

Designing a Data Processing Solution for the NHS Wales e-Library

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START

1.

The NHS Wales e-Library provides a national service to all staff members of NHS Wales, Social Care Wales, select Government departments and other partner organisations within the remit. These resources include:

- e-Journals
- e-Books
- Guidelines
- Databases
- Evidence Summary Tools
- e-Learning

These resources cover all professions within the NHS, from clinicians to librarians. The e-Library exists to provide trustworthy evidence and literature which is essential to NHS Wales employees carrying out their various roles. The e-Library procures these resources, manages and reviews the contracts, and ensures that NHS Wales has the best possible resources available, and that those are provided in the most cost effective way, while being immediately accessible anywhere in the country.

2. Objectives

Identify a solution

Format and pre-process data

Create a user-friendly dashboard

Usability Test

Publish Solution



The aim is to create a working BI dashboard for a single e-Library resource type by the end of the project. This prototype will be deployed to continually collect feedback and form the template for subsequent data dashboards.

Processing this data is an essential part of the NHS Wales e-Library, and underpins the procurement practice of NHS Wales. Streamlining this process will save significant staff time and resources, as well as make the data available to other stakeholders and parties that might also benefit.

Objective target—July 2023

Journal Report 1 (R4)			Number of Successful Full-Text Article Requests by Month and Journal											
National Health Service Wales														
Period covered by Report:														
2021-01-01 to 2021-03-28														
Date run:														
2021-03-03														
Journal	Publisher	Platform	Jan-2021	Feb-2021	Mar-2021	Apr-2021	May-2021	Jun-2021	Jul-2021	Aug-2021	Sep-2021	Oct-2021	Nov-2021	Dec-2021
Total for all journals														
American Journal of Infection Control	Mosby	Default	2	4	0	0	0	0	0	0	0	0	0	0
Applied Nursing Research	W B Saunders	Default	0	1	1	1	1	1	1	1	1	1	1	1
Archives of Psychiatric Nursing	W B Saunders	Default	1	1	1	1	1	1	1	1	1	1	1	1
Australasian Emergency Nursing	Elsevier	Default	2	3	4	0	0	0	0	0	0	0	0	0
Australian Critical Care	Elsevier	Default	1	1	1	0	2	2	2	2	2	2	2	2
Clinical Simulation in Nursing	Elsevier	Default	4	2	0	4	4	4	4	4	4	4	4	4
Collegian	Elsevier	Default	13	7	6	4	5	5	5	5	5	5	5	5
EXPLORE	Elsevier	Default	1	1	0	0	1	1	1	1	1	1	1	1
European Journal of Oncology Nursing	Churchill Livingstone	Default	2	1	1	2	0	0	0	0	0	0	0	0
Intensive and Critical Care Nursing	Churchill Livingstone	Default	2	1	1	0	0	0	0	0	0	0	0	0
International Emergency Nursing	Elsevier	Default	1	1	0	1	0	0	0	0	0	0	0	0
International Journal of Africa Nursing	Elsevier	Default	3	3	0	0	3	3	3	3	3	3	3	3
International Journal of Nursing Practice	Elsevier	Default	31	20	11	20	11	11	11	11	11	11	11	11
Journal of Neonatal Nursing	Elsevier	Default	1	1	0	1	0	0	0	0	0	0	0	0

The NHS Wales e-Library collects and must process all of the usage data for the wide range of resources to support the procurement and management of these contracts, and ensure the service is providing the best value for-money

4. Methodology

There are hundreds of potential Business Intelligence solutions available, with as wide a range of capabilities, popularity and price tags. Power BI however is already licensed and deployed throughout NHS Wales, and the benefit this offered in both cost saving and implementation time was too great to ignore. Given that Power BI would indeed be capable of solving the problem of a data processing solution for the NHS Wales e-Library, this was the selected product to utilise.

Data input requirements

COUNTER Format	Any BI solution will need to be capable of reading COUNTER data format. This is presented in an Excel file, but an ideal solution will be capable of reading in the data with minimal pre-processing.
Google Analytics	Before this project is considered complete, the solution will also need to be capable of visualising data generated from website traffic. To this end, the BI solution will need compatibility with Google Analytics.
Wide-ranging Format Compatibilities	Smaller, independent suppliers of e-Library resources might not be COUNTER compliant, and so present data in simple Excel format, or even on PowerPoint slides or in Pdf format. The wider the range of compatible data formats the better.

