

# TOWARDS A HOLISTIC ANALYSIS TOOL TO SUPPORT DECISION-MAKING IN LIBRARIES

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Lorena Siguenza-Guzman, Ludo Holans, Alexandra Van den Abbeele, Joos Vandewalle, Henri Verhaaren, and Dirk Cattrysse,  
"TOWARDS A HOLISTIC ANALYSIS TOOL TO SUPPORT DECISION-MAKING IN LIBRARIES." *Proceedings of the IATUL  
Conferences*. Paper 29.  
<http://docs.lib.purdue.edu/iatul/2013/papers/29>

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**Presenter Information**

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## Abstract

Academic libraries have recently been subjected to continuous budget reductions, mainly due to the increasing costs of information and the global economic crisis. As the primary purpose of an academic library is to provide well-balanced collections and a wide range of services to support education and research, an efficient use and allocation of limited resources is vital. However, allocating resources such as money, staff, time, and infrastructure between the library collection and services represents a challenge due to the multitude of data sources required to consult during a decision-making process.

Academic libraries are accustomed to keeping voluminous statistics on their collection and services; however these data are not fully used for decision-making processes due to the lack of an efficient structure for grouping this information. The authors in a previous study state that prior to decision making, data must be collected based on a holistic approach that incorporates all of the key elements that may influence a decision. It is in this sense that to holistically assess libraries, an approach combining a theoretical framework with several measurement tools is proposed in that study. Therefore, the aim of this paper is to document early experiences and lessons learned in implementing the holistic approach in an academic library in Belgium. To do so, the academic library is evaluated in two dimensions. The first dimension analyzes the library system and its collection, whereas the second dimension analyzes the perspective of both the user and the internal stakeholders. During the initial implementation stages, the proposed approach proved to be valuable to ensure a complete view of the library collection and services. There are, however, important considerations to be borne in mind such as the time required to implement the complete approach, as well as the need of a system to integrate the collected information.

## Keywords

Holistic analysis, academic libraries, case study

## 1 Introduction

Amid limited funding resources, academic libraries are striving to efficiently satisfy the growing demands for new and flexible services. Ernst and Segall (1995) state that institutions in these difficult circumstances are called to develop a strategic and well-coordinated budget plan by means of a “holistic approach”. This holistic approach requires interconnecting all necessary components in a way that responds to both, shrinking resources and dynamic library services.

Academic libraries are accustomed to collecting statistics about their collection and services. However, these data are not fully utilized for decision-making processes due to the lack of an efficient methodology for grouping and analyzing this information. The authors in a previous study (2013) proposed an approach which combines a theoretical framework with several measurement tools to holistically assess libraries prior to decision making. The goal of this paper is to highlight the key benefits, challenges and lessons learned in implementing the proposed holistic approach in an academic library in Belgium.

## 2 Theoretical background

Holism is a concept which emphasizes the importance of the whole and the interdependence of its parts (Editors of the American Heritage Dictionaries, 2011). If this concept is applied to libraries, it can be interpreted as an analysis that emphasizes the importance of the entire library and the interdependence of its processes, collection and services. In this respect, Siguenza-Guzman et al. (2013) propose a holistic approach to be used prior to developing a budget plan. The approach combines the theoretical framework proposed by Nicholson (2004), with several evaluation tools. This framework shown in Table 1 uses a two-dimension evaluation matrix, in which columns represent the topic (library system and collection), and rows represent the perspective (library staff and users).

Perspective	Topic	
	Library System	Collection
Internal (Library)	What does the library system consist of?	How is the library system manipulated?
External (Users)	How effective is the library system?	How useful is the library system?

Table 1: Conceptual matrix for holistic measurement (Nicholson, 2004)

The following paragraphs briefly describe the main features of each quadrant based on the holistic approach:

- *First quadrant: internal perspective of the library system.* The processes and services carried out within the library system are the main aspects studied. From an economic point of view as required in this study, Siguenza-Guzman et al. propose to analyze the costs incurred and the resources consumed by the library processes through the use of Time-Driven Activity-Based Costing (TDABC).

- *Second quadrant: external perspective of the library system.* This quadrant evaluates the users' perception about the quality of the offered services. To do so, Siguenza-Guzman et al. recommend the use of at least one of the top five assessment methods reported by Wright and White (2007). These methods are statistics gathering, suggestion boxes, Web usability testing, user interface usability, and satisfaction surveys.
- *Third quadrant: external perspective of use.* This quadrant allows quantifying the impact of the library collection on its users, providing library managers with better basis for decision making when acquiring new bibliographic materials. In order to accomplish this, Siguenza-Guzman et al. propose to combine citation analysis, citation database and vendor-supplied statistics.
- *Fourth quadrant: internal perspective of use.* The fourth quadrant analyzes the use patterns followed to manipulate the system. For instance, in digital library services, it is possible to track everything users search and retrieve from the library system. To analyze this users' behavior, Siguenza-Guzman et al. propose to incorporate log analysis methods such as transaction log analysis and deep log analysis.

