One automatic cataloging flow: tests and first results

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Abstract:
In this paper we want to discuss the development and the first tests of a Power Automate flow with integrated AI-builder. The presented flow aims to address the challenges that cataloguers face in describing the ever-increasing amount of (digital) resources. This project proposes an innovative solution for automating the bibliographic description process, which includes metadata recognition, automatic subject indexing, and linking with other databases. The impact of this tool on cataloguers' tasks and professional practices will also be explored. The flow significantly reduces the time and effort required for cataloguing, freeing up cataloguers' time to focus on other essential tasks. It also improves the accuracy and consistency of bibliographic descriptions, thereby reducing errors and inconsistencies in library records. The Power Automate flow is designed to comply with established metadata standards, ensuring that bibliographic descriptions are consistent and interoperable across different systems. The end result of the flow is a Marc21xml that can be imported in our Library Management System. In conclusion, this paper provides a practical solution to the challenges faced by cataloguers in managing and describing resources. The Power Automate flow has the potential to significantly improve cataloguers' workflows.

Keywords: Cataloging, Power Automate, Artificial Intelligence, workflow automation, metadata management.

Introduction:
In the ever-evolving landscape of libraries and information management, cataloguers play a crucial role in organizing and describing resources to ensure easy access and retrieval for patrons. However, with the constant influx of digital materials, cataloguers face the daunting task of efficiently managing and describing a vast amount of resources. The manual cataloguing process, often time-consuming and prone to errors, calls for innovative solutions to streamline workflows and improve accuracy.

Recognizing these challenges, the Royal Library of Belgium (KBR) has been actively exploring ways to enhance the cataloguing process and make it more efficient. One promising avenue is the utilization of the Power Platform, a suite of tools developed by Microsoft that empowers users to build custom applications and automate tasks. At the heart of the Power
Platform is Power Automate, a powerful workflow automation tool that allows for the creation of automated processes with ease.

This paper focuses on the development and implementation of a Power Automate flow with integrated AI builder, specifically tailored to address the challenges faced by cataloguers at KBR. The aim of this flow is to automate the bibliographic description process, leveraging AI technology and seamless integration with other libraries and data sets. By harnessing the capabilities of Power Automate, KBR endeavors to streamline and expedite the cataloguing process, ultimately enhancing the accessibility and usability of its resources.

In the following sections, we will delve into the details of the Power Automate flow, discussing its architecture, functionalities, and the benefits it can offer to cataloguers at KBR. This paper will shed light on specific use cases of implementing AI and machine learning methods in cataloguing and metadata management processes, highlighting the practical application and potential impact of this innovative solution. Furthermore, we will explore the ways in which the Power Automate flow aligns with established metadata standards, ensuring consistency and interoperability of bibliographic descriptions across different systems.

As we embark on this exploration of the Power Automate flow with integrated AI builder, we aim to uncover its full potential in revolutionizing cataloguers' workflows and ultimately improving the accessibility and discoverability of KBR's vast collection of resources.

**Introduction to Power Automate and Power Platform**

Power Automate is an integral component of the broader Microsoft Power Platform, a comprehensive suite of tools designed to empower users to create custom applications, automate workflows, and analyze data. The Power Platform combines Power Apps, Power Automate, Power BI, and Power Virtual Agents, providing a unified ecosystem for building intelligent business solutions.

Power Automate, formerly known as Microsoft Flow, was introduced in 2016 as a cloud-based service that enables users to create automated workflows across various applications and services. It offers a user-friendly interface with a vast array of connectors to seamlessly integrate with popular productivity tools, cloud services, databases, and more. With Power Automate, users can automate repetitive tasks, streamline processes, and orchestrate complex workflows without the need for extensive coding knowledge.

The Power Platform has gained significant traction across industries, offering organizations the flexibility to tailor solutions to their specific needs. Use cases for Power Automate span a wide range of scenarios, including workflow automation, data integration, notifications, approvals, and document processing. Its versatility and extensibility make it an ideal choice for optimizing business processes and improving productivity.