Output requirements

Usage Analytics	The data visualisation will need to demonstrate usage data by resource, by time period, and by Health Board, Trust or Special Health Authority.
Cost-per-use	The optimal solution would be programmable to automatically calculate resource Cost-per-use analytics based on the relevant e-Library algorithms.
Drill Down	Data will need to be visualised in a way that specific resources, time periods or geographic areas can be quickly compared. The capacity for a GIS output would also be a nice to have option.
e-Learning	The BI tool will need to visualise all e-Library KPIs, specifically the ability to visualise time spent in a learning module, and number of learning modules started and completed, not just e-Journal and Database usage data.

Usability

Ease of use	The BI solution will need to have an easy-to-use dashboard. Once completed, the intended users for this software will be the breadth of stakeholders, managers and otherwise interested parties across NHS Wales, regardless of technical ability.
Stakeholders	Stakeholders and company directors will require fast and clear visualised data, with which they can easily drill down to their specific areas of interest within the data, and use that to support decision making at a high level.
e-Library Users	The visualised data should be suitable for marketing purposes also, producing attractive graphics to support with engagement and marketing tasks.

6. Usability Testing

- “How do I search by Health Board?”
- “Can I compare data across years?”
- “How do I change data visualisation?”
- “Can I filter data by authentication route?”
- “I can see the data I would want right away”

Initial testing confirmed the predicted desire to be able to drill down on data by Health Board or Trust, reinforcing the need for this to be included in the first redevelopment. Users found it easy to navigate the data immediately before them and understand what they were looking at, marking a success for the usability of the unfinished prototype. There were also ideas presented that had not been considered for future developments. This feedback can continue to support the development of the end-product to meet the user need.

3. Research overview

“Data is a very powerful ally, and difficult to ignore when used to craft and promote one’s makerspace story, support strategic decisions, measure and validate metrics, and gauge impact.” [1]

The modern world of business runs on data. This isn’t limited to enterprises driving profits, data is being used to develop products and predict customer demand, to improve customer experience, for security and to improve operational efficiency. According to a study referenced by Harvard Business School, data analysis can improve productivity by 64%, improve decision making by 56%, improve financial performance by 51%, and at the time of the study, 65% of global enterprises were planning to increase their spending on analytics. [5]

In the context of the NHS Wales e-Library, data is used to examine usage of the myriad resources available across the Healthcare sector, including how many readers a journal has, or how many recognised NHS Wales IP addresses are attempting to access a new product. This data informs procurement direction and reviews the use of resources in place, to ensure the e-Library budget is being used for the resources in highest demand, and those which provide the best quality information. It can also be used to support marketing and engagement, identify training needs, and generally inform decisions with the ongoing management of the e-Library.

NHS Libraries across the UK, and even academic and public libraries in some respects are in the same position, and generally behind the technological curve when it comes to data analysis. Larger suppliers having identified this fact have drawn a great deal of attention in this last year developing very basic BI tools and marketing them to librarians who have never seen this kind of data analysis before.

“...the advancements in ICT tools and services are changing the way businesses’ decisions can be made, and therefore enhance organizational strategic planning. Indeed, this has also created the need for libraries and information centres to develop innovative and creative services to keep pace with a fast-changing society” [26]