### 3 A holistic analysis tool to support decision-making in libraries: A case study

#### 3.1 The case study

A case study was conducted at the Arenberg Campus Library (CBA - Campusbibliotheek Arenberg) of the KU Leuven in Belgium. The CBA staff, approximately 19 full-time equivalent employees (FTE), provide service to about 10,000 potential customers. To improve cost efficiency and effectiveness, the CBA has been forced to find new strategies to deliver its services, such as the use of new technologies, improving access to e-journals and databases, automation of repetitive processes and deployment of new digital and physical services. However, library budget cuts urge the CBA to keep improving its understanding and prioritization of the information collected for budget decision making. As a consequence, the proposal to implement a holistic approach to support decision-making in the CBA academic library was presented to its authorities. The project started in 2010 and is to be finalized by the end of 2015.

#### 3.2 First quadrant: internal perspective of the library system

This section documents the experience of applying TDABC to the four main traditional library functions performed in the CBA: acquisition, cataloging, circulation and document delivery. TDABC is a costing approach developed by Kaplan and Anderson in 2004 that requires only two parameters: 1) the unit cost of supplying resource capacity; and 2) an estimated time required to perform an activity (Kaplan & Anderson, 2007). To calculate the activity costs through a TDABC model, this study followed the six steps presented by Everaert et al. (2008), which are described in detail by Siguenza-Guzman et al. (2013). As a result, twelve processes were identified and analyzed (Table 2).

<b>Acquisition</b>	Acquisition of Books
	Acquisition of Journals
<b>Cataloging</b>	Original Cataloging
	Copy Cataloging
	Cataloging Closed-Stack Items
<b>Circulation</b>	Lending items
	Returning items
	Reference

	Requesting closed stack items
<b>Document Delivery</b>	ILL Outgoing Request
	ILL Incoming Request – digital items
	ILL Incoming Request – printed items

**Table 2: Activities analyzed using TDABC**

The application of TDABC to the CBA showed important benefits such as: 1) *Disaggregated values per activity*. Thanks to the TDABC implementation, many relevant findings on the process costs were unveiled. For instance, it was detected that scanning papers was a time consuming activity because the scanner was outdated (Pernot, Roodhooft, & Van den Abbeele, 2007). Overdue fines consumes a significant part of the librarian's time (5 times more costly than returning activities). A remediation strategy is to consider that fines could be paid by the annual university tuition fee. In addition, depending on the characteristics of an ILL request, "Searching" activities consumes approximately 75% of the process time (Pernot et al., 2007). This situation can be improved by simplifying the search process and outsourcing the activity to the requester. 2) *Allows comparison of different scenarios*. For instance, manually returning is almost 60% much more costly than the same activity performed using a self-check machine (Siguenza-Guzman, Van den Abbeele, et al., 2013). In addition, TDABC showed that copy cataloging is 30% less time-consuming and thus less costly than original cataloging. 3) *Allows the justification of decisions and choices*. For instance, hiring students to work in activities such as photocopying, shelving, and scanning can reduce up to 25% of costs and, in turn, allows librarians to perform other specialized activities. Furthermore, librarians can propose the development of new services based on their responsibilities and time availability.

Nevertheless, a number of challenges were found during the TDABC implementation. For instance: 1) *Time*: data collection on the duration of activities took significant time, as the measuring was gathered by direct observation. Data were collected multiple times using a stopwatch during several days in the first semester of 2010, and then validated through an additional data collection in the second semester. Moreover, documenting the activity flows required considerable time. Two rounds of interviews were conducted with library managers and staff in order to identify the activities, resources and responsables. This step was improved by combining MS Visio and MS Excel to store, analyze and create graphical representations of the activity flows. This combination allowed validating the collected information straightforwardly because librarians could easily understand the sequences and their responsibility in each process. However, a dedicated software tool to perform TDABC analysis is strongly recommended in order to keep the flows updated and consequently to facilitate long-term maintenance. 2) *Feeling controlled*: some staff members felt uncomfortable being observed while working. This discomfort caused some resistance and consequently delayed the data collection. A right communication as well as the involvement and commitment of the managers and staff can increase the level of acceptance. In addition, library managers and TDABC team should explain the purpose of measurement, importance of the model, activities to perform, and implications of the results. They should clearly state that the activities and profiles are measured, not the names of individuals.