In the subsequent sections of this paper, we will delve into the development, testing, and implementation of a Power Automate flow with integrated AI builder at KBR. By exploring the specific use cases and discussing the impact on cataloguers' tasks and professional practices, we aim to showcase the potential of this innovative solution in transforming the cataloguing landscape and unlocking new possibilities for efficient and accurate metadata management.

**Objectives and Methodology**
The development and implementation of the Power Automate flow with integrated AI builder at KBR was driven by several key objectives. Firstly, the aim was to optimize the cataloguing process by leveraging OCR technology to automate the extraction of information, thereby saving time typically spent on manual data entry. Secondly, the objective was to utilize AI technology to not only recognize text but also accurately identify essential bibliographic details such as the title, author, and publisher. Additionally, the flow aimed to harness the detected information to conduct HTTP queries, accessing external libraries and databases such as SRU of BNF (the national library of France), DNB (the national library of Germany), and KBR’s own catalogue, to enrich the bibliographic records. Moreover, the flow aimed to employ the text from the back cover (and potentially expand to other sources) to categorize the book and automatically assign subject indexing.

Development and Testing of the Power Automate Flow

The Power Automate flow begins by capturing scans of key pages, including the cover, title page, colophon, and back cover. This step is facilitated by applications equipped with automatic border detection capabilities, such as OneDrive, Microsoft Lens, or Adobe Scan. These applications generate a PDF file, which is subsequently saved to a designated folder within OneDrive. As soon as the PDF is placed in the designated folder, it triggers the Power Automate flow, initiating the automated cataloguing process.

Within the flow, three AI models come into play. The first model focuses on the title page and aims to detect essential bibliographic information such as the title, author, publisher, year, and place of publication. The second model targets the colophon and is designed to identify details like the ISBN, publisher, year of publication, legal deposit number, copyright information, and original title. Lastly, the back cover is subjected to text recognition to extract relevant content for book categorization purposes.

Following the AI models, a conditional check is performed. If the colophon AI model successfully recognizes the ISBN, the flow executes three HTTP requests to search the catalogues of KBR, BNF, and DNB. These external sources can be easily modified based on their SRU or API search capabilities. When a matching record is found, the flow saves the information in variables for later use in the flow's output.

Additionally, the flow incorporates ISNI (International Standard Name Identifier) to identify authors. If an external record from KBR, BNF, or DNB contains an author with an ISNI mentioned in subfield $0$ or $1$, the flow initiates an HTTP request to the ISNI SRU. In cases where there is no external record or no ISNI present in the record, the flow performs another HTTP request to the ISNI SRU using the author's name and title words. In both scenarios, if an ISNI is detected, the flow saves the unformatted ISNI, uri, surname, and forename in variables for future use in the flow’s output.

The flow then proceeds to search for work identification by utilizing an HTTP request to the VIAF (Virtual International Authority File) database. The search is based on the information obtained from the detected original title and author name. If a matching record is found, and it is indicated as a work (993S3=’worktoname’), the flow retrieves the local identifier and performs another search in VIAF to obtain the VIAF identifier, allowing for the saving of the VIAF permalink to the work.

Simultaneously, a parallel branch within the flow handles subject indexing based on the text from the back cover or summaries found in external records. Two approaches can be utilized for subject indexing. The first involves sending the text to the Annif API, a proven tool developed by the National Library of Finland. The alternative approach leverages a Microsoft model trained on a pre-existing dataset for text categorization. The subject indexing follows a hierarchical model, where a general category, such as Dewey codes 000, 100, 200, etc., is
initially detected. Subsequently, separate datasets specific to each general category provide subject terms related to that category. For instance, if the book falls under the '900 - history and geography' category, another model suggests subject terms such as 'Ancient Period,' 'Roman Empire,' 'Middle Ages,' 'Vikings,' 'Codicology,' etc. The dataset for subject indexing is based on exported summaries from BNF via SPARQL queries on data.bnf.be, ensuring a reliable collection of subject terms. However, compiling the training set this way, can also have drawbacks, I talked about that in the satellite meeting in KBR. Working with data from a single -European- institution can have the effect of giving the model a biased, French, Eurocentric interpretation of the texts.

