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Political participation within Local
Authorities and Councils: Evaluating the
use of a web application to improve
communication and engagement.

<https://github.com/harrynfry/BCPWebApp>

<https://bcp-feedback-app.web.app/>

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Abstract

This report investigates how sentiment towards communication, community engagement and interest in political participation can be increased at the local authority level of government using a web application. The research is undertaken in Bournemouth, Christchurch and Poole area. The project follows a 5-phase methodology of data gathering, application development, interaction, post interaction data gathering and analysis. The developed application focused on delivering communications direct from the council and providing users the means to give feedback. The results suggest that participants, especially young adults, felt more engaged in the community, are more interested in participating in political behaviours and felt more informed on local issues after using the web application. The combination of these may suggest an increased likelihood of voting in local elections but requires a longer period of study and wider sample size to confirm.

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1. Introduction

The last 15 years has seen a shift in government policy to hand powers down from central government to local authorities. The Big Society policy, introduced by the UK coalition government in 2010, aimed to pass responsibilities on to communities through increased management responsibility and financial autonomy (GOV UK, 2010). Whilst this policy petered out, the process of devolution, transferring power out of central government and into the local level, continued with policies such as “Levelling Up” introduced to aid areas in the development of social projects (GOV UK, 2022). Since 2018, 8 local councils have effectively declared themselves bankrupt, Croydon declaring on 3 separate occasions (POTTS & EDGINGTON, 2021). This declaration is via a section 114 notice, issued by the council finance officer who deems that the expenditure of the local council is unlawful in the *Local Government Finance Act 1988, Ch 41, ss.114*. With no cases of this occurring in the 18 years prior to 2018, the sharp rise in councils struggling to stay financially stable comes alongside the increased financial pressures that these government policies have laid on (HODDINOTT, 2023). Public support for local authorities can be crucial in providing legitimacy to policy, providing means of engagement and participatory practices in local governments allows constituents to feel decisions are made with them (PALESE, 2022). With the change in how local services are managed, the increased risk of consequences that mismanagement may have, and the policy changes introduced, constituents may have more of a say in the decision-making process than they realise through their vote in local elections.

Incidentally, the introduction of policies providing powers to local councils has coincided with a decline in voter turnout. Whilst local elections typically have a lower turnout than general elections, some wards are at an extreme low with one in Hull, Marfleet, recording a turnout of just 14.6% in 2021, with

constituents citing a distinct lack of interest from residents in the political process, and prospective candidates in their communications with constituents (BATEMAN & DALE, 2021). This low turnout creates a less democratic environment, where elected officials legislate for people who have not expressed their desire to be represented.

In the Bournemouth, Christchurch and Poole (BCP) 2019 general election, turnout figures ranged from 62% - 75.02% in the constituencies located in the BCP area (BCP COUNCIL, 2019a). These figures are in stark contrast to the local election figures of the same year where the highest turnout was 49.67% in the ward of Broadstone (BCP COUNCIL, 2019b). The lowest turnout of the same local election was recorded in the ward of Boscombe West, with 23.47%. 4 years later, in the 2023 local elections, total voter turnout declined from 33.13% to 30.62%, where a total of 28 wards saw a decline in voter turnout (BCP COUNCIL, 2023) (Appendix A). Voter fatigue may have played a part, as there have been multiple large elections in a shorter period than usual.

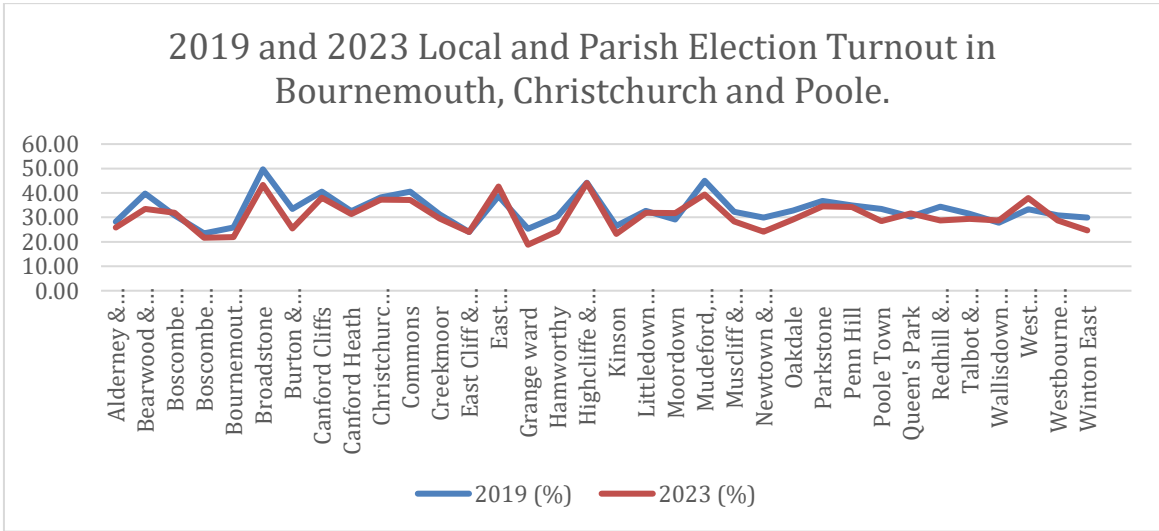


Figure 1 Chart displaying previous BCP election turnout figures. Data taken from BCP election figures (BCP COUNCIL, 2019b) (BCP COUNCIL, 2023).

In this new political landscape, engagement with local authorities in the way they lead and manage wards should be of the utmost importance. Through the

awareness of goals, policy and accomplishments via effective communication channels, the best interests of constituents can be represented by local authorities (LOCAL GOVERNMENT ASSOCIATION, 2024). Constituent feedback is also incredibly important to local bodies as it allows them to consider community opinion when legislating. Ward constituents should have a means of accessing council communications quickly and should be able to easily voice their opinions on matters they deem important. Equally, they should feel as though they are well informed on local issues and policy.

The internet has played a large role in the political process, especially in the modern era of social media. Whilst access to news and information has become widespread, it has mostly come at the expense of people engaging first-hand with politics, none more than the young adult population (SMETS, 2014). Political engagement can be displayed in multiple ways, for example through discussion, activism or voting. However, the way in which an individual can engage in these behaviours online or offline can change depending on the perceived effort it can take (GIBSON and CANTIJOCH, 2013). It can be argued that it is the responsibility of a local governing body to provide the tools to easily engage in discussion with its' constituents. Political discussion is aided at the highest level of government through tools such as TheyWorkForYou, a website aiming to make Members of Parliament (MPs) more accountable and accessible. However, there is a dearth of online tools to aid informing and communicating at a local political level.

How can local authorities take advantage of the internet as a tool to increase the quality of communication between themselves and constituents? In turn, do these effect how engaged and informed constituents feel about local politics, or their overall interest in involving themselves in political activity, especially voting? This report documents the development of a web application that aims to answer this by informing users of council published news, budgets and upcoming elections, whilst giving them a way to voice their opinions in a way

that can be utilised by the council. This application will focus solely on the local council of Bournemouth, Christchurch and Poole (BCP), and will use residents of the BCP area in the research and testing of this product.

2. Literature Review

The internet has drastically changed how individuals consume, interact and engage with political media. Since the late 1990's and early 2000s, there has been a huge rise in online traffic to early social media, blogs, and mainstream news websites. By 2002 half of the UK population was online, and 17% of the online population were using the internet to engage in political behaviours (GIBSON et al., 2005). Gibson et al. conducted a survey of adults to measure online political participation and discovered that 15-25-year olds were 40% more likely to engage with politics online than those over 65. The results of this study suggest that now, 20 years later, there could be a population of 35-45-year olds who have spent most of their adult lives interacting with politics online.

As broadband penetration into households increased voter turnout decreased, favouring incumbent parties, (GAVAZZA et al., 2019) with local elections having the lowest voter turnout by far. The study by Gavazza et al. reported that voter turnout declines higher in younger, less educated, poorer populations that spend more time online. They also report that local authorities tend to target spending on higher income, older voters who use the internet less. Local media appears to be shifting to a more online presence, but younger audiences interact and consume online news the least between age demographics.

