The Retrocatalography Project: Combining AI with the Microsoft Power Platform at the Royal National Library of Belgium

Anna-Lea Schumann and Ines Mergel

Abstract The Royal National Library of Belgium (KBR) collects all Belgian publications and safeguards the country's cultural and historical heritage. Given the increasing volume of records and the existence of records that are only catalogued on paper cards, there emerged a need for an AI-based solution. In response, KBR initiated a project called Retrocatalography, collaborating with the external service provider Initum. This partnership resulted in the development of an AI-based cataloguing solution which was created in just 10 days. Built on the Microsoft Power Platform, this low-code application is capable of gathering information from a book's cover, archiving it, and verifying the details. In addition, KBR developed the Allez app in-house to scan library records. Volunteers use the app by assisting in the verification process to ensure accuracy of the records data. The AI-based solution went live in October 2022, with strong support from top management of the library. Along the way, KBR encountered several challenges, including staff shortages, time constraints for integrating the system into daily operations, and various technical difficulties. Overall, the AI-based solution transforms the workflow of librarians at KBR. It has made cataloguing books more efficient, ultimately enhancing the quality of the library services.

Keywords Royal Library of Belgium · KBR · National Library · Artificial intelligence · AI · Retrocatalography · Microsoft Power Platform · Allez app · Low-code · Volunteers

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1 Introduction

The Royal Library of Belgium (KBR) is the National Library of Belgium with the mission to collect all Belgian publications, preserve Belgium's cultural and historical heritage, and provide society with information and cultural experiences [1]. It is the National Scientific Library and preserves a heritage collection of around eight million records [1]. It is a federal institution that reports to a minister and has financial control.

The KBR employs around 250 staff members. Among them, one employee is responsible for training the AI model. This individual possesses a background in librarianship but is not necessarily proficient in IT. Although training the AI model is a lot of work for one person, it also provides a lot of freedom to experiment. For future expansion of their AI projects, the KBR will require more personnel resources.

KBR developed a cataloguing AI solution within only 10 days in collaboration with a software company named Initum. The company is known for its innovative, user-friendly solutions that add value to its customers [2]. The project, called Retrocatalography, involved creating an application with the Microsoft Power Platform that can gather information from a book's cover, archive it, verify it, take a picture of it, and then analyse it using AI to check whether everything has been detected accurately [3]. The Power Platform allows for low-code application development using Microsoft's pre-developed components. There was no specific budget, but the expenses for the application, cell phones, etc., amount to around 20,000 Euros as of today. The AI application went live in October 2022.

In this chapter, we investigate the Retrocatalography project at the KBR. Our focus is on how the KBR implemented its AI solution, along with the needs and challenges linked to this implementation. We begin with a brief overview of the project, followed by an analysis of the needs that led to the adoption of AI and the skills and competencies necessary for the librarians involved. Furthermore, we identify the key actors in developing the AI solution and the challenges they encountered. Finally, we summarise the results of the AI project, the value it (co-)created, and the lessons learned throughout the process.

2 Description of the Project

Initially, the KBR had various proposals for digitising its records, such as scanning paper cards with the artefacts' records. However, this plan was turned down because some of the cards had already been scanned, while others were handwritten and in poor condition to be scanned. Eventually, the KBR resolved to begin the digitisation process from the original records instead of the library cards. The librarians searched their catalogue to determine which records were available in digital format and which were not. For those records that were not available, they searched through physical stacks and scanned the title page. A system was in place to detect the author, title, publisher, year of publication, and other relevant information from the

scanned document. This process worked well for records with similar title page templates. However, many title pages were unique in design. As a result, the KBR began working with the company Initum using Microsoft's AI tool to create applications and automated processes to address this [3]. The so-called Power Platform includes an AI component and an AI builder, allowing librarians to train their models based on the title pages of records, such as books or maps.

To use the developed tool efficiently it is crucial to identify the necessary information beforehand to import records into the catalogue. The required information includes the title, subtitle, author, and other relevant details. The information needs to be located on the cover page, and the order of the title page elements needs to be identified. This involves, for example, identifying whether the title comes before the author or vice versa. Depending on the layout, different collections may be needed.

