

A Trend from Germany: Library Chatbots in Digital Reference

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ASKademicus, Stella, INA and a fourth, yet nameless person, are chatbots – virtual characters whose mission is to help users of library websites. Chatbots can both understand and answer questions in natural language. They have established themselves as a form of digital reference in addition to E-Mail, live chat and other services. Until quite recently, chatbots on library websites have been a uniquely German phenomenon. However, international competition seems to be on its way: Ms Dewey is not a library chatbot, but the name of this “moderator” of a new search engine from Microsoft indicates that virtual characters may indeed be helpful in the library context¹. The contest “Mashing up the Library” by Talis has produced Lillian, a virtual librarian that helps people to search and locate information in libraries by using web services from Amazon and WorldCat².

A chatbot derives its communicative skills from a knowledge base, which contains potential questions of users in different semantic varieties as well as the answers to those questions. Aside from providing answers to frequently asked questions, chatbots can help users develop search strategies and become more aware of library services. Thus, marketing and 24/7 availability make for added bonuses of this innovative form of digital reference.

The development of chatbots involves the creation and design of an avatar and the programming of a knowledge base. Both aspects will be addressed after a short introduction of the four German chatbots. The article then offers some thoughts about the evaluation of chatbots before drawing some conclusions from the experiences with this particular form of digital reference and putting those conclusions in a more general context.

¹ MsDewey: <http://www.msdevey.com>

² Lillian: <http://www.daden.co.uk/pages/000394.html>

1 The four German Chatbots

1.1 University Library Dortmund: ASKademicus

ASKademicus has been online since March 2004. It is the first library chatbot worldwide. As the chatbot merely supports the live-chat service, it is not always available on the library's website. Aside from 24/7 availability of a reference service, the objectives of the chatbot project include assistance with the usage of the website and marketing of the library's services³.



"Hallo! Ich bin ASKademicus, der Auskunfts-Chatterbot der Universitätsbibliothek Dortmund. Obwohl ich ein Computerprogramm bin, weiß ich viel über die Bibliothek und bin gern bereit Ihnen weiter zu helfen."

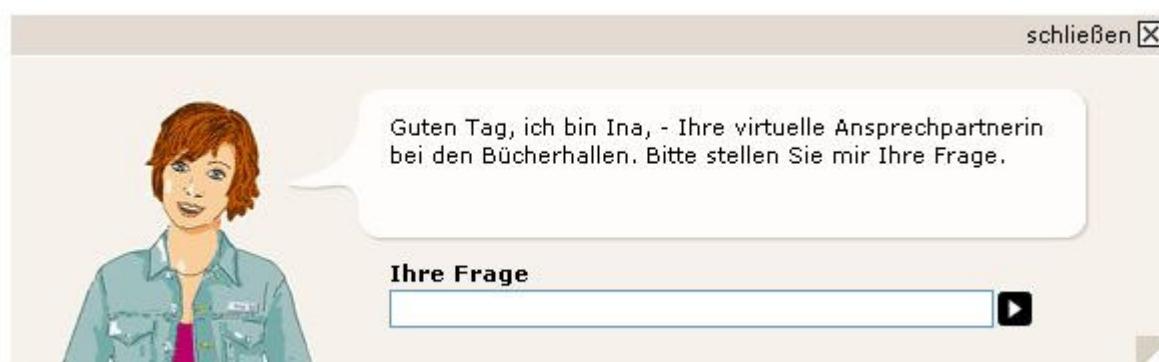
1.2 State and University Library Hamburg: Stella

Stella was introduced in October 2004. The chatbot was developed with funds from the Hamburg E-Learning Consortium. Stella's most ambitious aim is to teach information literacy by increasing the students' awareness for information resources, particularly the electronic resources⁴.



1.3 Public Libraries Hamburg: INA

INA (short for Internet Navigation Assistant) was developed to help users with the usage of the library's website. INA is the first chatbot of a public library and went online in January 2006. An important objective of the project is library marketing⁵.



