be of obvious importance for customer orientation. Finally, both the optional and the existing services were ranked once more by the library employees to validate the product ratings. This additional evaluation step was confirming the picture to a large extent, and we will be able to publish the product sheets soon.

So far only the effectiveness of our services has been considered. Therefore, the next step will deal with their efficiency. Strengthening the efficiency should not be confused with pure savings of costs or even of staff. Of course, a “one-person-library” might be very cost-efficient, but its service efficiency would exponentially decrease with the number of service requests. So, cost minimization alone cannot be a strategic model for successful academic libraries. In fact, beyond all possible options for rationalization there is an indissoluble connection between the quality of services and the resources needed. Thus, the decision of how to adjust the level of services against the level of costs is not only economical but rather political.

Efficiency may be strengthened by organizational development and development of personnel, as well as by reengineering business and by readjusting objectives. Such changes may not have been intended as independent aims from the very beginning but they can arise from common discussions. In contrast to discussing effectiveness, where the whole spectrum of services has to be considered, we will only be able to discuss the topics that are most important for service efficiency. Firstly, because of the traditional understanding of libraries by our customers, we have to consider all our customer-supporting activities, including marketing. Secondly, we have to evaluate critically our workflow and our transactions with respect to established library performance indicators such as the German library index BIX, which points out some already known but not completely understood deficits. Last but not least, we have to check our data processing routines, which are an indispensable foundation for most of our services, but have meanwhile gained a complexity that seems to be no longer of manageable size and that should be reduced if possible. Data processing has also been considered as a foundation of strategic planning where sophisticated data analysis techniques are needed that enable problem-oriented decision support in academic library management.

Customer intelligence and decision support

To know the customer is – as already indicated in the previous sections – a prerequisite of and the key to customer orientation. So far it is not really surprising that customer intelligence is not only intensively discussed in commercial enterprises, but also arouses increasing interest in academic libraries. But what does customer intelligence (CI) actually mean? In business CI primarily aims at gaining a comprehensive understanding of customers and their behavior by means of intelligent tools, which enable a more pointed customer contact and a higher degree of customer loyalty. Though this understanding of CI explicitly emphasizes the relevance of method-based approaches, the general relevance of intuition and pure experience should not be questioned. On the other hand, the rapidly increasing amount of data in libraries causes the management to apply appropriate techniques for information production. Typical questions to be answered in CI processes are:

- Who are the customers and what needs and preferences do they have?
- How and when do they use the library services?
- How loyal are the customers and who are the "valuable" ones?
- What activities or offerings are most effective in generating customer satisfaction?

The topic CI is frequently mentioned in the same breath as customer relation management (CRM). The underlying assumption is that an enterprise can only be successful in the long term if it is managed in a market or rather customer-oriented way. As a consequence, the success of any particular CRM activity is largely dependent on the ability to organize and deploy the usually diverse information sources of the library towards a common purpose: managing the customer relationship in all of its forms. Therefore, effective CRM is not possible without detailed and up-to-date customer knowledge.

Unfortunately, there is neither a unanimous understanding of CI in marketing science nor a well-defined set of CI methods. In particular, a validated theory, on the basis of which the substantial elements of CI could be concretized, is still missing. However, referring to the relevant literature, a certain consensus regarding the instruments needed for implementing CI seems to exist. The availability of a data warehouse as well as a method pool which includes both OLAP (On-line analytical process) and data mining techniques is frequently required. This particularly applies when the data pool to be analyzed for building customer knowledge is large. Thus, the success of data mining processes strongly depends on the data input (Delmater and Hancock, 2001). Library data can be mined if it is in the right format and well integrated.

The basic structure of a Library Management Information System (LiMIS), as it may be implemented in the CI context, is depicted in Figure 1. The heart of this LiMIS is a data warehouse. The basic idea behind this is to transfer the data generated by different operational systems to an autonomous database, the data warehouse. The term "operational system" summarizes all kinds of data sources within a library, e.g. the loan terminals, the library website and even periodically conducted user surveys. By separating the original data sources from the LiMIS, the justified demand for anonymity on the part of the library users can be taken into account. In this sense the transformation interface not only serves as a data converter but is also used to make the data anonymous before they are made

accessible for the LiMIS user. By this means it can be ensured that those persons who consult the system for decision support purposes do not have access to any data which would allow the identification of the individual library user. In fact, the