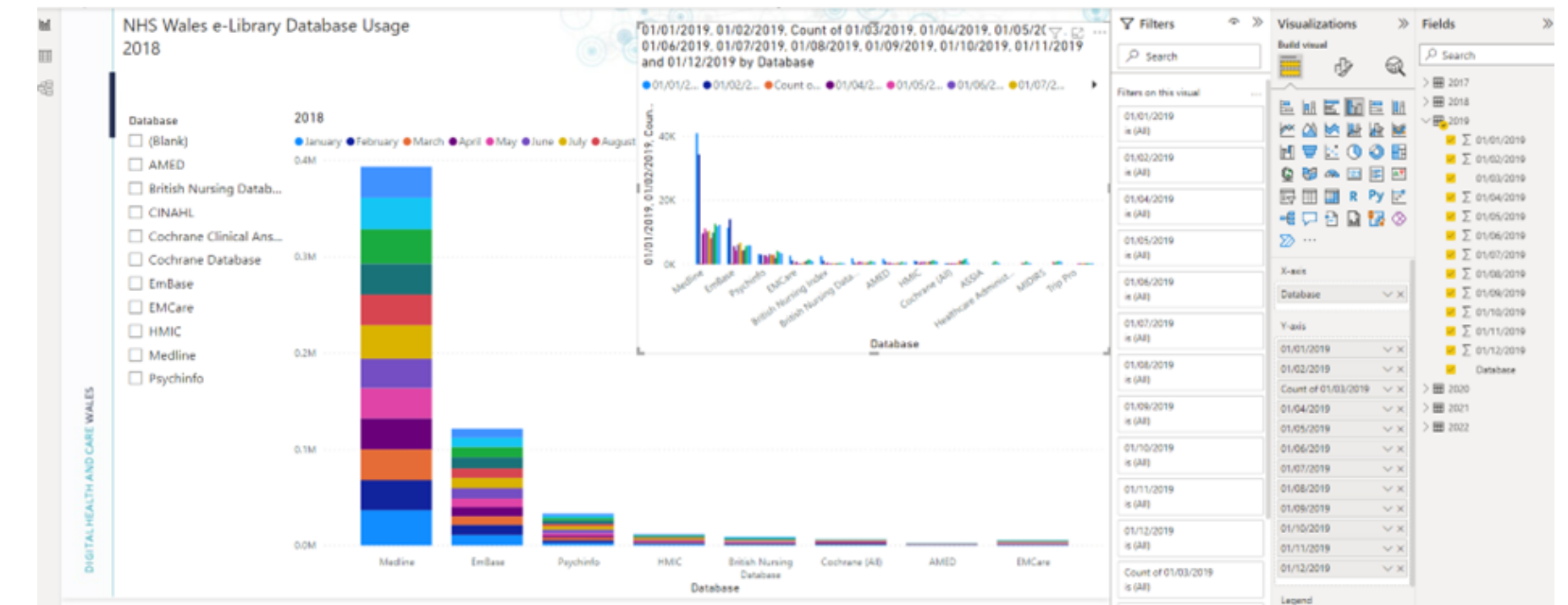
Libraries need this kind of information like any business. While it might not be a conventionally competitive sector, there are none-the-less challenges that librarians and library services face, and the power the BI offers will go towards combating and overcoming those challenges.

5. Design

One of the primary objectives with this solution is to improve efficiency within the e-Library team, reducing what is currently a task that can take weeks by the time the data is manually cleaned each time, to a matter of moments, with all of the data readily available for interrogation.

Of all e-Library resources, Databases are the most popular, as evidenced by e-Library website usage, and so it was decided that database would be the resource for displayed on the first dashboard.

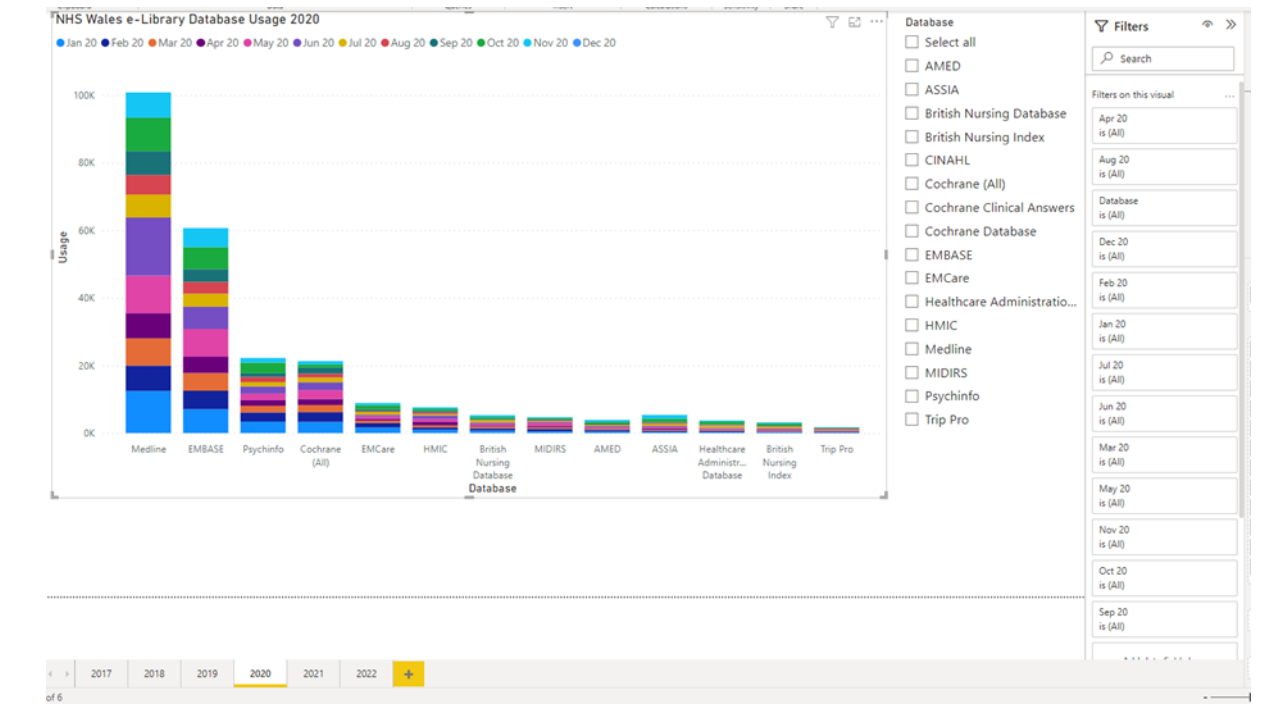
The data as it was currently formatted proved challenging when interacting with Power BI, and so time was taken to reformat the Excel spreadsheet which held the relevant data in to a format that would be more compatible with Power BI.