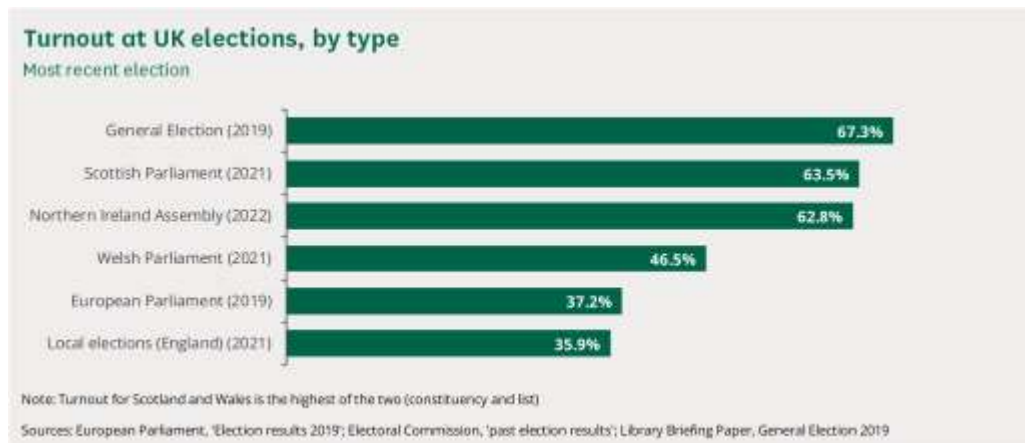


Figure 2 Election turnout in the UK 2019 (UBEROI, 2023)

<https://commonslibrary.parliament.uk/research-briefings/cbp-8060/>

This new media landscape has challenged how political behaviours are viewed, with previous, traditionally offline, behaviours not directly comparable to their online counterparts. A study by Gibson and Cantijoch investigated how the cost of these actions, the amount of effort exerted, changed how behaviours are measured when looking at online and offline participation in politics. They outline how behaviours may be passive or active depending on the cost of effort, and that online engagement may be more passive. They suggest that a multidimensional model is used so that each method of online participation can be viewed as a distinct behaviour (GIBSON and CANTIJOCH, 2013).

A study of the Dutch youth, 15-25, conducted by Hirzalla and van Zoonen, suggested that behaviours on social media such as liking, commenting, or sharing a political post on social media are multidimensional behaviours. They also report that these behaviours, alongside online consumption of political media, are of a low cost to the individual. They also report that these passive behaviours may be high, but may not be indicative of actual, active, participation (HIRZILLA AND VAN ZOONEN, 2011).

While passive participation methods have become engaging to younger populations in the UK, it has also been reported that online participation

behaviours and voter sentiment changes based on the political climate of the country, in more autocratic regimes online participation can lead to more activism (ZHURAVSKAYA et al., 2020).

In Italy, voter turnouts drastically declined through the 2000's. During this time, a political party known as the Five Star Movement (M5S) cultivated an online following via grassroots activism. Campante et al. discusses how M5S's following grew into the 2010's and how they leveraged their online profile to mobilise voters, 1 in 7 M5S voters had previously abstained from voting compared to 1 in 15 for other parties. This study outlines how creating an online presence can be utilised to reengage people in politics and elections (CAMPANTE et al., 2018).

Local elections for parish councils and local authorities have the lowest turnout of any UK election, the most recent figures in the constituency of Bournemouth, Christchurch and Poole (BCP) show only a 30% turnout at the previous election (BCP COUNCIL, 2023). Willett and Cruxon argue in their report, that due to low turnouts, this makes it the least democratic level of government, with civic disengagement on the rise and a disconnect developing between councils and the members of the community. In the report they discuss the effect of devolution policies combined with budget cuts and austerity on a local council's ability to operate. They also discuss the need to improve communication, as current methods feel one way and negatively impact public perception of the council (WILLETT and CRUXON, 2018).

Studies by Smets and Bartlett & Grabbe report how election turnouts among young adults have rapidly declined in the past 30 years, and if this population is not reengaged then future voting turnouts may suffer further. This has been recognised as an issue in Europe too, where party membership and turnout has also declined. These studies argue that effectively applied internet tools could provide the means to improve engagement, such as supplying effective

channels for two-way communication and feedback. Despite suggestions and recommendations for change, democratic institutions are still acting slowly to address these issues (SMETS, 2014; BARTLETT and GRABBE, 2015).

UK charity mySociety have developed four tools with the aim to aid democratic discussion, civic involvement and to increase transparency in government.

These are:

- WhatDoTheyKnow, users can make freedom of information requests.
- FixMyStreet, report issues in the community.
- WriteToThem, contact any elected representative.
- TheyWorkForYou, aims to make parliament more accessible.

TheyWorkForYou provides information about an MP, their voting record and summarising how they vote on key issues. It also posts parliamentary records of debates and speeches, with notifications when a chosen topic or MP is mentioned. This provides excellent insights into national politics but does not address parish level communication or reengagement.

The local authority of East Gosport created a Parish app for constituents to book council run facilities, access a calendar of events, view a newsfeed and contact members of the council, with the aim to increase engagement (PIZER, 2016). This was discontinued in 2023 but other councils, such as West Northamptonshire, have continued to develop the idea to include features like FixMyStreet. These apps act more like extensions of council websites, as they contain most of the same information and tools to provide access to services.

The tools that currently exist do not focus on the problem of how to politically reengage voters. Some of the main factors of civic disengagement is how well-informed constituents feel about their council and what they are doing, and how much they feel their voice matters in the council's decision-making process

(WILLETT and CRUXON, 2018; HIRZALLA and van ZONEN, 2011). A tool that focuses on communicating the council's actions, providing ways instant feedback can be given and showing that feedback has been received or acted upon may begin to increase interest in civic participation. This in turn could have a positive effect on voter turnout, as this form of participation incurs a low cost on an individual but can improve their overall feeling towards local political participation. As such, a web application that will aim to improve how councils communicate information and how feedback can be given and received is proposed for development.

3. Methodology

The project is divided into 5 phases:

- 1 - Data gathering, baseline results of population in BCP.
- 2 - Development and deployment of web application.
- 3 - Participant interaction with web application.
- 4 - Data gathering, post web app interaction results.
- 5 - Final analysis, comparison and analysis of phases 1 and 4.

Data will be gathered from residents in the BCP area only, as the web application will also only be focused on BCP council for this project.

3.1 Phase 1

The first round of data collection gathers information about political participation behaviours, interests and engagement of BCP residents via a survey. Participants from the BCP area were invited to take part in this survey via social media channels. Due to data sensitivity, considerations were made to omit questions asking for personal or political information. The survey was constructed with 4 sections.

Section	Description
<i>About you</i>	Demographic data, for grouping participants in analysis.
<i>Communication, participation and technology</i>	Likert scale questions to gather current attitudes and participation levels.
<i>General questions</i>	Test of knowledge, personal experience and project justification questions.
<i>Optional future participation</i>	Allow users option to provide contact information for future testing.

About you

Demographic data was restricted to age bands and employment status, as variables such as gender or race are outside the scope of the project. No questions about political voting intention or policy were asked, only about previous levels of participation. For each of these identifying questions users were given the option to refuse to answer. These demographics allow participants to be grouped by varying levels of life experience, exposure to council, participation and familiarity with the area.

Communication, participation and technology

This section asked the participant how much they agreed with a statement on the communication between themselves and the council, and how it may influence their voting participation. A 5-point Likert scale was used to

measure this, allowing variance in levels of agreement with a neutral option.

Participants then provided their level of participation and usage of technology when accessing BCP council news and updates. A 4-point Likert scale was used ranging from Never, Rarely, Occasionally to Regularly, with the removal of the neutral option. This is because participants cannot be neutral in participation, they either do or do not, with the only variance being regularity.

The quantified data from these Likert scales is used to calculate average scores for each statement. These can be further sorted by demographic. This will form a baseline with which to compare the results of phase 4.

General questions

Questions testing participant knowledge were asked to determine a level of general knowledge. This would be compared with answers from the previous section to determine if participants that felt well informed or communicated to were able to display general knowledge on local elections.

Other questions ask about the type of communication and interactions with the BCP council website the participant may have had. Answers to these may be used to influence design decisions and features that will be implemented in the web application during phase 2.

Optional future participation

The participant was asked to provide a contact email address, with which they were invited to test the deployed product if interested.

Results of phase 1 are collated and analysed to identify participant sentiment towards communication and political behaviours.

3.2 Phase 2

Design, development and deployment of the web application. Insights gathered from phase 1 are used to influence or justify design choices.

3.3 Phase 3

Participants that opted to share an email address in phase 1 were contacted and invited to interact with the web application. To maintain an adequate sample size, new participants were also invited to interact with the web application through social media channels. Participants interact with the application in their own time.