### 3.3 Second quadrant: external perspective of the library system

In the CBA case study, the LibQUAL+® survey was utilized to assess library service quality from an external perspective. LibQUAL+® is a set of services based on Web surveys that allows requesting, tracking and understanding users' perceptions of the

library service quality (Association of Research Libraries, 2013). Three dimensions are measured in this survey: Affect of Service, Information Control, and Library as a Place. In 2008, KU Leuven was the first Belgian institution that used LibQUAL+® for assessing its services (University Library Services, 2009). This survey was a full version consisting of 45 questions, each requiring a response on a nine-point scale for current perceptions, as well as, minimum and desired expectations. Survey results showed that users were generally very satisfied with the library services and collection. The Library as a Place dimension was the best scored as its punctuation was slightly below the desired level. The former and Information Control obtained the same score; however, users' expectations for Information Control were 15% higher. Users were also satisfied with the Affect of Service dimension, especially researchers and academic staff.

In 2012 KU Leuven chose the LibQUAL+® Lite version including 23 questions in total in order to increase participation ratios. As a consequence, the total number of respondents increased 47% compared with the previous survey. In general, CBA performed very well in the dimensions Library as a Place and Affect of Service, but less in the dimension Information Control. In comparison with the already overall high score of the previous survey, the CBA was rated 4% higher. The *Library as a Place* dimension was the highest perceived score, even slightly higher than in 2008. Therefore, the importance of the Library as a Place is evidently still a concern, especially for students demanding more areas for individual and group work. In the *Affect of Service* dimension, CBA ranked 4% higher than the first survey. Survey results showed a positive effect on perceived service value. In addition, users' expectations (minimum and desired scales) are even higher in comparison with LibQUAL+® 2008, placing considerable value on a courteous and knowledgeable staff. Ultimately, *Information Control* was the relatively weak dimension. CBA ranked 3% lower than the previous survey. One reason was that a new search platform to access the collection was implemented at institutional level and a stabilization period was performed. Another reason was that while students still consider the physical collection very relevant and perceived that was not updated; researchers and academic staff are expecting and demanding more number of e-journals. After analyzing the survey results, several actions are being taken as shown in Table 3 (Nassen, 2013; University Library Services, 2012):

Domains	Actions points
Library as place	Improvement of four group work areas and learning center facilities with high tech equipment such as smart boards, flat screens, and furniture.
Affect of service	Continuation of the customer service training programs, including student library employees.
	Development of long-term cooperation projects to exchange expertise in other library functions such as acquisition and cataloging.
	Cluster librarians that provided support on a number of related subjects became "Information Specialists". It meant going to the field to have a close contact with the researchers in order to know their expectations and needs.

Information control

Enhancing of the new search platform to provide easy access to all materials of its library collection.

Improvement opportunities of remote access to online library resources and information services

**Table 3: Action points after LibQUAL+® 2012**

The CBA had to deal with several challenges during the deployment period: 1) *Data Preparation*, due to specific factors such as language definition and great variety of population. Although LibQUAL+® provides the standard questionnaire in different languages, it was necessary to make some specific changes that had to be coordinated together with the Association of Research Libraries (Vandoolaeghe, 2013). In addition, KU Leuven chose to apply the survey in two languages: Dutch as primary language and English. This decision had important consequences such as the need of integrating the two results during the data processing. On the other hand, gathering the population data for each user group was not an easy task. In the case of students, for instance, it was important to distinguish the year that the student was being trained and not the year that the student was registered. Similarly, determining the number of PhDs by discipline was not a simple exercise because of the multidisciplinary groups. 2) *Granularity*, as no specific results for branch libraries and disciplines are provided by standard reports. LibQUAL+® survey produces standard reports in which the measurement is carried out in its overall performance and user groups (e.g. students, PhD's, faculties). This standard report also provides no direct insight into the library performance compared to other libraries branches where the LibQUAL+® survey was performed. As consequence, an online tool developed by Datimpact was appealed to analyze each sub-library (University Library Services, 2012). 3) *Participation rates*. Although LibQUAL+® Lite improved response rates and reduced respondent burden, there was still the perception that the survey was very long (Vandoolaeghe, 2013). Other strategies to stimulate the users' response were to offer incentives such as electronic devices and movie tickets, as well as to send a reminder email two weeks before the close of the survey. In addition, an input field for free text gave users the opportunity to submit comments regarding their concerns and to express suggestions for future improvements. Eventually, the University involvement was crucial to obtain good results and libraries were totally aware of the importance of this analysis.