After tagging the information of the artefact, the AI model is trained with an initial corpus, and librarians scan the records, for example, the colophon of a contemporary book, a publisher's emblem, or imprint, usually located on the title page of a book. The colophon typically includes the ISBN of a book, which can be used to search for the book in library databases. If a library has already provided a detailed book description, the KBR extracts the metadata and includes it in its catalogue as open data from other National Libraries to expand its catalogue and avoid extra work. As one of the interviewees states, AI extensions will speed up the process with minimal human input: "*So, in the end, it should be a process that we're just scanning the book, and everything is collected, and there's small review, and then it's pushed to the KBR database. That should be the goal of the total project.*"

KBR has also developed an in-house app called Allez, which is separate from its library management system. Using the app, volunteers are presented with a scan of an image or metadata and asked to verify whether the AI information is correct or incorrect. To validate the data, the KBR has posted a job offer for volunteers who can work with the app. After the records were verified and validated in the Allez app, KBR exported them to their catalogue: "*We check it, we clean it a bit, and then we import it in our catalog*." It is important to note that AI technology continues to improve with time, and less human work is necessary to correct data: "*Now actually [the AI] can read very well the difference between the authors, … and the titles. Before, I need a lot of time to correct one. Now in the same time I can correct five. It means the artificial intelligence works better and better*."

2.1 Need(s) Behind the AI Implementation

KBR still holds many books in its stacks that need to be listed in its online catalogue. Some books are still described only on paper cards, making it impossible for patrons to find these records in the library's online catalogue. Before the COVID-19 pandemic, this wasn't a significant issue, but during and after the pandemic, librarians asked patrons to reserve artefacts through an online reservation system. It became apparent during this transitory period that only around 50% of the records were available online, which creates challenges for patrons to reserve books they

need and puts librarians in a time-intensive situation to aim to locate the physical records. As a result, this topic has come to the attention of library management, and they are working to find solutions to digitise the remaining records.

2.2 Skills and Competencies Required for Librarians

At the KBR, the interviewees have identified as one of the most critical competencies for excelling in the use of AI the motivation and a keen interest in the field: "*But I think the main thing you have, and this is something I have for the moment, you have to be interested in it and you have to be willing to take your time. Sometimes, when there's a YouTube video, you really have to look for thirty minutes to the same YouTube video to really understand what they want to do*."

Learning the Power Platform process requires education to understand its steps, but it can be self-taught. However, fusion development, where the IT department works with the library staff involved in the AI project, is suggested to understand each other better.

Furthermore, library staff need the expertise to ensure that AI-generated results are correct, as one of the interviewees stated: "*… if AI has discovered a book or analysed a book, you do a review, check if everything is correct, and change where it's not correct. Again, it's less time because you already have everything written that is discovered and just do the corrections where needed. You gain a lot of time with that solution*."

2.3 Actors Involved in the Development of AI Solution

KBR works closely with the company Initum to create applications using the Microsoft Power Platform. The collaboration between the library and the company is described as the following: "*We have a good collaboration, we had a good understanding what they want to have, what they want to see. My experience is positive, very positive*." Furthermore, "*… [name of the responsible person in the KBR] knows the process, [name of the consultant] knows the technology and we need to bring that together*". These quotes show how the inclusion of an external partner helps the KBR staff to learn from the external service provider and how they pool their resources.

Along with hiring an external service provider, the KBR collaborates with seven to eight volunteers who scan and validate records in the Allez app, created by the library itself, to correct scans separately from the library management system. Most of these volunteers are retired and wish to contribute meaningfully and culturally to the work of the library as one of them highlights in the following quote: "*I go one time a week to the KBR to see my colleagues, the professional colleagues, a little bit chitchat, chitchat, and then to do the work and one coffee because I like that too*."

An external company recently supported the volunteers by helping them scan more records.

The close collaboration between KBR, its external service provider, and the volunteers can be described as co-production. This term refers to the interaction of various actors aimed at co-creating public value [4]. Co-production consists of five phases: co-commissioning, co-design, co-implementation, co-delivery, and co-assessment [4].

Co-commissioning marks the initial phase where KBR began its partnership with the external service provider, Inetum-Realdolem. Together, they explored potential AI solutions tailored to the library's needs and ultimately chose to utilise Microsoft's Power Platform.

The co-design phase involved collaboratively designing and training the AI model based on the Power Platform. Furthermore, the external service provider assisted KBR with technical support by their in-house developed app, Allez.

During the co-implementation phase, KBR closely collaborated with both the external service provider and volunteers, who worked on scanning and verifying records to ensure the Allez app accurately read and represented the data.

Co-delivery involved marking records in the online catalogue according to whether the information of the record was created by a librarian or generated by AI. Notably, co-design, co-implementation, and co-delivery phases run concurrently, influencing one another [4].

Finally, co-assessment serves as a retrospective phase of co-production [4].