Selected councillors from BCP council were invited to interact with application and asked for comment on the potential benefits such an application may have for the council. Councillors were selected from local wards and from portfolio holders, executive members of the council, for communication and for IT and data transformation. Responses from councillors will be used to aid in the discussion of recommendations.

3.4 Phase 4

Participants of phase 3 are invited to complete a survey after interacting with the web application. The survey modifies questions and statements from phase 1 to gather future interest, engagement and participation data. Participants are asked to supply attitudes towards current BCP communication techniques, allowing new participants to supply data which can be compared to data from post-app interaction in phase 3.

Section	Description
<i>About you</i>	Demographic data, for grouping participants in analysis.
<i>Communication, participation and technology</i>	Likert scale questions to gather current and post-app interaction attitudes and participation levels.
<i>General questions</i>	Future usage, app feedback.
<i>Optional future participation</i>	Allow users option to provide contact information for follow-up questions.

About you

Data to group participants into demographics. A new demographic question, asking if the participant had ever submitted a complaint, comment or compliment, was added. This would allow results to be sorted by people who had used BCP council's current feedback system.

Communication, participation and technology

Participants are asked about their agreement to statements concerning their current communication with BCP council and the potential influence it has on their political participation during Question 6. This allows participants from phase 1 to refresh and reiterate their position and new

participants to supply data that can be used as a point of future comparison.

Statements about the participant's experience using the web application followed, these were used to evaluate the usability of the web application and whether it managed to complete its' objectives. Statements about a participant's interest in taking part in future political behaviours and events are used to measure whether potential participation in political behaviours changes based on app usage. A 5-point Likert scale is used, where average scores across all data and specific demographics can be calculated.

General questions

Aims to gather insights into future usage of app and to gather feedback which can aid recommendations and development of future features.

Optional future participation

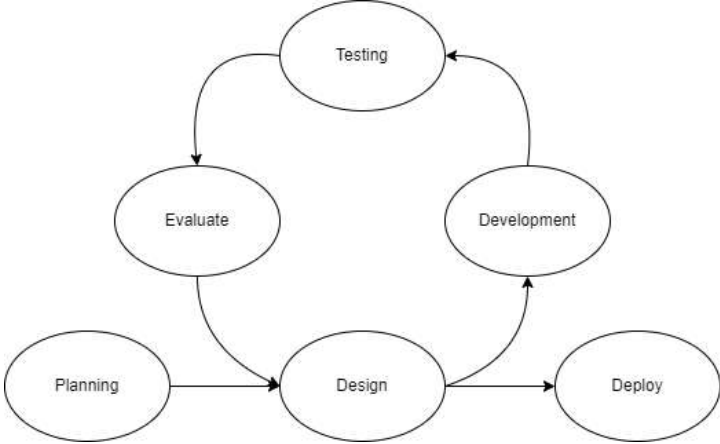
Opportunity to voluntarily supply contact details for follow up questions, option to discuss feedback and gain further qualitative insights.

3.5 Phase 5

The results of phase 1 and phase 4, question 6, are compared with the post-interaction results of phase 4 to identify changes in sentiment towards political participation, engagement, and communication. To measure the success of the project, the average sentiment scores across respondents and demographics of phase 1 and 4 will be compared. Changes in sentiment will be identified to determine the overall success of the project. The interaction with the web application developed will also be evaluated based on the results of phases 3 and 4.

4. Project Management

To manage the overarching project, a Gantt chart outlined milestones for project deliverables and analysis completion. The project was managed through a waterfall approach, where each phase was completed sequentially. However, phase 2 followed a modified Agile methodology, where the software development lifecycle was recreated through mini sprints, to deliver application features. This is discussed in 5.4 Application Development.

Phase	Methodology process
1	<ul style="list-style-type: none">- Build survey.- Distribute via social channel.- Collation and analysis of results.
2	<div><pre>graph TD; Planning([Planning]) --> Design([Design]); Design --> Deploy([Deploy]); Deploy --> Development([Development]); Development --> Testing([Testing]); Testing --> Evaluate([Evaluate]); Evaluate --> Planning</pre></div> <p><i>Figure 3 Agile approach to component development.</i></p> <ul style="list-style-type: none">- Modified Agile methodology to produce the requirements of web application.- Mini sprints develop features in order of importance.

3	<ul style="list-style-type: none"> - Phase 1 participants invited to phase 3. - Distribution to new participants through social channels. - Participants use application.
4	<ul style="list-style-type: none"> - Build survey. - Survey participants of phase 3. - Collation and analysis of results.
5	<ul style="list-style-type: none"> - Results of phases 1 and 4 are compared. - Conclusions and recommendations are made.

4.1 Data Collection and Interaction Management

Phases 1, 3, 4 and 5 required distribution, data collection and handling tools. The project gathers data from participants, this will be completed via survey.

Phase 1 and 4	
Tool	Use
JISC	<ul style="list-style-type: none">- Build and distribute survey.- Visualisations of question results.- Filter results by demographic.- Download data in csv format.
Microsoft Excel	<ul style="list-style-type: none">- Data analysis, visualisation.
Phase 3	
Microsoft Outlook	<ul style="list-style-type: none">- University email address to send consenting participants of phase 1 the artefact and survey.- Contact BCP councillors
Phase 5	
Microsoft Word	<ul style="list-style-type: none">- Document results and report.
Microsoft Excel	<ul style="list-style-type: none">- Data analysis through comparison of phase 1 and phase 4 results.

To distribute the application in phase 3, participants from phase 1 were contacted with the supplied email address. Links to both the artefact and the phase 4 survey were included.

Hello,

Thank you for taking part in my research and indicating your interest in testing. Today my test application has been released and I would like to invite you to try it out!

Here is the link:

<https://hcn-feedback-app.web.app/>

Once you've had a chance to look around and interact with it, I would be very grateful if you could complete a second survey about your experience. The link to this survey is at the top of the app, but I will also link it below:

<https://app.onlinesurveys.jisc.ac.uk/s/solent/civic-engagement-and-democratic-awareness-in-bournemouth-christchurch-and-poole>



If you have any questions, please get back in touch.

Kind regards,
Harry Fry

Figure 4 Email inviting phase 1 participants to phase 3 and 4.

Councillors from BCP were also contacted for comment on the use of the application in a real-world setting by the local authority. Councillors were selected based on their role in the council, with interests relevant to the usage for an application like this.

4.2 Requirements

The project delivers a web application as a means for participants to interact with BCP council communications and leave feedback of their own. The proposed web application's design was focused on delivering a direct pipeline for communicating council news articles to BCP residents, with the residents able to leave their desired feedback. To best deliver this information to the user, an article feed with feedback components was ideated. Feedback must adhere to BCP council's current methods, where type of feedback is categorised as compliment, comment or complaint. Additional information, such as site information, social media links and feedback sentiment would also be delivered as components.

The results of phase 1 were used to justify the design decisions of required components in phase 2, while also identifying features that were not initially considered. For instance, in phase 1 81% of respondents did not believe they knew when the next local election would be. 19% of participants believed that they were informed on this topic, yet each participant gave a different answer as to what year they believed the election would be when asked to display that knowledge.

10. Do you know what year the next BCP election will be held?

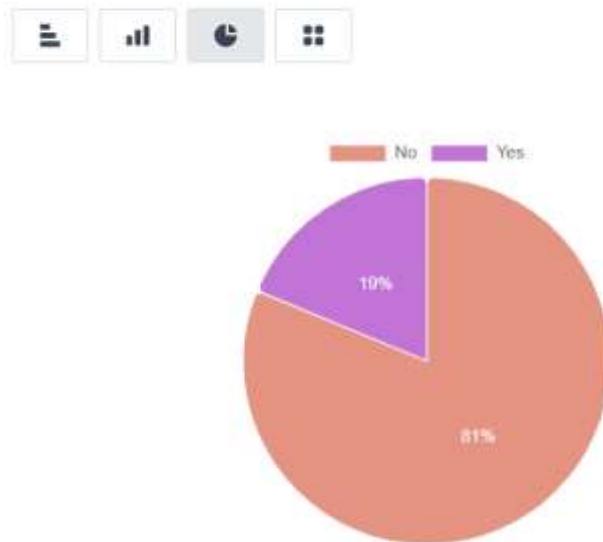


Figure 5 Phase 1, Question 10, breakdown of responses showing 81% do not believe they know when the next local election is.

It is apparent that residents of BCP may not be receiving clear information about upcoming local elections. Due to this, a feature was added to the news feed design to display upcoming election details with voter registration instructions linked to the user with the aim to increase the user's election knowledge.