#### 3.4 *Third quadrant: external perspective of use*

In the third quadrant, the theoretical framework evaluates the usefulness of the library collection. To do so, Siguenza et al. propose to combine citation analysis, vendor-supplied statistics and citation databases such as PubMed, Scopus, Web of Science, and Google Scholar to gain extensive knowledge about the value of the library collection. At the CBA, an ambitious project that combines the three methodologies is currently being performed. The aim of this project is to have a deep insight of the local use of the collection, with especial interest on the e-journal's availability. Thus, more than 1,200 PhD theses submitted over a six-year period (2005-2010) are being analyzed. These theses correspond to researches conducted in 13 departments of Science, Engineering and Agriculture of the KU Leuven. As a result about 235,000 references are being collected and evaluated. The results will allow to personalize reports based on the library requirements such as journals cited per department, workgroup, and advisor. The project is expected to be concluded by the end of June 2013.

The study first collects in a database all references cited in each PhD theses. In parallel, a second database is created gathering information about the publishing patterns of PhD students. This second database allows determining the most attractive journals where departments choose to publish, as well as verifying whether these journals correlate with the citations used as reference. A third database is used to collect the vendor-supplied statistics of all journals downloaded during the period 2005-2010. These electronic journal usage data are received from COUNTER-compliant publishers as part of the subscription contract. The Counting Online Usage of NeTworked Electronic Resources (COUNTER) standards are an internationally accepted initiative that facilitates the recording and exchange of online usage data in a consistent, credible and compatible manner (COUNTER, 2013). This third database verifies the correlation among the citations patterns, publishing patterns and journals downloaded. The information collected in these three databases is then used to test an additional correlation with the 5-year Impact Factor produced by Thomson ISI Web of Knowledge. Finally, as a result of the previous analysis, a list of journals is created and classified according Bradford's Law in order to determine the core collection of the library.

The implementation of this analysis has faced several challenges, such as: 1) *Time*. To manually analyze a thesis, it is necessary an average of 2.5 hours to both collect the information and incorporate them in the different databases. However, in order to facilitate long-term maintenance, process automation is necessary. 2) *Abbreviations*, there is no defined standard for journals' abbreviations and acronyms, thus collecting journals' information is not always straight forward. For instance, the ISO Abbreviation for the Journal of the American Chemical Society is J. Am. Chem. Soc.; the JCR Abbreviation is J AM CHEM SOC, while its acronym is JACS. Proc. IEEE is the ISO abbreviation for The Proceedings of the IEEE and its JCR abbreviation is P IEEE. Therefore, a certain expertise is necessary to differentiate the different abbreviations and acronyms of journals that PhD students cited as reference. 3) *Data management*, although the project is using Excel sheets as main platform, there is the need of dedicated software to collect the large amount of information, as well as to evaluate the results.

### 3.5 Fourth quadrant: internal perspective of use

The final quadrant measures users' interaction with the system. Siguenza-Guzman et al. suggest the use of transaction log analysis to monitor users' behavior in a digital environment. To date, at the CBA no prior studies have assessed users' behavior. Therefore, a project to analyze transaction logs is expected to start in July 2013 and to be concluded by the end of June 2014. Examples of challenges that this project will face include: 1) *User privacy*. Privacy of personally identifiable user information is of concern during the bibliomining process (Nicholson, 2006). Several solutions have been proposed in literature such as to encode the user identification in the data warehouse by replacing the user ID with a code. Another option is to create a demographic surrogate to replace personal information about the user through a set of demographic values (e.g. age, sex, education). 2) *Identifiability of IP Addresses*. Because CBA is part of a University system, it is required to carefully define the range of IP addresses to be monitored.

## 4 Conclusion

To holistically analyze a library, several parameters must be considered including both the library functions (collection and services), as well as stakeholders' perception (internal and external). In this paper, the implementation of a set of methodologies and measurement tools has been described. We conclude that the model proposed by Siguenza-Guzman et al. is a simple and powerful structure for grouping the library information prior a decision making. By documenting the initial stages of implementation, this paper provides preliminary experiences supporting the practical validity of the

proposed holistic approach in order to enable a budgeting decision-making process. There are, however, important considerations to be borne in mind such as the time required to implement the complete approach, as well as the need of dedicated systems to automate the different quadrants.

## 5 Acknowledgements

We wish to thank the KULeuven Arenberg Campus Library staff, especially to Hilde Van Kiel (Head of the Library) and Christophe Nassen (Circulation responsible) for their big support. Special thanks to the University of Cuenca, the Flemish Interuniversity Council (VLIR-IUC), and the National Secretariat of Higher Education, Science, Technology and Innovation of Ecuador (SENESCYT) for supporting this research project.

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