Visual Discovery Through AI: Unlocking the Postcard Archive at the National Library of Sweden

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Abstract This chapter provides an overview of the National Library of Sweden (NLS) as well as an overview of AI initiatives taking place at the library. Finally, the chapter presents details of a specific AI solution, Bildsök, a service developed to search the National Library of Sweden's postcard collection. Bildsök is an AI-based service that makes ca. 17,000 digitalised postcards accessible to the broader public by using AI. The chapter provides insights into the needs for the project, the actors involved in the planning and implementation and the challenges encountered on the way. The chapter also provides insights into the value that such a project generates for different stakeholders, the lessons learned and the skills that national libraries need in the era of AI.

Keywords Swedish National Library · Artificial intelligence · AI · Value creation · Digitalisation · Postcard project · Digital transformation

1 Introduction

The National Library of Sweden (NLS), located in Stockholm, Sweden, is a government agency under the Ministry of Education. It collects, preserves and provides access to almost all material that is published in Sweden, from books and newspapers to music, TV programmes and pictures. The library also holds foreign research literature, mainly in the humanities.

The NLS was established in 1661, when Sweden introduced a legal deposit act requiring all printers to deliver one copy of their material to the NLS. In the late 1900s, the act was expanded to include sound, moving images and video games. In 2009, the Swedish National Archive of Recorded Sound and Moving Images became a part of the National Library and ceased to be an independent institution [1].

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The NLS is also responsible for coordinating all Swedish libraries, including public libraries and for providing information to higher education and research, which includes obtaining central license agreements for research and university libraries to increase access to various databases [2].

NLS's collections currently include over 18 million items. The library had a budget of 394 Million Swedish Crowns in 2017 and counts about 350 employees [3].

1.1 AI Applications in NLS

In 2019 NLS established an AI lab, the KBLab, that is a national research infrastructure for digital humanities and social science. The KBLab counted about 10 employees in 2024 but planned to employ about the double in 1 or 2 years. The lab experiments with AI technologies to provide access to the library collections in structured and quantitative form, as well as to design, develop and train AI models to analyse the library's collections in innovative ways.

One project where KBLab has used AI to provide access to collections that otherwise would not have been able to be accessed by the public is the postcard project, Bildsök (Bildsök—en demotjänst från Kungliga biblioteket (kb.se)) [4]. In this project, AI supports the library users' interaction with the postcard collection by generating metadata on the fly. As the director of the KBLab states:

> *It's one of the tools from the lab. It's nothing, that's old news now, but it's an example of AI-supported interaction with the collections. It's a small collection of postcards but still, you don't really need metadata. You can create metadata on the fly. (Director of the KBLab, Interview 1)*

This chapter investigates how the National Library of Sweden developed and implemented the AI-based solution Bildsök. The chapter first introduces the KBLab, that is a national research infrastructure for digital humanities and social science established at NLS. Then the chapter goes in depth with Bildsök, which is one of the AI solutions developed at the KBLab. The chapter first provides a description of the project. Then it explores the National Library's motivations for developing and implementing such a solution and discusses the internal and external actors involved in developing and implementing Bildsök. Finally, the chapter provides insights into the value (co-)created through Bildsök, the challenges faced and the lessons learned.

2 Description of the Project

NLS stores and preserves a huge amount of data due to the Swedish legal deposit act that dictates that the national library receives a copy of everything published in Sweden. Therefore, it has been impossible for the NLS to manually catalogue each and every incoming item due to the huge amount of material that the library receives.