Features and components of the application must be designed to clearly display information, allow users to access the article and provide a means to leave feedback after reading the article. Information about the applications' purpose as research tool must be displayed to the user, including instructions on participating in data gathering surveys. The requirements for the artefact are as follows:

Feature	Description
Web scraping tool	<ul style="list-style-type: none"> - Gather and store required information directly from BCP council website's "News Articles" - News articles BCP (bcpcouncil.gov.uk). - Articles uploaded to database from local .json file.
News feed	<ul style="list-style-type: none"> - Display news articles, upcoming election details, display link to news article, provide overview of article contents and date of publication. - Articles will be fetched from database collection.
Feedback form	<ul style="list-style-type: none"> - Allow users to leave their feedback via a compliment, comment or complaint. - Validate the user is a BCP resident by asking for a postcode, this postcode should start in "BH" to pass validation. - Store feedback in subcollection of article document in database. - Hide form until user has accessed/read the article
Feedback display	<ul style="list-style-type: none"> - Feedback is fetched from database for each article and displayed in a feedback component. - Feedback can be hidden/shown by clicking a button. - Overall feedback sentiment (Positive-Negative) is displayed.

Data display	<ul style="list-style-type: none"> - Contains charts to best display BCP spending breakdown. - Charts must be well annotated, with sources
Header	<ul style="list-style-type: none"> - Contains site information/title. - Contains link to data collection survey. - Contains BCP social media links.
Footer	<ul style="list-style-type: none"> - Contact details and site purpose.
Testing	<ul style="list-style-type: none"> - Components must be tested, automated or manually, making sure they are rendered and function as expected.
Deployment and Monitoring	<ul style="list-style-type: none"> - Application must be deployed and hosted online for distribution and access by participants. - Application is monitored for the duration data is gathered, moderating feedback, responding to unforeseen bugs.
User Interface	<ul style="list-style-type: none"> - Design must be clear and simple, colour palette/theme like BCP council website.

With the requirements of the web application outlined, they are then ordered by feature importance. This will provide structure to the mini sprints, as each component is developed sequentially.

Rank	Feature	Description
1	Web scraper	Web scraper to gather article data
2	Article upload/firestore	Data is uploaded and stored in firestore.
3	News feed	Fetch data. Display all article data in feeditem components
4	Submit feedback form	Feedback form, with validation. Uploads to article document subcollection.
5	Feedback display	Display the feedback in a feedback component
6	Spending data	Display BCP council budget breakdown in chart component
7	Feedback sentiment	Calculate sentiment of feedback (positive/negative) and display to user
8	Header/Footer	Site banner, social media links and site info, survey link.
9	User interface	Develop consistent UI between components.

Figure 6 Web application requirements ranked in order of importance.

4.3 Development and Deployment Management

Phase 2, the development and deployment, with the creation of front-end wireframes, client-server relationship diagrams and database designs of all the features necessary to deliver the requirements outlined for the web application, outlined in 6.1 Design Ideation. During this planning stage, the features identified in requirements were planned to be developed in order of importance. Each mini sprint thereafter followed a cycle of design, develop, testing and evaluation, which allowed components to be created and merged with the application.

Mini Sprint	
Stage	Process
Design	- Feature/Component ideated.
Develop	- Feature/Component is created.
Test	- Interactions with the new feature/component are tested for expected results with automated or manual test.
Evaluate	- Implementation of feature is evaluated.
Deploy	- Feature is either deployed as complete or returned to design stage for modification.

Phase 2, the development of the web application, required multiple technologies to deliver the product as required for use in phase 3.

Phase 2	
Tool	Use
Figma	- High fidelity prototype designs to test User interface and interactions
Miro	<ul style="list-style-type: none"> - Whiteboard, design client - server relationship diagrams and database collections - Low fidelity wireframes, early concept designs
Draw.io	- Low fidelity wireframes.
Visual Studio	- Integrated Development Environment (IDE), used to write code for web application.
PyCharm	- Python IDE used to develop web scraping tool.
Firebase	<ul style="list-style-type: none"> - Back end of project, Firestore used for data storage. - Hosting deployed application.
GitHub	- Version control.

Web Application

The application was developed using a mixture of language, frameworks and libraries to produce a single page application (SPA) that would deliver all the required features with a clear user interface (UI).

Technologies	Description
JavaScript	<ul style="list-style-type: none"> - Dynamic, object-oriented web language, majority of code is written using JavaScript
HTML and CSS	<ul style="list-style-type: none"> - HTML is markup language for web document, defines structure of web content. - CSS describes how elements of the web page are rendered.
React	<ul style="list-style-type: none"> - JavaScript library that uses components to design UI. - State and Props pass and hold data between components. - Create-react-app framework builds an SPA, comes with preinstalled config tools, such as Babel and Jest.
Babel	<ul style="list-style-type: none"> - Converts ECMA6 code into backwards compatible JavaScript
Jest	<ul style="list-style-type: none"> - Node-based, JavaScript testing framework. Used to write automated testing scripts.
Recharts	<ul style="list-style-type: none"> - Library of components to produce data visualisations.
Material UI	<ul style="list-style-type: none"> - Open source React component library with UI elements.
Firebase CLI	<ul style="list-style-type: none"> - The Firebase Command Line Interface, allowed the interaction to initialise and deploy application
Firebase	<ul style="list-style-type: none"> - Environment to host web application
Firestore	<ul style="list-style-type: none"> - Database collection and storage

Web Scraper

To gather the news data from BCP to display on the web application, a web scraper was developed. This web scraper was designed to access the News Articles page on the BCP council website and return the required data in JSON format. The div containing the required data was manually located by inspecting the HTML code, this allowed the web scraper to locate and extract only the necessary data.

Technologies	Description
Python	<ul style="list-style-type: none">- Easy to use
requests	<ul style="list-style-type: none">- Library allowing HTTP requests to be sent.- Stores response as HTML string
Beautiful Soup: bs4	<ul style="list-style-type: none">- Python library used to pull data from HTML.- Accesses HTML data through a DOM, used to extract specific data.
uuid	<ul style="list-style-type: none">- Universally unique identifier- Used to assign article objects a unique ID, used when using local .json file rather than firestore.
datetime	<ul style="list-style-type: none">- Library to parse date and time data
json	<ul style="list-style-type: none">- Library to parse data into JSON

Testing

Each developed component was tested for functionality. Depending on the type of the component, the test may be automated to check that a UI element renders correctly or detects user interaction, or the test may be a manual test to check that data is submitted correctly.

Technologies	Description
Jest	<ul style="list-style-type: none"> - A tool provided through create-react-app. - Scripts are created to test render specific features, that components are properly displayed. - Runs tests via a testing environment that displays whether tests passed and failed
Manual	<ul style="list-style-type: none"> - Tests features that submit data, forms. - Functions that handle data are tested via console logs as well as checking database activity.

4.4 Risk management

Each phase contained risks that could potentially hamper the overall success of the project. At each phase of the project, steps were taken to mitigate these risks whilst also preparing contingencies, where required, to counter the possible effects of these risks if realised.

Phase 1

When conducting a survey, the potential response rate can be much lower than the number of people the survey was distributed to. To maximise the number of respondents, the survey was shared through multiple social channels.

Another risk is that the sample size of each demographic that responds may vary to a large degree. To mitigate this, the social channels selected to distribute the survey contained a wide variety of potential respondents.

When designing the survey, the decision was made to limit the number of questions, and therefore the overall amount of time that the participant would spend answering them. This limit meant that the survey should take between 5 and 10 minutes to complete on average. This was to increase the potential retention rate of participants as they complete the survey. To secure participants for phase 3 and 4, the option for participants to supply a contact email address and consent to be contacted was included in the survey.

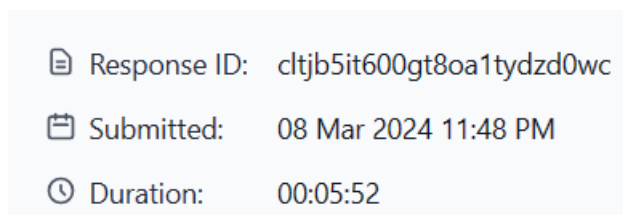


Figure 7 Response time for survey in phase 1.

When analysing the results of the survey, they may not have supported the original design decisions proposed for the web application. However, the

designs were designed to not be final until after the analysis had been completing, allowing flexibility and the opportunity to modify the designs before development began.

Phase 2

Several risk mitigating solutions were implemented during the development of the application. Mini sprints reduced the overall risk of not delivering a functioning artefact at the end of this phase. Components and features were ranked in order of importance to produce a list of major components that needed to be delivered. This would ensure that a minimum viable product was produced for use in phase 3.

