

NISRA Flexible Table Builder

Project evaluation

March 2025



NISRA - <u>nisra.gov.uk</u> Flexible Table Builder - <u>build.nisra.gov.uk</u>

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1. Introduction

The Northern Ireland Statistics and Research Agency (NISRA) is the principal source of Official Statistics and social research on Northern Ireland. These statistics and research not only inform public policy but also academic and private sector research.

NISRA Census Office conducts the Census of Population every 10 years which every household in Northern Ireland must complete by law. It is used by central and local government, health trusts and other organisations to plan and provide future services. The most recent census took place in March 2021.

As part of the Census 2021 data dissemination strategy, Census Office initiated the Flexible Table Builder (FTB) project, with the aim of providing users with a self-service platform to create customised statistical tables and analyses. This evaluation explores the project's objectives, design, implementation, performance and impact. It also highlights challenges encountered and provides recommendations for future developments.

2. Background

For the 2011 Census, NISRA previously disseminated census data by publishing thousands of pre-defined tables which were based on a combination of user needs and data consumption from previous censuses. Each of these pre-defined tables had to be designed, constructed and manually checked for quality and data disclosure issues using an iterative process that was time consuming and resource intensive. In addition, while user need was reflected as much as possible, it was not always the case that these catalogues of tables met users' needs in full – either because they were not available at particular levels of geography, or didn't include appropriate variable detail. In parallel, many tables that were designed and published, ended up not being consumed by census users because they did not contain priority information.

As such, NISRA identified the need for a more efficient data dissemination strategy for Census 2021 which prioritised user need in terms of offering flexibility, and reduced the resource required to design, build and quality assure large sets of predefined tables. The development of a user-centric online tool that would allow users to generate their own tables on demand with statistical disclosure controls built-in, would be an ideal solution. Allowing users to create their own tables would mean there would be a reduction on the reliance of 'static' tables. It would also improve user satisfaction through customisation and offer operational efficiency as quality checks and statistical controls would be built in, thus reducing the need for manual checks.

The design and implementation of this approach was taken forward in the FTB project for Census 2021.

3. Project objectives

Several key objectives were set for the FTB project:

3.1 Improved dissemination

Enable users of varying technical skill levels to quickly and easily create, pivot, preview and download census data in a format to suit their needs. FTB should allow users to create and preview their data tables before downloading them in a suitable format. This will ensure users get the data they need online without having to submit a request to NISRA.

3.2 Increased flexibility

Provide both public and private sector stakeholders with greater flexibility when accessing census data by allowing users to manipulate the data rather than simply providing static data tables. Granting free, online access to a range of flexible data tables means that NISRA would be able to make thousands of census tables available to the public and allow any user to customise them for their own purposes.

3.3 **Production capacity**

The FTB should help to reduce the number of individual tables that NISRA is required to produce and publish as part of the census outputs programme and therefore make census data available more quickly.

3.4 Resource efficiency

Reduce reliance on NISRA staff for data queries by empowering users to access data independently. NISRA should be able to improve resource efficiency by creating an 'Online First' data strategy. Online First, can work if we develop a usercentric online tool that makes it easier and more accessible for users to access census data.

3.5 Data conformity

Publish data that conforms to Open Data principles and adheres to GDPR and data protection guidelines. We should utilise methods such as statistical disclosure controls and cell key perturbations to ensure no one can be personally identified in the data.

3.6 Safe access

We cannot put census microdata online in its raw format. We need to develop a way to make the data available in a safe, secure and non-disclosive way.

3.7 Scalability

Create a system that is capable of handling increasing demand for data and one that is scalable so it can handle large datasets without compromising speed and thus user experience. Data requests are increasing in number and complexity, we therefore need a system that can respond to those changes in the future

4. **Project initiation and management**

The FTB project was a joint partnership between the Office for National Statistics (ONS) and NISRA, utilising the expertise and capabilities of a local software development company based in Belfast (the Sensible Code Company – SCC) who had developed a product called Cantabular, which was capable of producing fast aggregations of microdata while applying disclosure control at the point of access (one of NISRA's key requirements).

Partnership with ONS was a natural progression from their project to develop a similar product for Census 2021 in England and Wales – Create a Custom Dataset – which utilised the same Cantabular software developed by SCC. The arrangement of the project was such that ONS took the lead in project management, while NISRA and SCC worked collaboratively to develop the software capabilities for NISRA's specific use case. The project was initiated in September 2022, with a deadline of June 2023 for launch.

The implementation of the FTB was conducted using an Agile approach. Phases of the project included:

4.1 Scoping

Census Office had previously conducted an outputs strategy consultation that included requirements gathering for census outputs. Elements of this were used as base requirement for creation of FTB functionality and content.