After some time researching, experimenting and learning how to use Power BI, the Slicer tool made for an effective solution to drill down on selected databases, however it could not simultaneously be used to drill down by time or Health Board/Trust. Ease of use by non-technical staff is a key element of this project, and so consideration of Nielsen’s Heuristics to assure the design process takes constant consideration of those specified usability guidelines [30]. It was not enough that one could interrogate time frames by using the fields on the right to create queries, it would need to be a simple, click friendly solution. To that end, tabs were created to enable a user to move between reporting years for the databases.

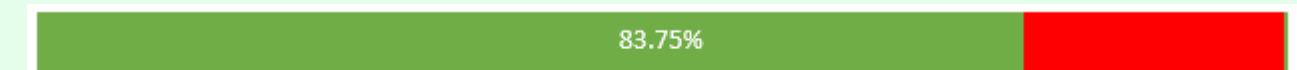
At this point, two of the original targets for data manipulation have been attained, leaving only the ability to drill down by Health Board/Trust lacking. Given time constraints at this point however, and the need to pre-process more data, this final objective would have to be left for a future development in order to meet the target deadline.

This visualisations also needed to be compliant with Accessibility Guidelines (WCAG 2.1) [31], to be consistent with other e-Library content, and also just giving consideration to best practice. To this end, the stacked column graph offered the best, clearest visual display to view all of the e-Library database data at once, and so this visualisation formed the default dashboard view.



7. Conclusion

Of the original objectives of this project, 83.75% were completed, lacking the ability to drill down on one of the 3 intended data types, and also being unable to ultimately publish the dashboard owing to unforeseen delays caused by organisational policies and approval processes.



Research clearly evidenced that a BI solution was exactly what was needed to resolve the NHS Wales e-Library problem. Power BI was selected as the best solution, owing to its already being deployed in NHS Wales, and even when considering the learning curve to using the software, the cost and time saving from not having to implement an alternative product was too great to ignore.

From there, user-focused design was key in designing the dashboard, supported by WCAG 2.1 and working to the concepts of Nielsen’s Heuristics. A user friendly dashboard was developed, capable of drilling down in the dataset by both product, and date at the click of a button. Usability testing reinforced the plans for the intended development direction of the first dashboard revision, as well as offering some new ideas, while also confirmed the efforts spent on ease-of-use had been successful.

Research and experimentation will continue alongside the planned developments for the Power BI dashboard, with priority developments including the ability to filter by Health Board and Trust, and maintaining the simple and intuitive dashboard while new features are added. The dashboard is still planned for publication as soon as possible, and feedback will be continually collected to support the development of the product.

Reflection

Having worked for NHS Wales for almost 5 years, I was aware of the challenges and barriers I might face from the organisation, nonetheless I had not anticipated the approval process for simply publishing a Power BI dashboard. In hindsight, I also underestimated the need to pre-process the e-Library data to such an extent, and how much time that would take. These have been lessons learned, alongside the lessons of how unwieldy Power BI can be, this having also taken an unexpected amount of time to learn.

Despite these challenges, I am happy with the outcome of the project, and am close enough to the publication of a Power BI dashboard for e-Library database usage data, awaiting only one final approval, that I am satisfied with what was achieved within the scope of this project.