The result is that certain types of items get grouped together under collective catalogue entries and detailed information and metadata about each single item is not provided by the library. This has been the case for the postcard collection, which counts a rich and diverse collection of c. 600,000 postcards from the nineteenth and twentieth centuries [5] as Haffenden et al. [6] write on the KBLab blog:

> A pertinent example of a material that, while preserved, lacks description—perhaps due to its perceived ephemerality historically and the limited valuation this has granted in terms of archival resources and attention—is visual heritage collections from the nineteenth and twentieth century. Descriptive cataloguing has long been a central part of KB's making its collections accessible and searchable, but it has been impossible for each and every incoming item to be manually catalogued, given that legal deposit legislation dictates the library receives a copy of everything published in Sweden. Instead, certain items such as postcards or adverts have tended to be grouped together and classified under collective catalogue entries that often preclude the detailing of any specific information about the individual object per se…Although KB has a rich and diverse collection of *c. 600,000 postcards*, the lack of navigability and overview entrenched by scarce metadata has made the material hard for users to access—or even to be aware of its existence. Despite being preserved as part of our shared cultural heritage, such items are thus at risk of disappearing from view altogether. [6]

The library users have had, therefore, difficulties in accessing this collection due to the lack of detailed information about each specific item.

Recently, the KBLab, as part of its wider mission to contribute to wider use and discussion of AI tools for the heritage sector, has applied AI to develop a service, Bildsök, that provides access and makes it possible to search part of the postcard collection. The Bildsök project is still at the experimentation stage, and a demo has been launched on the Web [4]. The project only includes 17,409 postcards because they are the only postcards that have been digitised. To be able to display the postcards, NLS has signed a contractual license agreement with Bildupphovsrätt in Sweden as Haffenden et al. report on the KBLab's blog [6]:

> The Royal Library can display the postcards in this service because we have signed a contractual license with Bildupphovsrätt i Sverige. It is you as the user who is responsible for finding out whether the material is copyrighted and for obtaining approval if you wish to distribute it further. [6]

To make it possible to search in the postcard collection, the KBLab has used the adaptation of the CLIP model, Swe-CLIP 2M, developed by Carlsson et al. [7] to enable free-text search in Swedish. The Swe-CLIP 2M is the Swedish adaptation of the OpenAI model CLIP, which enables free-text search on images in English.in English. The Swe-CLIP 2M AI model, instead, enables free-text search in Swedish. It is possible to search by simple keywords such as "Church", blue sky, etc. As stated on the Web site of the project [4]:

> *Slowly, the model has learned to associate texts in image descriptions with corresponding images. When "church" has appeared in a text, the model has become good at generating a similar numerical representation for the text "church" as well as for images depicting a church. Similarly, it has learned to associate the text "blue sky" with the color blue and horizon and sky-related motifs in images.*

2.1 Need(s) Behind the Implementation

The main need to start Bildsök was the very limited access that the library users had to these kinds of collections or sometimes even the awareness of their existence. Such limited access was a result of the lack of navigability and overview due to scarce metadata. There is therefore the risk that such material may be completely forgotten, even though it is part of Sweden's cultural heritage, as Haffenden et al. [6] state on the KBLab's blog:

> Although KB has a rich and diverse collection of *c. 600,000 postcards*, the lack of navigability and overview entrenched by scarce metadata has made the material hard for users to access—or even to be aware of its existence. Despite being preserved as part of our shared cultural heritage, such items are thus at risk of disappearing from view altogether. [6].

2.2 Actors Involved

The project was initiated and completely developed internally in the library. It is supported directly by the head of the KBLab and indirectly by the library top management, by supporting and financing the KBLab to innovate and experiment with AI solutions in the library context.

The project was started and implemented by a team of KBLab developers. However, the KBLab team has collaborated with other departments at the library including key librarians/archivist experts of the postcard collection. KBLab employees have also involved User Experience (UX) employees at the library and final users of the library in testing the service. In addition, they have collaborated with the copyright agency to get permission to publish the postcards on the Web. As the director of the KBLab states:

> *When it comes to implementation into the library, we work in very close collaborations with the other departments at the library, the librarians basically, or archivists. Sometimes we need to work very close with them and sometimes we don't really need that much because it's collections that we're already familiar with. When it comes to articulating the needs, we do that together with the team around the developers. (Director of the KBLab, Interview 1)*

During the project implementation, several co-production activities with different stakeholders' involvement were identified. Here we follow Mergel et al.'s [8] phases of the co-production process to identify the co-production activities characterising the Bildsök project, which are summarised in Table 1.