4.2 Project management

Cantabular was selected as the platform to deliver the FTB, in collaboration with the Sensible Code Company (SCC) and the Office for National Statistics (ONS). This meant that NISRA was able to capitalise on the knowledge and understanding that SCC had developed in creating a similar solution for ONS. SCC managed product development and ONS provided resource to manage the project, assist with penetration and accessibility testing, and undertake capability readiness reviews.

4.3 System specification

A key requirement of the system was that it was safe and fast. We built on the experience that ONS had with SCC to develop a specific metadata and data pipelines that were specific to the NISRA use-case and worked with SCC to tailor the front-end software to meet the needs of the NI user.

4.4 Data preparation

Creating and formatting datasets for compatibility with Cantabular was done via the creation of tailor-made delimited text files. Working with these types of files made it straightforward to develop data and metadata resources which were fit for purpose.

4.5 Quality assurance

SCC held workshops with us to detail the correct format that the metadata should conform to. Once the CSV files were created, they were uploaded to a private repository on GitHub. The use of GitHub allowed us to version control the files and apply additional QA checks to the data prior to the creation of the final metadata file, referred to as a Codebook in Cantabular.

4.6 Testing and deployment

The testing phase included accessibility and penetration testing as well as data and metadata accuracy checks. Each iterative prototype version was loaded on to a local server for this testing. Data accuracy testing included querying and retrieval – assessing that against expected outcomes. It also tested set parameters for disclosure control. Once all tests were completed the agreed version was signed off and uploaded to live. The hosting solution for the FTB is provided by the ONS.

4.7 Training and outreach

Census Office gave training sessions, uploaded video user guides, and maintain support during office hours via a customer services function. Census Officials have also attended conferences and events to showcase the FTB in person to its target audience.

5. Product design

The FTB was designed to meet diverse user needs while maintaining simplicity. Built with speed and efficiency at its core means FTB users can quickly manipulate multiple variables within a table, streamlining the process of synthesising information. This saves valuable time and enhances productivity by providing a simple user-friendly interface for data manipulation.

Multivariate datasets can be downloaded in several formats or shared with colleagues via weblinks for improved project collaboration. Key features include:

5.1 User interface

The FTB offers a simple, fast and user-friendly experience – available at https://build.nisra.gov.uk. The homepage includes three main areas:



Figure 1: Screenshot of Flexible Table Builder homepage

5.1.1 Build a custom table

Users can build a table from scratch by going through an easy step-by-step process:

- select a database (People or Households)
- select a geography
- select variables

5.1.2 Find ready-made tables

A collection of over 100+ starter tables are available that users can onward flex and change. These are based on common requests and previously released tables. Any of the pre-built tables on FTB can be changed to suit the user need. This includes changing the geographic area and adding or removing variables.

5.1.3 Supporting Information

Users can explore the metadata or access help and support resources

Explore our metadata: In this section users can explore the metadata for every variable in the FTB. Each variable includes a full description and classification of its values, which can be used to create tables with a single click of a button (Build a table with this variable). This information is also available in well placed information buttons when building a table.



Figure 2: Screenshot of a metadata page from Flexible Table Builder

5.2 Table summary/download page

Once a table is created the user is presented with a summary of their selections in a useful summary, alongside a preview of their data.

S NISRA	FLEXIBLE TABLE BUILDER									CENSUS 2021
	DT-0024 © READY-MADE Economic A Download V	TABLE Activity (9 Ca iew data	tegories)	by Age (11 Ca	tegorie	s) by Sex				
	Summary This dataset provides Economic Activity, Ag	s Census 2021 estimat ge, and Sex.	es that classify us	ual residents in Norther	n Ireland by					
	Your table	Decele								
	Population	People								
	Geographic level	Local Gove	rnment District 20	014					Change	
	Geographic area	Northern I	eland						Change	
	Variables	Economic A	Activity - 9 Catego	ries, Age - 11 Categorie	s, Sex				Change	
	Filters	None selec	ted						Filter table	
	Pivot	No pivot ap	plied						Pivot table	
	Download >									
	Table preview									
	Showing 10 out of 2,1	178 counts from your	able.							
	Local Government District 2014	Local Government District 2014 Label	Economic Activity - 9 Categories Code	Economic Activity - 9 Categories Label	Age - 11 Categories Code	Age - 11 Categories	Sex Code	Sex Label	Count	

Figure 3: Screenshot of a table summary page from Flexible Table Builder

There are some additional available options at this stage:

- **Filters:** Users can filter selected variables to only include classifications of interest (for example, exclude males from sex analysis).
- **Pivot:** Users can restructure their data my moving variables between columns and rows.
- **Download:** Tables can be downloaded in multiple formats, including Excel, CSV and JSON, supporting easy integration into external analyses.
- View data: Data can be viewed to inspect the layout before downloading.
- **Permanent link:** Users can share built or customised tables via a unique URL. A shareable link is available at the bottom of each table summary page, allowing recipients to access the created table by simply following the link.