Table 1 summarises the roles of different actors in each phase of co-production, detailing how they support KBR in implementing AI and creating public value.

Table 1 Co-production phases of the AI project of the Royal Library of Belgium (KBR)

Co-production phase	Description of the phase	Application in the case
Co-commissioning	Prospective co-production phase	Collaboration with Inetum-Realdolem, where Inetum-Realdolem consulted KBR with a possible AI solution. They decided to go with Microsoft's Power Platform.
Co-design	Concurrent co-production phases	KBR and Initum trained an AI model based on the Power Platform, and Initum provided KBR with support using their in-house developed app, Allez.
Co-implementation		KBR collaborated closely with Initum and volunteers, who scanned and verified records to ensure that the Allez app was reading and reflecting the data correctly.
Co-delivery		A remark in the online catalogue indicates whether the record information was created by a human or an AI.
Co-assessment	Retrospective co-production phase	

2.4 Organisational Level

The KBR library leadership was receptive to AI and allowed the responsible employee to find an AI solution. Overall, their assessment was that "*It's not necessary to have one AI department because AI is too big to have one use. I think every department has to have an AI component in it to see where can we use AI.…*" In addition, it is more critical to have library staff who is "*…open for it, … [is] willing to look into it, to test it, to see can it work, can it not work*".

KBR sees it as essential to advocate and foster a culture in the library that is interested in AI and its use. In KBR, library management empowers employees with flexibility in AI projects.

2.5 External Actors

The KBR has decided to use the Power Platform, a Microsoft AI tool included in the Windows 365 package. The costs are relatively affordable, and since the library already has a license for the package, it only needs to pay per employee who utilise the AI application. The KBR collaborates with a company called Inetum-Realdolem, which supports them with the Power Platform. However, the KBR creates the in-house AI workflow, the Allez app. Despite this, the company assists the KBR with coding questions.

The KBR suggested that National Libraries should cooperate more to improve their category classification and subject indexing with the help of AI: "*So, I think every library is a bit searching for a way to give an answer to the same problems. I think there we can help each other*." They propose that in the long run, each National Library should have its local dataset, which can then be combined to create a general dataset that AI can use for subject indexing. The KBR emphasised that these ideas are intended for the future. Additionally, collaborating in low-code, which allows for less coding and enables faster application development, could be an effective approach to utilising AI projects with other libraries in Belgium in the future.

2.6 Challenges

The KBR faces the challenge of including more staff members and simultaneously increasing the number of records that can be catalogued and at the same time serving as input for the training of the AI tool. This fact implies that the library leadership might have to increase the resources for the project and adopt it as part of its official mission. In addition, library staff struggle to integrate AI into their daily work due to time constraints, as one of the interviewees suggested: "*So, it's a bit difficult between finding the time to do and willing to do it*." Training a model comes

with several technical challenges. One such challenge is handling situations where the model is not functioning optimally and needs to be retrained automatically. However, there has been a recent development where models can automatically retrain themselves based on the data collected. Another challenge is deploying the model in different environments, such as development, test, and production environments. Microsoft is investing a lot of money in the Power Platform to address this challenge and is making significant progress in introducing new functionalities and possibilities. Finally, the budget for AI projects at the KBR is challenging: "*… we don't have a lot of money, so we have to think about every euro we spend*."

3 Results

3.1 Organisational Level

AI in the KBR has added to the transformation of how librarians work daily: "*So, it helps people to be faster in their work. That's why AI is really important in the future, I think, it's to make work being faster, efficient, and make, I think, also boring work more advanced because reading a book back plane and try to categorise it, it's a really boring work.*" However, not all employees in the library have been able to identify the value of low coding and the Power Platform.

3.2 Value Created and Co-created

The value gained from implementing AI focuses on the increase in output: KBR now has a more detailed overview of its collection, making it more user-friendly for patrons with specific requests: "*The value is that we want for ourselves we want to have a better view what do we have*." This means that patrons can now find more records in the online catalogue to fulfil their requests. Additionally, patrons can quickly identify if a record in the catalogue was generated by AI, as this information is transparently displayed in the following remarks: "*When I search the title, … now I get a record, and then it says also for a remark, it's AI-generated. So,* the reader knows *that it's AI generated*." In addition, the library staff now needs less time to collect information, making it possible to catalogue more books efficiently and effortlessly. Finally, the data quality within the library will improve by the end.