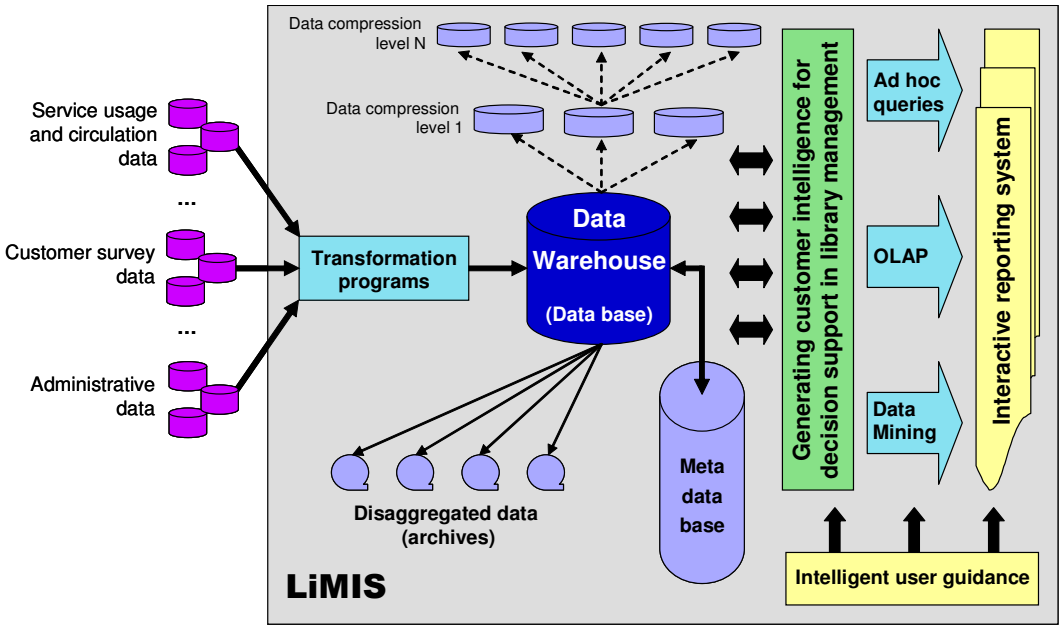

Figure 1: General structure of a data warehouse-based Library Management Information System (LiMIS)

focus is on the provision of individualized but not personalized customer knowledge. In the best case, the use of the analytical instruments is managed by an intelligent front-end, as is already becoming a standard in statistical analysis systems such as SAS.

The basic relevance of data warehouses in practice was recently supported by an empirical study carried out by Ariyachandra and Watson (2006). The focus of this study was on the general success of data warehousing and business intelligence activities in companies. The 454 companies included in this survey mostly rated their implementations as tending towards success with regard to the attainable decision support. But this study also provides evidence that the introduction of a data warehouse needs considerable resources and cannot be done “by the way”. The comparatively high total costs diagnosed for companies also apply to libraries, at least as long as adequate standard software packages for holistic implementations do not exist.

Building a data warehouse for generating customer intelligence inevitably leads to the question of how to obtain relevant customer information. In order to answer this question, a closer look at the customer process itself may be helpful. Usually four phases are distinguished. In the search and orientation phase (1), we can learn something about the things the customers are interested in. Information of this kind can be gained by analyzing the individual usage of a library’s website. The obvious starting point for this is the log file data which is automatically generated when a user visits and surfs a website. The “purchase” or rather library usage behavior (phase 2) finds its expression, for example, in individual lending data or an observable stay in the library. The latter would be possible by using

electronic visit counters at the library entrances, for example. The development of satisfaction and loyalty in phase 3 is reflected in regular transaction data and appropriate customer surveys. Finally, if satisfaction is high, the repeated usage of the respective library services (phase 4) can be measured according to phase 3. With these aspects in mind we can have a closer look at the CI process in libraries, which can be divided into six steps:

1. Capturing customer data across all points of interaction between the customers and the library according to the decision preferences of the library management;
2. Integration of the anonymized customer data into the data warehouse to enable trans-sectoral analyses at low IT costs and according to relevant data protection law;
3. Application of advanced data analytical techniques to generate customer information with predictive potentials;
4. Transformation of the customer knowledge into customer-oriented library services;
5. Measurement of the incremental benefits resulting from particular customer investments;
6. Adjustment and/or refinement of the CI process to improve future efforts.