5.3 Statistical Disclosure Controls

One of the key benefits to the FTB is its safe architecture, which is facilitated by a specific and real-time operational disclosure control system. This system continuously assesses the data to be returned by the query as it is being built and determines whether or not that query satisfies or fails a particular set of rules defined by NISRA. The purpose of this is to mitigate the risk of individuals or households being identified by preventing disclosive counts from being released (no personal-identifiable information is included in the datasets). In an enhancement to the release policy for previous censuses, if a table violates disclosure rules, only geographic areas that fail the rules are withheld – rather than the entire table.

SISRA FLEXIBLE TABLE BUILDER		CensUs 2021			
<u>← Back</u>					
Choose your variables	Your table				
Search available variables	Q	Data confidentiality			
All		★ Your table is not available at this level of geography. Try less detailed classifications or a higher level geography.			
Your selected variables					
Age	Change Remove (1)	Cell count: 1,116,050			
Ethnic Group	Change Remove i	Population: People			
Cours and countinues	Geographic level: Census 2021 Super Data Zone				
Save and continue		Geographic area: Northern Ireland			
		Variables: Age, Ethnic Group			
		Filters: None selected			

Figure 4: Screenshot of a statistical disclosure control example from Flexible Table Builder

6. **Project evaluation**

The FTB project was initiated to develop a user-centric tool that would enable users to freely access and create customised tables/analyses from census data. Overall, the project was a success as it delivered a user-friendly tool that allows anyone to access and manipulate census data online and download or share that customised data as they require.

The project achieved its key objective of developing an easy to use, fast and flexible table building solution which provided access to census data online and protected the data with appropriate safeguards (disclosure control).

Some of the key learning outcomes from the project are listed below.

6.1 **Positive outcomes**

6.1.1 Data availability

NISRA has increased access to census data by providing nearly 300 census variables and over 100 pre-built tables available online. Whilst the most popular topics remain religion and ethnic group, the range of variables and levels of geographic analysis is wide and varied. There have been over 200K page views and 9K tables downloaded in the first 12 months.

6.1.2 Accessibility

The FTB has significantly reduced the need for direct assistance from NISRA staff, as users can independently create tables tailored to their needs. Levels of engagement are high with typical users spending over 10 minutes on the site per visit.

6.1.3 Meeting user needs

Comments from our customer survey, our online help and support page and direct feedback from dedicated user groups indicate high levels of user satisfaction with the FTB's usability and functionality. The FTB project has enabled NISRA to demonstrate its commitment to data transparency and to user-centric innovation.

6.1.4 Data security

Extensive testing of SDC on the local version of FTB prior to launch has led to NISRA being able to provide a secure method of dissemination of census data without risking the disclosure of information on specific individuals and households.

6.1.5 Data interoperability

The project necessitated the transformation of census data into a more interoperable format – the benefits of which were incorporated into other products involving census data.

6.1.6 Performance

Datasets with millions of rows of data underpin the FTB. There has been no evidence of discernible reduction in the speed or performance since launch.

6.1.7 Operational efficiency

Census Office staff now spend less time managing routine data queries, allowing them to focus on more complex queries that are increasing exponentially as demand for data continues to increase.

6.1.8 Budget

The project was successfully completed within the agreed timeframe and allocated budget.

6.2 Challenges

6.2.1 Wider user need

A minority of users, particularly those less familiar with data analysis, found the FTB challenging to use at first despite the help resources provided. However, other products such as the <u>Census 2021 Main Statistics</u> and the <u>Census Area Explorer</u> provide access to census data for users of varying levels of expertise.

A <u>series of short instructional videos</u> are also available to help users understand and make better user of the product, to date these videos have almost 1,200 views.

6.2.2 Functionality

While the FTB enables the creation of customised data tables, more advanced users expressed a desire for additional features such as data visualization and mapping tools. This is something that NISRA plans to explore in the future.

6.2.3 FTB content

Only standard variables from Census 2021 were published on the FTB. Due to project timescales and budget limitations, more complex census variables and previous census data (for example, 2011) could not be included. The customer services function that is available in NISRA will continue to plug this gap.

6.2.4 Hosting solution

The hosting solution has been very successful. There have been no bugs or issues since the FTB was published, and no downtime reported, even during peak usage. NISRA is reliant on a third party to host the FTB on their servers so there is an external dependency that requires management.

7. Conclusion

The NISRA FTB project represents a step change in providing improved access to census data in Northern Ireland. By enabling users to create their own customised tables, the FTB has increased data transparency and availability when compared to the dissemination of data after the previous census in 2011. We can conclude that the project has largely succeeded in meeting its key objectives and it has made a positive impact on the use of census data across multiple sectors.

Going forward, the need to address areas for improvement and embrace innovation will be key to maintaining the FTB's relevance and effectiveness. Within the context of a new corporate plan period, a more strategic focus on the FTB could allow it to become a cornerstone of NISRA's data dissemination function.