3.3 Lesson Learned

The key competencies for excelling in AI development include motivation and a strong interest in the field, as well as the necessary education to understand the concepts. Furthermore, creating an AI solution is an ongoing process, as one

interviewee noted: "*But little bit by little bit, the way we are working now was one year of work, trial, and error … You cannot say from the beginning, 'That's very good.' No, you have the idea, you have the tools, and then you have the planning, and then all together we came to the way where we are now today here*."

4 Conclusion

In this chapter, we investigated the Retrocatalography project at the KBR, focusing on implementing its AI solution and the associated needs and challenges. In 2022, KBR collaborated with external provider Initum to develop a cataloguing AI solution using the Microsoft Power Platform, completing the project in 10 days.

These needs arose during the COVID-19 pandemic, addressing the urgent need for online access to library books. However, many titles are still only catalogued on paper cards, hindering patrons and librarians from locating these records quickly in the library's online system. The top management of the library has supported exploring an AI solution from the beginning of the project.

Through close collaboration among KBR, the external service provider, and volunteers, the application can capture information from a book's cover, archive it, verify data, take a photograph, and then analyse the information using AI to ensure accurate detection of all relevant details. The Power Platform facilitates low-code application development by leveraging Microsoft's pre-developed components.

However, the KBR faced challenges such as staff shortages and a continuously rising number of records. Furthermore, due to time constraints, it is challenging to integrate experimenting and working with AI in daily work. There are also some technical challenges, including situations where the AI model is not functioning optimally and needs to be retrained automatically. Lastly, the budget for AI projects at KBR is a challenge.

Experimenting with the newly developed AI-based solution is transforming how librarians work at the KBR. This technology enhances internal processes, allowing librarians to concentrate more on intellectual tasks. With the AI solution, cataloguing books becomes more efficient and effortless, ultimately leading to improved quality within the library. The KBR now has a more precise overview of its collections, making it more user-friendly for patrons with specific requests. Additionally, patrons can quickly see whether a catalogue record was generated by AI, as this information is transparently displayed in the remarks section.

However, not all library staff recognise the value brought by this advancement. To excel in AI development, librarians need key competencies, including motivation, a strong interest in the field, and adequate education to grasp the underlying concepts. Table 2 summarises the Retrocatalography project at the KBR and gives an overview of the main results.

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Appendix

Table 2 Summative overview—Royal Library of Belgium (KBR)

Case and project name			
Retrocatalography at the Royal Library of Belgium (KBR)			
Country	**Number of employees**	**Type of AI solution**	**Year and maturity level**
Belgium	Approx. 250 employees at KBR	Cataloguing AI solution with the Microsoft Power Platform	Application Go-live: October 2022 Legal Deposit Updates (Development): Spring 2024
Project description			
KBR developed a cataloguing AI solution in 10 days with a company named Initum in 2022 and then started to feed the tool with data until 2024. The project, called Retrocatalography, involved developing an application with the Microsoft Power Platform that can gather information from a book's cover, archive it, verify it, take a picture of it, and then analyse it using AI to check whether everything has been detected accurately. The Power Platform allows for low-code application development using Microsoft's pre-developed components.			
Need(s) behind implementation	**Actors involved**	**Challenges**	
Some books are still only described on paper cards, making it impossible for patrons to find these records in the library's online catalogue. The COVID-19 pandemic has highlighted the need to digitise these records There was a need to promote collaboration between departments within KBR to explore AI and develop an AI solution.	Close collaboration with the software company Initum. Collaboration with seven to eight volunteers who scan and validate records. In addition, an external company recently supported the volunteers. The library management supports exploring an AI-based solution.	The main challenges are a staff shortage and a rising number of records. The library staff is finding it difficult to integrate AI into their daily work due to time constraints. Technical challenges include, for example, situations where the AI model is not functioning optimally and needs to be retrained automatically. Lastly, the budget for AI projects at KBR is a challenge.	

(continued)

Table 2 (continued)

Case and project name		
Retrocatalography at the Royal Library of Belgium (KBR)		
Results		
Organisational level	**Value created and co-created**	**Lesson learned**
AI within the KBR revolutionises how librarians work, making processes more efficient and allowing librarians to focus on intellectual work. However, not everyone in the library currently recognises the value that AI brings.	The KBR now has a clearer overview of its collection, making it more user-friendly for patrons with specific requests. In addition, patrons can easily identify if a record in the catalogue was generated by AI, as this information is transparently displayed in the remarks section. Moreover, the AI solution makes it possible to catalogue more books efficiently and effortlessly, and the quality within the library will improve by the end.	The key competencies for excelling in AI development include motivation and a strong interest in the field, as well as the necessary education to understand the concepts.

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