So, data warehouse and OLAP/data mining techniques build the “bridge” between customer data and customer information, while customer knowledge is the result of the translation and dissemination of customer information in the library. Customer knowledge can be explicit (in the form of structured information in the LiMIS) or implicit (in the form of knowledge in the mind of library employees or the customers themselves) (Rollins and Halinen, 2005). In practice, both forms of customer knowledge have to complement each other if the aim is maximum impact of the related (marketing) activities. In what follows, we are going to sketch significant challenges in developing a LiMIS intended to be used to support the process of generating customer intelligence in libraries, whereby the focus will be on the explicit form of customer knowledge.

Selected issues of developing a LiMIS

The development of a LiMIS for CI activities and decision support in strategic library planning involves the solving of a couple of more or less complex subtasks. First, the relevant data structures have to be identified. That is to say, we have to answer the question of which data (generated by the different operational systems being employed within and in relation to the library) should be represented in the data warehouse. This, on the other hand, leads to the crucial question of how to deal with the heterogeneity of different library data, starting with quantitative loan data and ending up with qualitative user survey data (e.g. attitudes and opinions with respect to new library services). Therefore, the successful implementation and application of a LiMIS largely depends on the adequacy of the underlying data model. To ease the data transformation process, a flexible data model is needed which allows the description of the relevant data in a consistent and largely standardized way.

One possibility is to use an ASCII-based data interface (Baier and Marx, 1992). The idea is to describe all data considered to be relevant with an a priori

defined set of attributes. The following example demonstrates the procedure by referring to an OPAC search protocol (Table 1):

Number of attributes used for describing the data set,	e.g. 7
Identification of attribute type 1,	e.g. `text`
Description of attribute 1,	e.g. *login*
Identification of attribute type 2,	e.g. `date`
Description of attribute 2,	e.g. *date of OPAC search*
Identification of attribute type 3,	e.g. `time`
Description of attribute 3,	e.g. *time of OPAC search*
Identification of attribute type 4,	e.g. `text`
Description of attribute 4,	e.g. *search mode used*
Identification of attribute type 5,	e.g. `integer`
Description of attribute 5,	e.g. *number of hits*
Identification of attribute type 6,	e.g. `text`
Description of attribute 6,	e.g. *author of the document*
Identification of attribute type 7,	e.g. `text`
Description of attribute 7,	e.g. *title key word*
value_attribute_1 value_attribute_2 value_attribute_3 value_attribute_4 value_attribute_5 value_attribute_6 value_attribute_7	
value_attribute_1 value_attribute_2 value_attribute_3 etc.	

Table 1: Set of attributes for describing an OPAC search protocol

A 7-attribute data set to be transmitted weekly to the data warehouse, for instance, might then look like this (Table 2):

7 `text` *login* `date` *date of OPAC search* `time` *time of OPAC search* `text` *search mode used* `integer` *number of hits* `text` *author of the document* `text` *title key word*
„internal“ 2006.01.04 15:13:11 „1“ 1 # „guatemala politicos“
„external“ 2006.01.04 15:19:04 „2“ 6 „Murray“ „Econometrics“
„internal“ 2006.01.04 15:22:02 „2“ 2 „Burns & Bush“ „Marketing Research“
„external“ 2006.01.04 15:23:12 „2“ 0 # „Goethe-Institut“
„internal“ 2006.01.04 15:24:19 „1“ 1 „Hardgrove“ „Mathematics Library“

Table 2: Example for a LiMIS data set

The attribute *login* informs about the access to the OPAC system, whereas the nominal values „1“ and „2“ for attribute *search mode used* distinguish between single-line search and field search. With the attributes *author of the document* und *title key word* the content of the search has been specified. The remaining attributes are self-explanatory, and the symbol # marks a missing value. An ASCII-based data interface does not only ease the integration of different operational systems, but also enables extensions of the data model with acceptable efforts. In this context, the question of the adequate level of automation regarding the data transformation process arises. A high level of automation reduces the daily operating costs, but also requires anticipatory action when developing the data model in order to avoid the risk of costly subsequent improvements or corrections.