Designing prototypes of components, overall structure and required interactions at the start of the phase allowed the development of each component to stay within the scope of the project. It also allowed for consistency in the design of the user interface.

Phase 3

Phase 3 required participants to interact with the web application. This increased the risk of a low participation and retention rate as the perceived cost of effort to participate was quite high. To combat this, surveyed participants from phase 1 that consented to be contacted were invited via email to interact with the app alongside new participants through social channels to increase sample size.

Another risk of the perceived cost of interacting with the web application is a shift in demographics that participate in this phase of the study, with users less comfortable interacting with this technology less willing to participate. However, in the event of this happening, the opportunity may arise to analyse how web applications can be used to re-engage the more willing populations in

political behaviours, such as voting, where specifically younger population participation rates are declining.

Phase 4

The phase 4 survey was used to gather data that could determine the success of the web application. As with phase 3, the risk of low participation is high as the survey is reliant on participants interacting with the web application, a process that may be perceived as high cost of effort. This is mitigated through the invitation of phase 1 participants alongside the invited new participants. To make sure results from phase 1 can be compared to the results gathered from new participants of phase 3 and 4, the modifications are made to the survey to gather current sentiment data.

Phase 5

As the success of the project and evaluation of the web application is reliant on the comparison of results from phase 1 and 4, there is a risk that the analysis does not return the expected results. If this occurs, these results will be investigated, and recommendations made to improve future iterations of this project and development of the web application.

4.5 Professional, Legal and Ethical issues

Prior to any data collection, ethical approval for this project was sought and granted by Solent University ethics, a copy of this is found in Appendices C. The surveys for phase 1 and phase 4 were both created using JISC Online Surveys, through Solent University's licence, to conform to ethics regulations. Phase 1's survey was deployed and shared with members of BCP, supplying a university email address as an additional point of contact. For phase 3, participants that had supplied email addresses were contacted via a university email address, before distributing as phase 1 was.

Contact details that participants supplied in this survey were secured as all survey responses are collected through JISC's encryption layer of protection. When data was extracted to .csv format all supplied email addresses were removed to anonymise the data.

As the web application was developed as a test product, considerations were made to not include features that gathered and stored personal data, such as emails and passwords for account authentication. Location data, a postcode, was asked for to validate form.

5. Design & implementation

5.1 Design Ideation

The structure of the application was designed, considering front-end features and the interactions they have with back-end server functions. The passing of data and the handling of data to and from the database was also diagrammed.

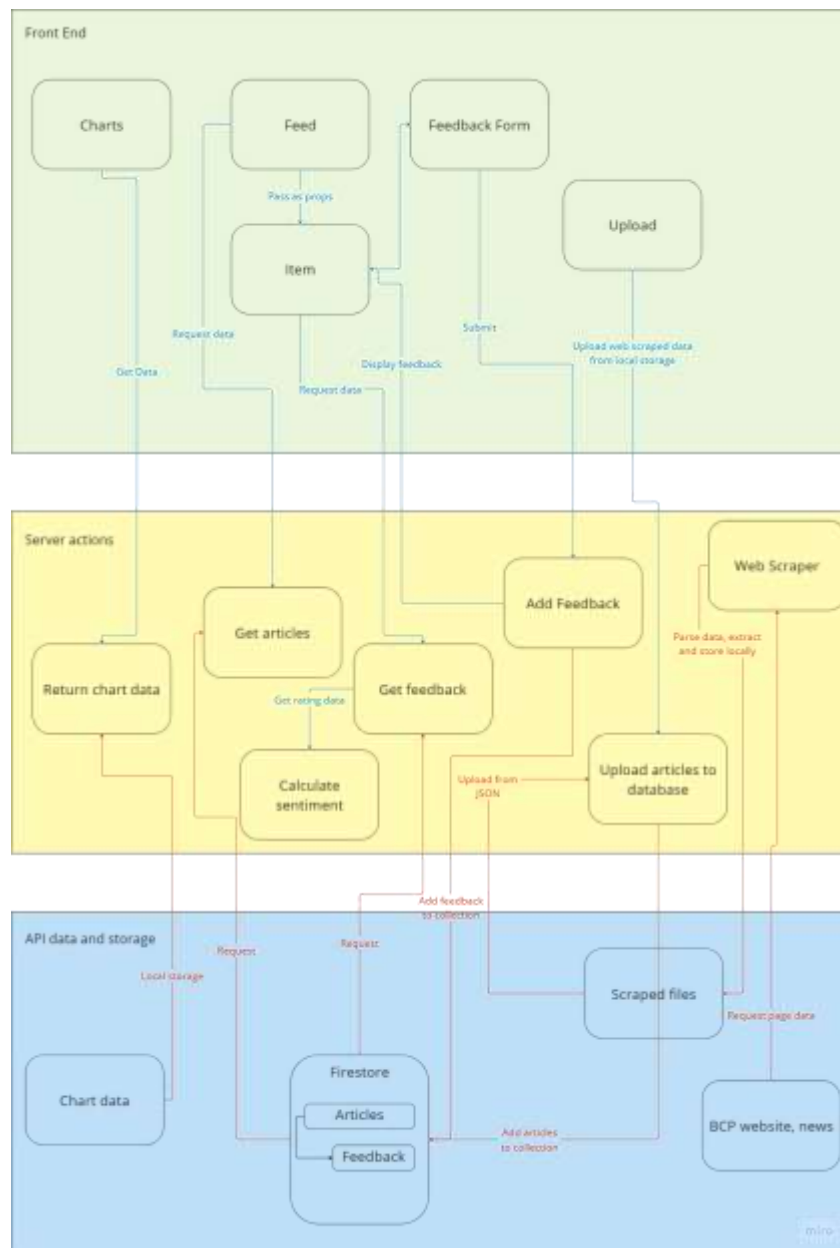


Figure 8 Client-server structure diagram of web application.

This client-server structure diagram would act as the basis for interaction design and wireframing prototypes. It would also aid the overall design of the database collection for articles and feedback, as data attributes necessary to requirements were identified.

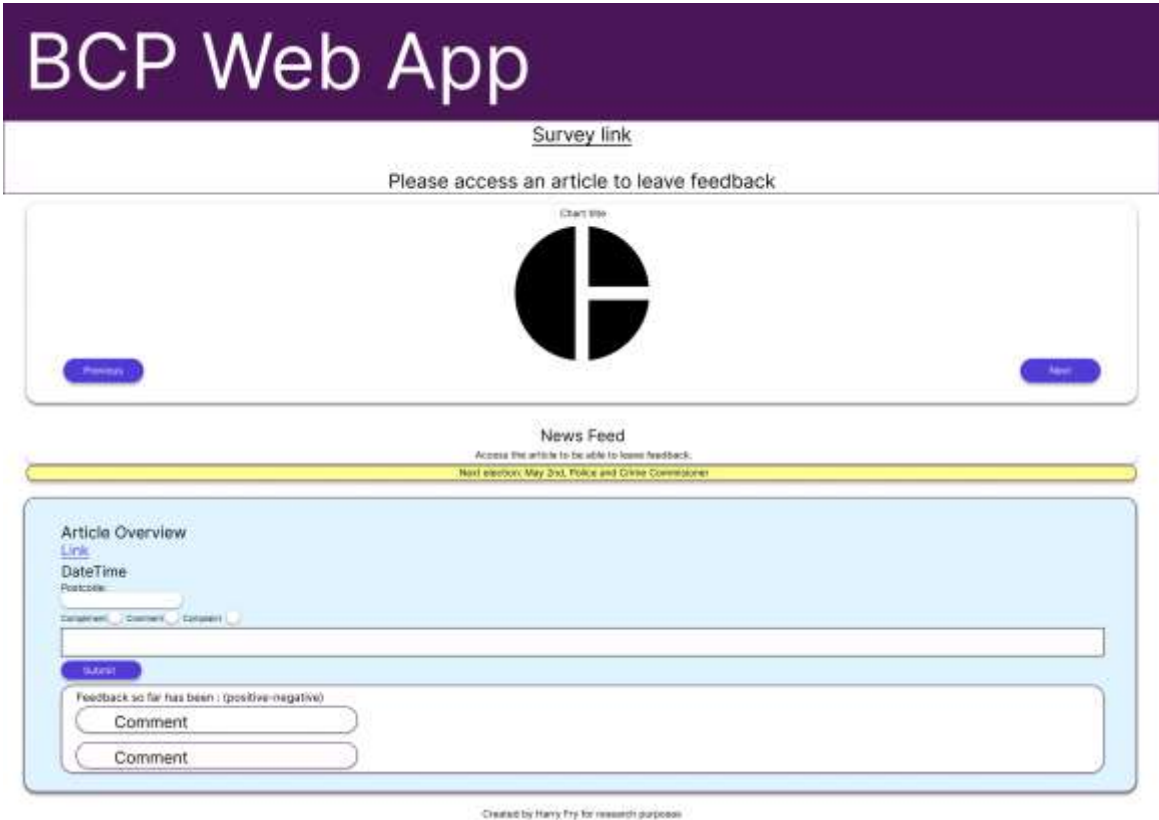


Figure 9 High fidelity wireframe of desktop application in Figma



Figure 10 High fidelity wireframe of mobile application in Figma

The front-end design layout was visualised through wireframing with Draw.io. Through low fidelity wireframing, the layout of the application took shape. This was then expanded on using Figma to create high fidelity wireframes that acted as the blueprint for the final front-end design for desktop and mobile. The process of wireframing designs allowed new features, recommendations from phase 1, to be incorporated.