2.3 External Actors

The postcard project was initiated and completely developed internally in the NLS. However, the CLIP model applied in the project, Swe-CLIP 2M, was developed and adapted by KBLab data scientists together with scientists employed at

Table 1 Co-production activities in the development and implementation of Bildsök at the National Library of Sweden

Co-commissioning	*Prospective co-production phase*	The developers of the KBLab initiated the project as part of KBLab's wider mission to contribute to wider use and discussion of AI tools for the heritage sector
Co-design	*Concurrent co-production phases*	Bildsök was designed by the KBLab developers together with the librarians (archivist expert of the postcard collection)
Co-implementation		The KBLab developers and the librarians experts of the postcard collection were the main actors involved in the implementation of Bildsök. User experience employees and library users were involved in testing the service. Collaboration with scientists employed at other research institutions and the copyright agency was key to make the service a reality
Co-delivery		Bildsök has presently a demo page on the NLS Web site and can be used and tested by library users and anybody interested in the service
Co-assessment	*Retrospective co-production phase*	The KBLab developers, the librarians/archivists, the library UX employees and the library users are the main actors involved in the co-assessment of the service in the initial implementation phase. Presently, on the Web page of the service, there is a link where it is possible to use and test the service

other research institutions. In addition, the copyright agency has been involved to clear/buy all the needed copyrights of the postcards to make them available online and searchable to the library user.

2.4 Challenges

In developing Bildsök, the NLS and the KBLab have encountered several challenges. One major challenge in the project is related to technical requirements necessary both to scale up the project to all the ca. 600,000 postcards in the collection and to go from the present demo stage to full implementation as a library service. Such technical requirements include developing a public interface which meets the accessibility standards required by the library services and integration of Bildsök into the existing library system. As the research coordinator (Interview 2) points out:

> *There's a difference between just showing something works on one person's laptop to we need to get developers in, we need to think about a public interface, we need to make sure that interface meets the accessibility standards that the libraries website must have. That's a different phase of development work that necessarily also takes time. (Research Coordinator, Interview 2).*

Another important challenge is the copyright issues that need to be cleared to publish the postcards and make them available and retrievable on Bildsök as the research coordinator (Interview 2) points out:

> Another part of that though was the licensing issues to be able to show this material. Technically, they're copyrighted, the postcards, even though we're not always sure who produced them. It's not like a book where we know we have the author of this is X, Y, and Z. (Research Coordinator, Interview 2)

Finally, the lack of resources and lack of strategic leadership to put the demo service into full production is also pointed out as an important challenge by the research coordinator:

> *But once you've come up with something, the next step [is] about how do we go from prototype to something that exists for all of our library users in the real world as it were…They need other type of skills and competences, not least the legal aspect. (Research Coordinator, Interview 2)*

3 Results

3.1 Organisational Level

The postcard project has generated different values for the National Library of Sweden. The main value consists in making library material such as the postcard collection accessible and available to the broader public, therefore contributing to accomplish the library overall mission. As a metadata strategist states:

> *The significance for us is that we can make our collections available and useful through a trained model that other stakeholders can value and use and fine-train for their own. needs. (Metadata strategist, Interview 4)*

Another important value for NLS is the administrative value. In fact, the AI model relieves library employees from eventually having to retrieve the physical postcards and therefore frees resources to conduct other tasks as a metadata strategist states:

> *I think that also goes hand-in-hand with the digitisation and AI to be for the staff within the library that don't need to go and fetch these postcards, go and look for them in boxes, and so on. It makes the material available directly and we could use our resources for other things than getting things in and out of the archives DALL·E and also saving the material from preservation actions through wear. (Metadata strategist, Interview 4)*

Finally, another important value for NLS is the project contribution to innovation processes within the National Library of Sweden:

> *The second point of value from this project is about method development within the library itself. (Research Coordinator, Interview 2)*

3.2 Lessons Learned

There are a few lessons that NLS has learned through the postcard project, many of them related to funding issues. The first is that it is important to have internal AI expertise and competence and not only rely on external providers. The second lesson is the importance of integrating the AI competences within the specific context of libraries and not only having and developing AI competences per se. The third is that the library leaders need to understand the AI use cases and make decisions that support the adoption of AI projects within the library. Fourth, it is important to use AI responsibly and ethically and think carefully about where AI can add value to the library. Fifth, it is important to have cleared all copyright issues related to the material that has to be made available online to the wider public. Some of these lessons are summarised by Haffenden et al. [6] on the KBLab's blog:

> There are certain practical preconditions for the adoption of such technology in a heritage setting, most of which can be related to questions of funding: that the material has been digitized, that there are sufficient resources available for computation, data science and developer expertise, and that there are licensing agreements in place [6].

3.3 Value Created and Co-created

According to the respondents, there are different public values that the postcard project at NLS has generated or has potential to generate for the society. The most important value is the democratic value. Specifically, the postcard demo generates this value by providing accessibility to the postcard collection. Such a collection would otherwise be nearly impossible to access without using AI. As a metadata strategist states:

> *One of the key points that's lifted is to be an effective research infrastructure to raise the quality of Swedish research. And then, the sub-points relating to that is, of course, collecting the cultural heritage as part of our assignment with legal deposits. Not only collecting and preserving, but also making it searchable and available for researchers in appropriate forms, so that they can access it. (Metadata strategist, Interview 4)*

In addition, the postcard project may generate cultural heritage access value for diverse groups of external actors such as journalists, authors, and researchers as a metadata strategist states:

> *But for the library, I think it's in a way broader, the cultural heritage also includes value for the public and professionals, for example journalists, authors and people doing other kinds of research, like genealogy. So, it's a much broader group that could find value in this, especially if we start to see that this pilot works even though we have a very, very small subset of our postcards. (Metadata strategist, Interview 4)*

From a larger perspective, the KBLab generates democratic value at the societal level by building large language models that understand Swedish in all its variants

and dialects; increasing access to heritage material; developing open source AI models; and making them available on the Hugging Face open source platform [9] contributing to build an effective research infrastructure to raise the quality of Swedish research. This is illustrated by the following quotes by the director of the KBLab, metadata strategist and research coordinator, respectively:

> *Our languages are underrepresented in the multilingual model. We see that as a democratic task for us that every way that Swedish is spoken or written or otherwise, that should be represented also or mirrored in these models, transform the models, because these are transformative techniques, and we need them to be representative. So, every dialect spoken in Swedish—when we train some models, for example, we based the training on—we try to get as much variation into the underlying data as possible. (Director of the KBLab, Interview 1)*

> *This is important for an open society, for democratic values that it's possible for researchers but also for the general public to be able to access our preserved cultural heritage. (Metadata strategist, Interview 4)*

> *Open-source AI models… we released these AI models on the platform, Hugging Face, that way they're freely available AI-tools. (Research Coordinator, Interview 2)*

Another important value generated at the societal level is the administrative value for external stakeholders. This mainly consists of the application of the AI models produced at KBLab by other stakeholders such as governmental organisations to automate information heavy processes with AI thus increasing efficiency, as a metadata strategist (Interview 4) states:

> We know that the models are used, for example, in the governmental sector to make the information processes more effective. As you know, these processes usually have a resource-heavy manual side to it. If you can support that with automation through AI, that's a good thing for streamlining processes and transparency. (Metadata strategist, Interview 4)

3.4 New Skills

The most important new skills needed in implementing AI at the KBLab are data scientist skills. However, the director also points out the importance of other skills for the implementation of AI projects. These include classical librarian skills, for example, historians, traditional IT skills such as IT architects and IT developers, product managers, product leaders and UX experts:

> *The key competence at the lab is data science…Then, we have all the historians at the library, typically with a PhD…. who know stuff about the collections. We need that.…And then, the typical—we have to have IT architects to set up the whole computational environment locally…When it comes to implementing applications into the library, the team that we're building now it's data science, but it's also product management, product leaders, UX people, developers, etc. (Director of the KBLab, Interview 1)*

A research coordinator adds that in addition to pure data scientist skills there is a need for *data generalist skills*, that is employees who can see the connection

between AI and library operations and the potential of applying AI specifically to the data that the National Library of Sweden has:

> You also need more generalists that have an understanding of AI and data science, but also see some bigger picture, that see what these things might be able to do within the library and beyond, and also how that affects the other types of the library's operations that aren't going to be rooted in data science. (Research Coordinator, Interview 2)

4 Conclusions

In this chapter, we investigated the use, development and application of AI in the National Library of Sweden.

The National Library of Sweden has established an AI lab, called KBLab, where the library is experimenting with AI to provide improved access to the library collections as well as to design, develop and train AI models that can be used to analyse the library's collections in innovative ways. Recently, the KBLab, as part of its wider mission to contribute to the wider use of AI tools for the heritage sector, has applied AI to part of the NLS's postcard collection and has developed Bildsök. Bildsök is a service that provides access and makes it possible to search part of the NLS's postcard collection. Bildsök *is still at demo stage, but its long-term aim is* to provide access to a digitalised postcard collection that otherwise would not have been able to be accessed by the public. In fact, the main reason why the KBLab has started the project was the very limited access that the users have to these types of items and collections. Even though the main actor responsible for the initiation and implementation of the project was the KBLab, several internal and external actors were essential for the success of the project, including key librarians, experts of the postcard collection, the library users, UX employees and the copyright agency.

Bildsök has generated different values for the NLS. The most important value is the democratic value, which is enacted in the project contribution to the library mission of making the Swedish cultural heritage widely accessible to the broader public.

In conducting the project, NLS has learned several lessons concerning the application of AI in the national library context. They include the importance of developing internal competences such as data science, building AI on a contextual understanding of libraries as a particular type of organisation with specific challenges. Finally, NLS pointed out the need for data generalist skills, that is employees that are able to understand not only AI but also how it can be applied to the specific context of the National Library of Sweden to generate value.

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Appendix

See Tables 2 and 3.

Table 2 Overview of the postcard project at the National Library of Sweden

Case and project name			
The postcard project at the National Library of Sweden			
Country	**Number of employees**	**Type of AI solution**	**Year and maturity level**
Sweden	350	A multimodal AI system called Swe-CLIP 2M	Experimentation stage; a demo has been launched on the Web
Project description			
Searching in postcard collections of ca. 17,000 digitised postcards			
Need(s) behind implementation	**Actors involved**	**Challenges**	
Very limited access that the users had to this kind of collection; sometimes even the awareness of its existence	KBLab developers/ librarians/ archivists/user experience designers; library users; copyright agency	Copyright, technical integration and accessibility challenges with the rest of the library system; the lack of resources and lack of strategic leadership to put the demo service into full production	
Results			
Organisational level	**Value created and co-created**	**Lesson learned**	
AI models relieve library employees and free resources for other jobs; KBLab's contribution to library innovation processes	The democratic value of accessibility to a postcard collection	Develop internal competences to use AI responsibly and ethically; AI expertise gets integrated within the library and takes into consideration some of the informational challenges of large-scale collections; building AI on a contextual understanding of libraries as a particular type of organisation with specific challenges; develop AI where it can add value to the library	

Table 3 Overview of interviews at the National Library of Sweden

Interview number	Position of the respondent	Interview length
1	Head of data lab at the Swedish National Library	1 h
2	Research Coordinator	50 min
3	Research Coordinator	30 min
4	Metadata strategist at the National Library of Sweden	1.20 h

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