A further crucial point concerns the actual information that should be provided by the LiMIS. Determining practical system requirements virtually means referring to two aspects, namely the type of information to be provided and the level of aggregation desired. The first aspect can be taken into account by involving the library management in both the design and the implementation process. Kick-off meetings before, and evaluation workshops during the development process, focusing on the information needs the LiMIS should be able

to meet and the level of detail required for the respective decision topics, can significantly increase acceptance. Typical questions to be answered are:

- What kind of information plays a major role in decision making in library management?
- Which decisions would particularly benefit from the availability of detailed customer information?
- In what order is the relevant information entering the decision processes?
- Which management figures should be made available by the LiMIS reporting system?

But sound planning and a deliberate balance between technically possible and actually useful options are also indispensable regarding the method selection and implementation process. The method selection problem primarily concerns the data mining component (see Figure 1). To avoid needless implementations of partly sophisticated techniques, a goal-driven procedure seems to be favorable. That is to say the decision or planning process to be supported by the LiMIS determines the (data mining) method to be integrated. If the library management is interested in analyzing the conjoint demand of documents (e.g. in the form of textbooks), for example, the application of an association rules-based approach (Agrawal and Srikant, 1994) to loan or OPAC search data suggests itself. Customer knowledge of this kind can be helpful in acquisition planning, for instance. Budget allocation analyses to objectify future library budgets on the departmental level, however, may be carried out by means of logistic discriminant analysis based on the intensity of media usage measured in the respective departments. Already, these two examples are showing that the method normally has to follow the decision problem, and not the reverse. By first determining the decision context to be covered with the LiMIS, and then integrating those methods which seem to be most suited for solving the related data analysis problem, a discouraging method overload can be avoided. Here, the expert system discussion of the late eighties and early nineties of the last century comes to mind again. At that time the euphoria in science quickly gave way to a certain disillusionment, when the developers had to recognize that the automation of decision processes is neither trivial nor necessarily accepted on the part of the users. To prevent similar effects, data mining should be done in a goal-driven manner, especially in fields of application, where the regular use of this type of data analysis is not yet widespread.

For similar reasons, the design and implementation of the reporting system also deserves closer attention. In the ideal case, the relevant customer information (the figures and tables as well as the related interpretations) is provided at the touch of a button. To ensure that the reporting system always delivers its results at the optimal level of aggregation and detail, two aspects are most notable, namely (a) the basic importance of a particular aspect for the decision problem at hand and (b) the way the interestingness of an available result is determined. The first point means that, depending on the decision problem and the customer knowledge available already, the LiMIS users might be interested in different levels of information aggregation. Strategic decisions in the budgeting context mentioned above, for example, would require a more global view, e.g. with a general focus on the quarterly budget available or needed for the electronic journals subscribed by the individual departments of a university. On the other hand, a concrete budget discussion with the head of a particular departmental library, with respect to the

extension or cancellation of a journal subscription, would require detailed information about previous utilizations of the respective journal by the department members. The selection of the adequate level of aggregation can be supported by an intelligent (e.g. rule-based) user guidance system, which determines the level by means of a goal-driven dialogue to specify the individual concern. The second point (b) refers to a more technical problem in data mining. Although data mining is often defined as the – more or less – automatic search and identification of patterns in large amounts of data, this process is still controlled by the user and the results are not inevitably self-explanatory. If association rules are used to uncover interesting patterns in individual textbook-loaning behavior, for example, the results (i.e. the detected rules) are rated using so-called measures of interestingness, such as the lift and the conviction (Brin *et al.*, 1997). Due to their different definitions, these measures may lead to different assessments. To be able to evaluate the virtual relevance or interestingness of a pattern, users who are not familiar with the respective methodology need specific support regarding the interpretation of the individual measures. Here, once again, intelligent user guidance is indispensable, if the data mining process is not to degenerate into a randomized picking of data.