Finally, by applying entity extraction models to the back cover texts, we are able to detect and identify individuals and cities mentioned within. This process enhances the cataloging process by providing additional information about the publication. When a city is identified in the text, it is automatically extracted and incorporated into the description as a geographic name. This inclusion allows searches related to the specific city to encompass this presentation as well. Furthermore, the identified city name can be further processed through HTTP queries, for instance, by utilizing services like GeoNames. This approach transforms the city name into machine-readable and uniquely identifiable data, expanding the possibilities for seamless integration and improved discoverability.

Lastly, entity extraction is looking at the back cover texts and detects persons and cities. That can help even disclosure the publication even more. If a city is mentioned, that city name is detected, and added to the description as geographic name. That way searches on that city name can also include this presentation. The city name can even be looked up with HTTP queries in for example GeoNames, in order to make that city name also machine-readable and uniquely identifiable.

Once all the necessary information, including automatic detection results, HTTP query outcomes, entity extractions and subject indexing, is gathered, it is incorporated into the output. Adhering to established metadata standards is paramount in the cataloguing process, as it ensures consistency and interoperability of bibliographic descriptions across different systems. The Power Automate flow allows to align with these metadata standards, offering cataloguers a reliable and standardized record output. The flow generates two widely recognized metadata formats: MARC21XML and BIBFRAME-rdfxml. MARC21 is still widely used in the library community and are compatible with various Library Management Systems (LMS). To facilitate this integration, the Power Automate flow can include a step that sends the file through an API directly to our catalogue. Alternatively, the file can be transmitted via FTP to our server, where it can be automatically picked up and imported into our system. This streamlined process allows for the efficient transfer and integration of the bibliographic descriptions, ensuring that they are seamlessly incorporated into our cataloguing workflow and readily accessible to library users. Additionally, the Power Automate flow generates a BIBFRAME file, leveraging the BIBFRAME standard to enhance the discoverability and interoperability of library resources. The flow incorporates the detected ISNI-URI and VIAF-Work-URI in the creation of the BIBFRAME record. While this aspect of the flow is currently in the testing phase, initial results have shown promising outcomes. However, further refinement and improvement are necessary to optimize the creation of BIBFRAME records. The ongoing tests and future enhancements aim to ensure seamless integration of authoritative data and enable enhanced resource discovery and interoperability within the library environment.

By adhering to these metadata standards, the Power Automate flow ensures that the bibliographic descriptions created are consistent, standardized, and compatible with other library systems. This promotes efficient resource sharing, collaboration, and interoperability,
ultimately benefiting both cataloguers and library users by facilitating seamless access to a wealth of information.

This is the end of the flow. Consequently, after taking the initial scans, the cataloguer can return to their computer to find the automatically created record, complete generated and imported data and with suggestions for subject indexing and entity extraction. We can also, through iframe, show an embedded view of the scans for verification. This allows them to finalize the record efficiently and effectively.

Overall, the Power Automate flow encompasses the entire cataloguing process, reducing the time and effort required by automating various steps. With the flow efficiently executing in under 2.5 minutes, cataloguers can expedite their tasks and allocate more time to enriching the created record by incorporating authorities and linking it to other relevant resources within the catalogue. This allows them to enhance the quality and accessibility of the library's resources while ensuring comprehensive and interconnected bibliographic descriptions.

**Testing and training of the AI-models**
The AI models employed in the cataloguing process utilize advanced algorithms, such as convolutional neural networks (CNNs), to identify and locate text regions within the scanned images. These algorithms excel in distinguishing text from other visual elements, such as images or decorative elements found on title pages. For instance, in a separate project focused on cataloguing older books, a different AI model based on the title page was utilized. Older books tend to contain a wealth of information on the title page, making it a crucial element for extracting relevant bibliographic details. The AI algorithms learn to identify patterns and characteristics associated with the title by analyzing a dataset of images where text is printed larger and positioned in the center of the page. The AI algorithms adapt to these patterns and apply them when encountering new images, allowing for consistent and accurate detection of the title. This approach mirrors how human brains also rely on learned patterns for recognition.