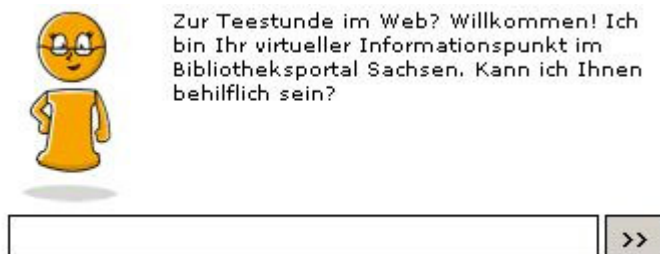
³ ASKademicus: <http://www.ub.uni-dortmund.de/chatterbot/>

⁴ Stella: <http://www.sub.uni-hamburg.de>

⁵ INA: <http://www.buecherhallen.de>

1.4 Portal of the Saxonian Libraries: N.N.

The website of the Saxonian Libraries was relaunched in May 2007 with a federated search functionality. The – still nameless – chatbot is meant to assist users with this new feature and provide information about the libraries in the consortium ⁶.



2 Creation of an avatar

The creation of an avatar has to precede the programming of a knowledge base because the tonality of the answers will have to suit the chosen character. A chatbot that is meant to serve as a marketing tool will have to be designed carefully in order to meet the following demands:

- Accordance with the library's image
- Reliability regarding the knowledge of the library and its usage
- Entertainment value as desired

Even though the creation of an authentic and entertaining biography may seem to be quite a challenge, this part of a chatbot project has proven to be as crucial for the future success of the chatbot as the depth of its knowledge. Users like to test the chatbot's reactions and are often curious to find out more about the virtual character. Thus it is important to prepare the chatbot for this type of small talk and also to provide it with some humorous answers. Light tonality is another essential. As the word chatbot indicates, it is vital to employ elements of spoken language. One experience in the Stella project in Hamburg has been that written instructions from the website or leaflets could not be reused for the chatbot because wording and syntax were not appropriate for chat.

The avatar can be equipped with technical features such as animation or a synthesized voice. Both features involve extra costs, and an audio output for the answers would make the maintenance of the chatbot more time-consuming. None of the library chatbots currently employ these features.

⁶ N.N.: <http://www.bibliotheksportal.sachsen.de>

3 Knowledge base

The knowledge base of a chatbot is designed according to the scope of the project, which also determines the selection of the software. These decisions need to be made carefully. However, the different software solutions that are available all work on the same basic principle: They allow the creation of rules or categories that contain possible questions from users and the reactions of the chatbot to these questions (answers, opening of specified HTML pages). One of the main differences between open source and commercial products is the way the possible questions of users are coded.

The open source solution A.L.I.C.E. is based on the Artificial Intelligence Markup Language (AIML), an XML derivative⁷. A very basic rule looks like this:

```
<alice>
  <category>
    <pattern>Good morning * </pattern>
    <template>Good morning. How are you?<template>
  </category>
</alice>
```

A rule is here referred to as a category. The pattern contains the users' input, employing the asterisk * as a truncation sign. In this case, the input "Good morning" could be followed by any string ("Good morning, Alice", "Good morning how are you", ...) . The template contains the chatbot's reaction.

Commercial software products use more sophisticated ways of coding rules. In IQ Composer by Novomind, the user input is called an expression and consists of regular expressions that are combined through Boolean operators. This allows for a greater variety of possible questions to be addressed in a singular rule. This is the example of a rule concerning interlibrary loan:

```
((("#HOW# .* (order|make|do) .*#ILL#) || ("#HOW# does #ILL# work") || ("how works #ILL#") || ("what do I have to do to (make|place)? .*order(s)? .*#ILL#"))
```

This rule covers questions like:

- How does interlibrary loan work?
- How do I order via interloan?
- What do I have to do to order something via document delivery?
- How do I order something with the interlibrary loan system?

Words in ## are patterns. They contain synonyms for a certain term, the pattern #ILL# for instance could cover terms like interlibrary loan, interloan, document delivery etc. Patterns and Boolean logic are used extensively in the rules in order to create complex expressions, which are needed for the rather specialized questions that may occur in the field of library usage. Additionally, commercial software products offer different reactive strategies for the behaviour of the chatbot. An answer can for example contain another subsequent question that is asked by the chatbot to

⁷ A.L.I.C.E.: <http://www.alicebot.org>

better determine the information need of the user. Thus, dialogs with several steps are enforced that can be modelled along the rules for the classic reference interview. The commercial products have also proven to be more powerful as far as the matching mechanisms are concerned.