5.2 Data structure

Two database collections were identified as necessary to requirements. The first collection was for articles, and the second would be for feedback. The feedback collection would be a sub collection of each article document.

Articles Collection:

<u>Name</u>	<u>Data type</u>	<u>Description</u>
id	String	Article Id
link	String	URL to news article
desc	String	Overview description of the article
dateTime	String	Date/time of published article.

The attributes of article documents were designed to correspond to the type of data that would be accessed by the developed web scraping tool. When inspecting the page source, the <div> containing the required information already contained separated elements for link, desc and dateTime. The decision to store dateTime as a string as opposed to firestore's DateTime was taken because the data extracted from the page source would be a string with "Published: " preceding the date.

```

1 <a class="listing-card_title" href="/news-hub/news-articles/share-your-views-on-new-road-safety-measures-for-bournemouth">
2 Share your views on new road safety measures for Bournemouth
3 </a>
4
5 <p class="listing-card_description">
6 Bournemouth, Christchurch and Poole (BCP) Council are asking residents and local businesses to share their
7 thoughts on proposals to deliver several road safety improvements in Bournemouth. |
8 </p>
9 <ul class="listing-card_information-list">
10 <li>Published:< />1-- --
11 <time datetime="2024-03-22T00:00:00">
12 Friday 22 March 2024
13 </time>
14 </li>
15 </ul>
16 </>

```

Figure 11 BCP news articles HTML source code snippet.

Taken from: <https://www.bcpCouncil.gov.uk/news-hub/news-articles>

Feedback Collection:

<u>Name</u>	<u>Data type</u>	<u>Description</u>
id	String	Feedback Id
comment	String	User submitted text
postcode	String	Postcode to validate user location in BCP
rating	Int	Type of feedback left by user, 1 = compliment, 2 = comment, 3 = complaint. Used to calculate overall sentiment of feedback.

Postcode is stored as part of the form validation. While it serves no use outside of that, it does provide future opportunities to analyse how residents of differing postcodes may feel on issues. This could be very beneficial to councillors of specific wards when legislating. Rating is used to calculate the sentiment of the feedback given by calculating the percentage difference in submitted compliments, comments and complaints.

The feedback collection was designed to be a sub-collection of an article document in firestore. This would allow the application to request the feedback

data, storing it in state, when a component is passed article data as a prop and mounted. This will be explored in more detail in 6.4 Application Development.

5.3 Web Scraping Tool

To gather the information needed to populate the articles collection database, and thus display it to users, a python web scraping tool was developed to access the BCP news articles page and extract data. The script uses python's request tool to send a GET request to the target url, in this case BCP's news page. BeautifulSoup is used to access a DOM of the response HTML string and parse the results.

```
# url to scrape
url = "https://www.bcpCouncil.gov.uk/news-hub/news-articles"
response = requests.get(url)
soup = BeautifulSoup(response.text, 'html.parser')
# find all <a> elements belonging to class
links = soup.find_all('a', class_='listing-card__title')
# create list to store objects
link_desc_objects = []
```

Figure 12 Code snippet of web scraper, targeting HTML elements.

Using the HTML source code, the <div> wrapping the data is identified through a class name. The find_all() function then locates all elements of that class, storing them as a dictionary. An empty list is initialised in preparation for the extracted data to be appended to.

```

# loop through each element, extracting href link and description from <p> class
for link in links:
    href = link.get('href')
    description = link.find_next_sibling('p', class_='listing-card__description').text.strip()
    dateTime = link.find_next_sibling('ul', class_='listing-card__information-list').text.strip()
    . . .
    obj = {
        "link": "https://www.bcpccouncil.gov.uk"+href,
        "description": description,
        "dateTime": dateTime
    }
    # append obj to list
    link_desc_objects.append(obj)

timestamp = datetime.now().strftime("%Y-%m-%d_%H-%M-%S")
file_name = f"Scrape_{timestamp}.json"
# insert desired file path as C:\user\folder\
file_path = r'File path here' + file_name

with open(file_path, 'w') as json_file:
    json.dump(link_desc_objects, json_file, indent=4)

print("File created at:", file_path)

```

Figure 13 Code snippet of web scraper, extracting data and creating JSON file.

Iterating through the dictionary of results, elements are targeted for extraction through their attribute or class name. An object is created, assigning key value pairs before appending to a dictionary. The file is named using datetime to easily locate the most recent file when multiple scrapes have been done. The file path is set as the folder location of the web application. While in development, uuid was utilised to assign each article a unique ID. This was removed after firestore functionality was set up, as firestore automatically assigns a unique ID when a document is added to a collection. The specified folder location for web scrapes was monitored for new files when the tool would run to check that extracted data was as expected.

5.4 Application Development

Project Initialisation

The development environment for the project must be setup prior the any front-end features or back-end functionality could be created.

Technology	Description
GitHub	- Version control
Create-React-App	- Framework for React projects
Firebase	- Hosting and database via firestore

The first step of the application development process was to initialise a GitHub repository that would be used for version control. This would allow development of the project across devices through repository cloning and syncing. The project would be worked on through one branch, “main”, as the application was developed independently and would not be maintained once deployed and phases 3 and 4 were completed.

The framework for developing this application was create-react-app, since the aim was to produce a single-page React application. It also bundles Babel and Jest, tools that will compile and aid in testing the application respectively. After installing through the IDE terminal, front-end features that were packaged in create-react-app were removed, leaving a blank slate for development to begin.

A Firebase project was initialised by creating the BCP-feedback-app project and registering a BCP-feedback-WebApp as an application via the Firebase console. The Firebase SDK was then installed with the necessary imports for Firebase and Firestore via the IDE terminal.

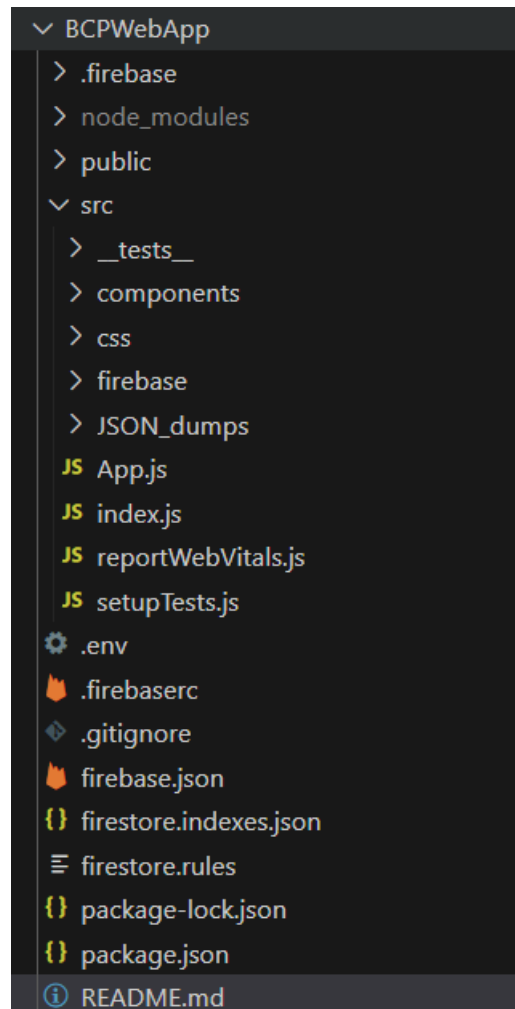


Figure 14 Folder structure of web application.