To optimize the AI models' performance, the dataset was structured into multiple collections, each based on the layout variations of the title page. For example, one collection focuses on title pages with the author listed above the title, while another collection comprises title pages with the title preceding the phrase "by author." By understanding how the AI models interpret and categorize the text based on the page layout, it becomes possible to curate datasets that align with the model's expectations. While the Microsoft AI Builder offers a user-friendly interface, additional technical insights and guidance regarding dataset creation would be beneficial to further enhance dataset quality. Expanding our knowledge of how the AI models function and their requirements for dataset creation would be valuable in refining the cataloguing process and achieving even better results.

**Impact on Cataloguers’ Tasks and Professional Practices**
Traditionally, cataloguing has been a time-consuming process that demands meticulous attention to detail. Cataloguers often spend significant amounts of time manually entering bibliographic information, cross-referencing data, and ensuring accuracy and consistency in the descriptions. However, with the implementation of the Power Automate flow, cataloguers can now automate many of these repetitive tasks. The automation provided by the flow streamlines the cataloguing process, allowing cataloguers to focus their expertise and attention on more critical aspects of their work. By freeing up time previously spent on manual data entry, cataloguers can redirect their energy towards more value-added activities that require human judgment, such as quality assurance, metadata validation, and improving resource
discovery. By embracing this innovative solution, libraries can optimize their cataloguing workflows and empower their cataloguers to deliver high-quality services while efficiently managing their vast collections.

Moreover, the automated process facilitated by the Power Automate flow improves the accuracy and consistency of bibliographic descriptions. AI technology, combined with OCR capabilities, enables efficient extraction and recognition of bibliographic information from scanned documents. This reduces the likelihood of human errors and inconsistencies that can arise from manual data entry, ensuring more reliable and standardized bibliographic records. Furthermore, the integration of AI in cataloguing brings the advantage of being able to read and recognize scripts in various languages worldwide. While a human cataloguer, even if multilingual, can only recognize a limited number of languages, AI has the potential to comprehend a vast array of languages. This becomes particularly valuable as the number of Belgian publications in different languages continues to grow. The use of AI in cataloguing provides a significant advantage in accurately identifying and cataloguing resources in diverse languages.

The flow's ability to automatically retrieve and enrich bibliographic records through HTTP queries to external libraries and data sets further contributes to the accuracy and comprehensiveness of the descriptions. By accessing external resources cataloguers can leverage additional metadata to enhance the overall quality of the records. This enrichment process results in more robust and interconnected bibliographic descriptions, improving the discoverability and usability of resources within the library's collection.

Beyond the immediate impact on cataloguing efficiency and accuracy, the Power Automate flow also holds the potential to enhance security and resource management. With faster registration and processing of resources, the flow enables a more streamlined approach to tracking and managing materials within the library. The timely cataloguing of resources ensures that they are properly accounted for, reducing the risk of misplacement or loss.

**Conclusion**

The cataloguing process in libraries can be revolutionized by the adoption of Power Automate, a workflow automation tool within the Power Platform developed by Microsoft. This paper explores the implementation of a Power Automate flow with integrated AI builder at the Royal Library of Belgium (KBR) to address the challenges faced by cataloguers in managing and describing resources. The flow automates the bibliographic description process, leveraging AI technology for metadata recognition and integration with external libraries and data sets. It significantly reduces the time and effort required for cataloguing while improving accuracy and consistency. The flow adheres to established metadata standards, generating output in MARC21, compatible with KBR's Library Management System, and BIBFRAME. Moreover, the integration of AI enables recognition of various languages and enhances subject indexing based on text analysis. The Power Automate flow empowers cataloguers to streamline their workflows, focus on higher-level tasks, and improve resource management and discoverability.

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