Data and methods for generating customer intelligence

The following two examples show how different the data and methods which may define the basis of CI can be in practice. We start with so-called preference data generated by means of Conjoint Analysis. The basic idea of Conjoint Analysis is to decompose rank-ordered evaluation judgments of a set of alternatives (e.g. products) into relevant components based on qualitative attributes. That is to say, each alternative is considered as a combination of attributes, each of them contributing to its utility to some degree. For each level of each attribute, a

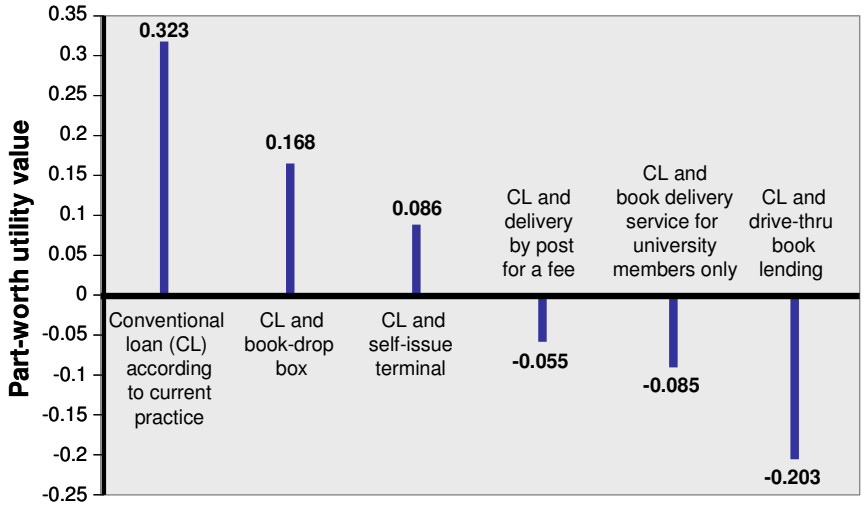

Figure 2: Part-worth utility values of alternative options related to book loan and delivery

numerical part-worth utility value is computed from the rank orderings that have been collected from the respondents in an appropriate survey. The sum of the part-worth utility values for an alternative is assumed to be an estimate of its unknown (latent) utility. The goal is to compute the part-worth utility values such

that the computed utilities of the considered alternatives reflect the original rank orderings of the alternatives considered as accurate as possible (see Decker and Hermelbracht, 2006 for methodical details). Figure 2 illustrates the preferences, or rather part-worth utility values, regarding future options for lending and delivering books at Bielefeld University Library. The study underlying this example comprises the answers of about 2,100 library users. From Figure 2 we learn, for example, that the current practice at Bielefeld University Library is preferred most, whereas a combination of conventional loan (CL) with a chargeable home delivery service would obtain comparatively low approval.

The data underlying Figure 2 have been generated especially for preference measurement purposes and thus represent typical primary data. In contrast to this, the second example is based on secondary data (i.e. on data that have been collected for some purpose other than the one considered now). It demonstrates the application of a pattern mining technique to media usage data. In the respective study about 3,770 book profiles were analyzed using a self-organizing neural network approach. The profiles had been defined by means of 34 items describing the usage of the respective books in the considered period of time. As a result, 11 book usage patterns could be identified. Table 3 displays profile information for eight items of two book types (the numerical values equal the weights defining the neurons of the neural network). Books of type 2 – on average – feature about 375 pages and are mostly available in the second or even a higher edition. The total number of loans per term is higher than five (5.25) and the average number of biweekly loans equals 5.19. Looking closer at the authors of this type of book, and/or the topics they are focusing on, may be helpful in future acquisitions decisions. Books of type 2 may also be candidates for reading lists of related lectures.

Item	Book type 1	Book type 2
Number of available copies	1.20	2.10
Number of pages	250	375
Last edition	1.12	2.25
Year of publication	1991	1994
Total number of loans	0.89	5.25
Number of reservations	0.04	0.66
Number of biweekly loans	0.13	5.19
Number of copies lent during the term	0.57	3.70

Table 3: Patterns in book usage data

Concluding remarks

Finding the truth about customers is an ambitious task, not only in commercial enterprises but also in academic libraries. Management information systems based on data warehouses representing data that can be assumed to explain, or at least motivate, customer preferences and behavior are promising tools for decision support in strategic planning. The crucial point is to find the optimal balance between the required level of detail and justifiable abstraction. Therefore, acceptance of a LiMIS strongly depends on the extent to which its developers succeed in integrating the available methods into concrete decision tasks, or, in

other words, the extent to which it helps to associate tessellated customer information in order to obtain coherent knowledge about the customer. Thus, meeting the customer intelligence challenge in academic libraries is much more than investing in modern IT technology.

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