Article Upload/Firestore

With article data gathered and stored locally, it had to then be uploaded to a database collection for articles, as previously designed. During phase 2, multiple scrapes were conducted to get up to date information that the application would display. These scrapes were imported into the application and stored locally. The application would import the most recent file, selected manually, and store it in state in App.js. To store the data in firestore, an upload button was created which would call the uploadArticles function when

clicked. This iterates through the list of objects in data, passing each to the uploadArticles function. This was imported from a firestore Hook, a file that would go on to export all the functions necessary to the requirements of the web application, such as getting article and feedback data and uploading feedback.

```
// uploads scraped articles into "articles" collection
async function uploadArticles(data){
  console.log("upload useFire");

  const articleQuery = query(collection(db, "articles"), where("link", "==", data.link));
  const querySnapshot = await getDocs(articleQuery);

  // checks to make sure no duplicates are uploaded
  if (!querySnapshot.empty){
    console.log("Article already uploaded: ", data.link);
    return;
  }

  try{
    const docRef = await addDoc(collection(db, "articles"), {
      link: data.link,
      description: data.description,
      dateTime: data.dateTime
    });
    console.log("article uploaded: ", docRef.id);
  }catch(e){
    alert(e);
  }
}
```

Figure 15 Code snippet of uploadArticles function.

```

function Upload({ data }) {

  const { uploadArticles } = useFirestore(); // import function

  // click handler, for each object in data call upload function
  async function clickHandler() {
    console.log("upload btn clicked");
    try {
      for (const obj of data) {
        await uploadArticles(obj);
      }
      console.log("All articles uploaded successfully");
    } catch (error) {
      console.error("Error uploading articles:", error);
    }
  }

  return (
    // button with click handler
    <div>
      <Button variant="contained" onClick={clickHandler}>Upload</Button>
    </div>
  );
}

export default Upload;

```

Figure 16 Upload button code snippet.

During development, this process was used to maintain an up-to-date version of news articles in the database. However, the upload button to initiate this process was removed from the front-end when the application was deployed with the most up to date web scrape, but the components and functions are still present in the codebase. This was because the application would be distributed used by participants in phase 3, and each experience with it had to be consistent, including the data that they were shown. Using the firebase console, the upload function was tested for the expected result of a new collection of article objects.

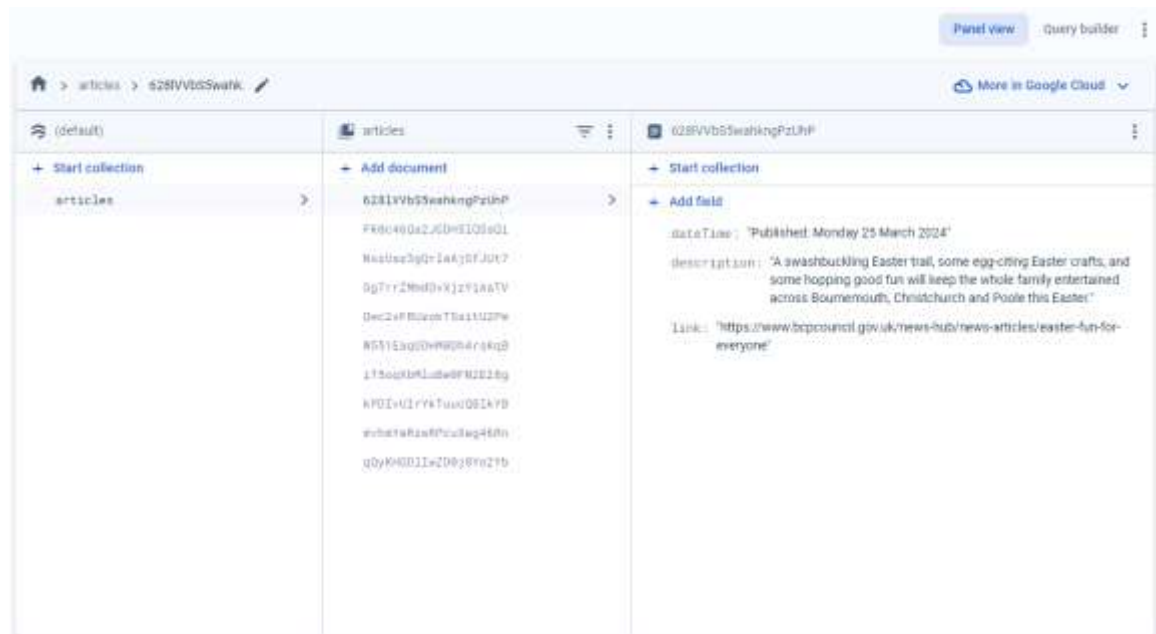


Figure 17 Firestore articles collection.

News Feed

With the development environment in place and a database with article documents to work with, development of components could commence. The first requirement was to create a news feed which would display all the information of the article to the user. To do this, the data must be retrieved from the database when the page renders. When the App component mounts, a `getFeed` function is called to query the articles collection and return all found documents as a list of objects. This object is stored in state as part of the App parent component.

A child component, `Feed`, is passed the article data as a prop. The `Feed` component provided an opportunity to implement a feature ideated from the results of Phase 1 and discussed in requirements. This was the inclusion of upcoming election details, represented by a high visibility container at the top of the `Feed` component.



Figure 18 Feed component, with instructions and upcoming election details.

The Feed component iterates through each article object in props and renders a FeedItem component with that iteration of article data passed as a prop. FeedItem will access each attribute of the data passed to it for rendering.

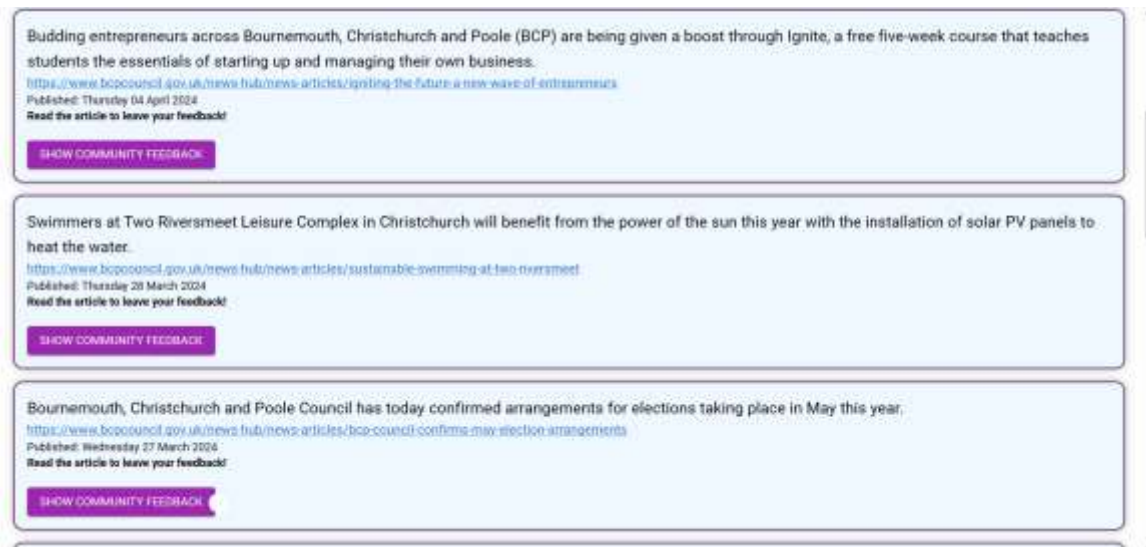


Figure 19 FeedItem component displaying article data.

While in development, console logs would print the details of the props objects, testing that data was being correctly passed between components and stored in state. Automated tests in Jest were also run, checking that page elements were rendering as expected using mock data.

```

BCPWebApp > src > _tests_ > JS Feed.test.js > ...
1  import React from 'react';
2  import { render, screen } from '@testing-library/react';
3  import Feed from '../components/Feed';
4
5  // Mock data for testing
6  const mockData = [
7    {
8      id: '1',
9      link: 'https://example.com/1',
10     description: 'Description for item 1',
11     dateTime: 'Published: Thursday 01 January 2024',
12   },
13   {
14     id: '2',
15     link: 'https://example.com/2',
16     description: 'Description for item 2',
17     dateTime: 'Published: Friday 02 January 2024',
18   },
19 ];
20
21 // Mock useFirestore hook
22 jest.mock('../firebase/useFirestore', () => ({
23   __esModule: true,
24   default: () => ({
25     getFeed: jest.fn().mockResolvedValue(mockData),
26   }),
27 }));
28

```

Figure 20 Code snippet of component test run with Jest.