The number of rules in the knowledge bases of the four German chatbots varies. The knowledge of ASKademicus is limited to 74 frequently asked questions in different variations. ASKademicus mainly answers the questions by opening a page from the library's website that contains the requested information. A typical answer to a question regarding the circulation periods would be "You can find details on the circulation periods on this page". The other chatbots however have a considerably deeper knowledge. They can recognize more questions in more variations. The answers may be accompanied by the opening of a web page, but in most cases the chatbots attempt to answer the questions themselves, i.e. by giving the requested details on circulation periods ("The circulation period for books is four weeks. If you check out material from the reading room, other rules might apply. Do you want to learn more?"). The chatbot on the portal of the Saxonian Libraries has the largest knowledge base. This is due to the fact that the chatbot has to be able to provide information on all eight participating libraries.

Table 1 summarizes the information on the four chatbots' knowledge bases.

	Software Product	Size of the knowledge base	Time spent on development	Maintenance
ASKademicus (University Library Dortmund)	Quinscape ⁸	74 library related questions in different variations and small talk	5 months	0,5 day per month
Stella (State and University Library Hamburg)	Novomind ⁹	3050 rules (questions in different variations)	18 months	1 day per month
INA (Hamburg Public Libraries)	Kiwilogic / Artificial Solutions ¹⁰	1105 rules (questions in different variations)	6 months	6 hours per month
N.N. (Saxonian Libraries)	Novomind	5500 rules (questions in different variations)	18 months	5 days per month

Table 1: Knowledge Bases of the four German library chatbots

⁸ Quinscape QLangBot: <http://www.quinscape.de/qims/jsp/produkte/qlangbot/index.jsp>

⁹ Novomind: <http://www.novomind.com>

¹⁰ Kiwilogic/Artificial Solutions: <http://www.kiwilogic.de/>

4 Evaluation

The commercial software products both include tools for statistical analysis (number of dialogs per day/week/month, average number of dialog steps). Figure 1 shows the average number of dialogs per day in all four chatbot projects. The reason why the usage numbers for ASKademicus are considerably lower than for the other chatbots is that ASKademicus is only accessible when no reference librarian is available for live chat.

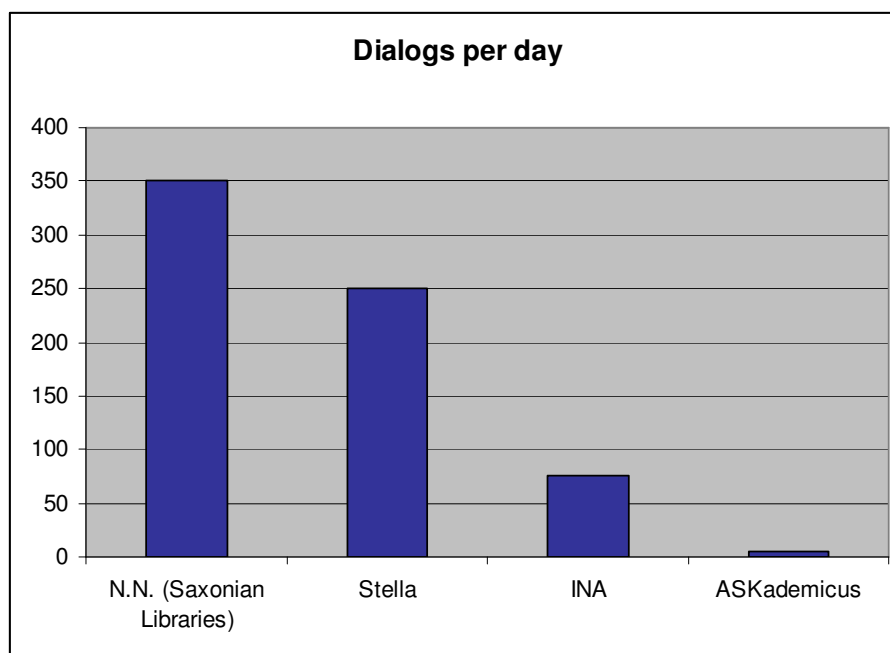


Figure 1: Average number of dialogs per day

The key tool to examine the quality of a Chatbot is the session transcript. Transcripts do not only indicate needs for the maintenance of the knowledge base, but also serve as a valuable means to learn more about how users use the Chatbot. Extensive evaluation of Stella's session transcripts has led to a decrease in the percentage of wrong or misleading answers from more than 30% to 15%.

Unfortunately, none of the Chatbot projects has included usability testing in their evaluations, even though this seems to be a promising way of finding out more about the helpfulness of the Chatbot and its answers.

5 Why Chatbot reference?

Forms of virtual reference include FAQs, online tutorials, e-mail reference and live chat services. All these services can be implemented with a relatively small budget, whereas chatbots are a rather expensive form of virtual reference. Aside from a software license, the implementation of a chatbot involves costs for the design of an avatar, software training and consulting. Additionally, the costs for the staff that builds the knowledge base have to be taken into account. Do chatbots actually offer enough benefits to justify these expenditures?

The most outstanding asset of library chatbots is their usage numbers. The average number of transactions per day exceeds those of other forms of virtual reference by far. Live chat services in particular lack acceptance in German libraries, even though they can undeniably offer much more individual and comprehensive answers than chatbots. The reasons for this phenomenon would surely make for an interesting research project. A possible hypothesis is that users appreciate an anonymous form of communication. Face to face reference interviews and live chats might be perceived as compromising for users with no or little knowledge about libraries. Chatbots are an excellent means of communication for people that suffer from library anxiety.

The possibility to communicate with chatbots in natural language and to receive instant answers is a second advantage. Chatbots have proven to be entertaining and engaging tools that meet the expectations of the net generation ¹¹. Chatbots as an innovative and interactive form of communication can affect the perception of a library in a positive way. If this aim is pursued, the chatbot character will need to be developed accordingly – i.e. by creating a likeable and authentic virtual person.

Chatbots can also be regarded as an instrument of library automation. They provide 24/7 availability of reference services. They are however not appropriate for rationalization – a bonus that is often cited in chatbot projects in commercial areas. None of the library chatbots has been introduced to decrease the need for reference librarians. Instead, reference librarians and chatbots can collaborate: While chatbots take care of frequently asked questions and typical simple reference dialogs, reference librarians can concentrate on offering in-depth research consultations or developing reference tools like wikis or browser toolbars ¹². Ideally, a chatbot would encourage people who predominantly use the library online to interact with a real librarian.

Thus, chatbots serve as a marketing tool for professional reference services. This is a particularly welcomed side effect of chatbots; especially as reference services are faced with a growing number of competing services. Examples include Yahoo Answers! ¹³ or Askville and Nownow by Amazon ¹⁴. They can be characterized as peer-to-peer networks. As Jessamyn West, a librarian who worked for Google Answers, pointed out, a reason for success of these reference networks is their informal, low-key character:

“you don’t worry too much about second-guessing that answer, because, hey, it’s basically friendly advice” ¹⁵

Library services on the other hand do not tend to be perceived as informal and low-key. Asking information professionals for advice on any given subject seems to require more confidence than it does to submit a question to a peer-to-peer network. Chatbots offer an anonymous form of interaction to those users who have already found the way to a library’s website. But as the majority of students starts their research elsewhere, it seems advisable for librarians to be visible in peer-to-peer networks and other popular services as well. Brian Mathews, a reference librarian

¹¹ Mi, Jia; Nesta, Frederick: Marketing library services to the net generation. In: Library Management 27 (2006) 6/7, S. 411-422

¹² Lankes, R. David: Using virtual reference to rule the world. Presentation. URL: <http://quartz.syr.edu/rdlankes/Presentations/2007/AusWorkshop.pdf>

¹³ Yahoo! Answers: <http://answers.yahoo.com>

¹⁴ Askville: <http://askville.amazon.com> , Nownow: <http://nownow.com>

¹⁵ <http://metatalk.metafilter.com/13179/#362850>

at the Georgia Institute of Technology (USA), set another brilliant example for this kind of “reference 2.0”: He systematically reads the web logs of students at his institution and uses comments to give hints about possible search strategies and suitable resources for the course-related issues discussed in these web logs ¹⁶.

A chatbot is one way of reaching out to the net generation, but – as this example shows – the usage of web 2.0 and its platforms is another effective option. The positive effects of a chatbot on the library as a brand should yet not be underestimated. Laura Zick already foresaw the potential of “intelligent software agents” in libraries in 2001. Chatbots are a form of intelligent software agents, and they can help to meet the new demands of reference in a 2.0 world, especially when they are part of a tiered reference model that offers a variety of reference scenarios, provided by a variety of professional, paraprofessional and, last but not least also virtual staff.

¹⁶ Mathews, Brian S.: Intuitive revelations: the ubiquitous reference model. URL: <http://hdl.handle.net/1853/8446>