Submit Feedback Form

A feedback form is rendered as part of the FeedItem component. The form will only be displayed to the user once the link to the article has been clicked. To track this, a state variable is created and set to false by default. A handleLinkClick function is set as the article links onClick effect and will set the state variable to true.

The FeedItem component will detect when this state variable is true and render the form. State variables are initialised along with handler functions for each form component, to hold entered data in state until the form is submitted.

The screenshot shows a web interface titled "News Feed". At the top, a yellow banner contains the text "Next election: Police and Crime Commissioner (2 May 2024)" and a link "Register to vote". Below this, a message states "To leave feedback, click the article link and return to this page." The main content area displays an article snippet: "Budding entrepreneurs across Bournemouth, Christchurch and Poole (BCP) are being given a boost through Ignite, a free five-week course that teaches students the essentials of starting up and managing their own business." It includes a URL, a publication date of "Thursday 5th April 2024", and a prompt to "Read the article to leave your feedback!". Below the article is a feedback form with the heading "I'd like to leave a:" and three radio button options: "Compliment", "Comment", and "Complaint". There is a "Your postcode:" field, a "Feedback:" text area, and a "Submitting characters: 0/50" indicator. A blue "SUBMIT FEEDBACK" button is at the bottom of the form. Below the form is a purple button labeled "SHOW COMMUNITY FEEDBACK".

Figure 21 Feedback form shown after link has been clicked by the user.

An onSubmit function handles form submission, validating the content of the form. The form data and article ID is passed to an addFeedback function that will validate the contents of the data passed to it. Data submitted by members outside of the BCP postcode areas will be rejected. The feedback will then be uploaded to a feedback sub collection of the article document. Error handling will return console logs for debugging.

Automated Jest tests check that the form elements rendered correctly, while manual checks through the firebase console monitored expected updates to the feedback collection of articles and content was shown/hidden as expected.

Feedback Display

When a FeedItem component is mounted it calls the fetchFeedback function to retrieve all the feedback of the article passed as a prop. This feedback would then be preserved in state to be accessed for display. However, this initially caused unforeseen issues in development.

Upon attempting to develop this feature, the interactions between rendering components, storing data in state and sending asynchronous requests when the component was mounted caused an infinite loop of renders of the FeedItem component. This in turn sent a huge number of requests to the database, causing it to crash. This was fixed by making a function with useEffect and an empty dependency array. This meant that feedback would only be requested once when the FeedItem component mounted, rather than any time state was updated. The feedback retrieved was stored in a state variable, to be passed to a Feedback component. To make sure that the user would be able to see their feedback once it had been submitted, the page was force reloaded upon feedback submission. This was because useEffect would only run once, so therefore new feedback wouldn't be retrieved unless the component was remounted.

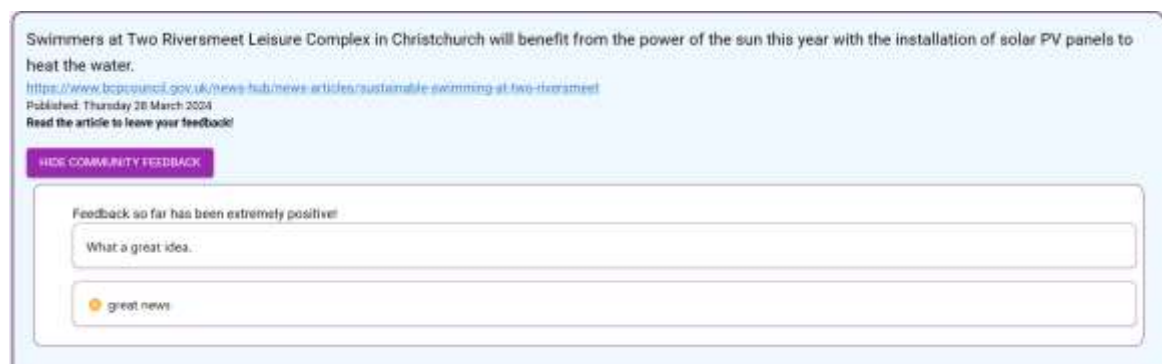


Figure 22 Feedback component showing feedback items.

A Show/Hide feedback button was used to display or hide the Feedback component. State was used to track the functionality of the button. The Feedback component received the list of feedback objects as props, before iterating through each object and passing a single feedback object to its' child component, FeedbackItem. FeedbackItem displayed the data passed to it as a prop.

Spending Data

DataDisplay acted as a wrapper component for three separate charts, GrossExpChart, GrossInc and NetBudget. Two buttons allowed the user to navigate to the Next or Previous chart, using state to track which chart was currently being shown.

```
const renderComp = () => {  
  switch (currComp) {  
    case 'netBudget':  
      return <NetBudget/>;  
    case 'grossExp':  
      return <GrossExpChart/>  
    case 'grossInc':  
      return <GrossInc/>  
    default:  
      return <NetBudget/>  
  }  
}
```

Figure 23 Switch statements to display chart.

A series of switch statements were used to display the chart that corresponded to the value in state. Imported components from recharts were used to display the data visualisations as pie charts. The data for each chart was hard coded into the component and had been taken from the latest BCP budget book at the time of development. Quality of life features such as legend and tooltips, when sections of the pie were hovered, were included to improve the display of information to the user.

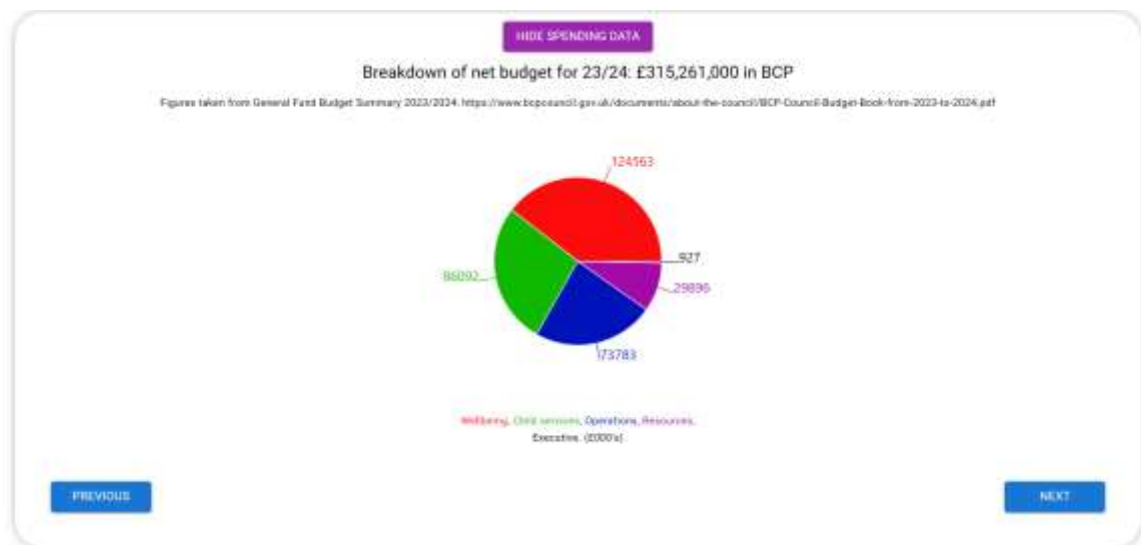


Figure 24 Pie chart showcasing NetBudget component.

The component could be shown or hidden from view via a button, which used state to track its' status. Tests using Jest were completed to check all chart features rendered correctly.

Feedback Sentiment

The feedback sentiment feature was designed to calculate the percentage of comments, compliments and complaints that had been submitted as feedback. This would then render a summary of the general attitude that the community had towards that topic or article.

Budding entrepreneurs across Bournemouth, Christchurch and Poole (BCP) are being given a boost through ignite, a free five-week course that teaches students the essentials of starting up and managing their own business.

<https://www.bcprouncil.gov.uk/news-hub/news-articles/igniting-the-future-a-new-wave-of-entrepreneurs>

Published: Thursday 04 April 2024

Read the article to leave your feedback!

HIDE COMMUNITY FEEDBACK

Feedback so far has been extremely positive!

Great, easy to use and informative. Just what's needed!

What a great idea, investing in the future

This sounds amazing - I hope the students enjoy it!

Cracking stuff!

Great idea!

Figure 25 Feedback sentiment feature in Feedback component.

```
const sentiment = () => {
  const total = numCompliments + numComplaints + numComments;
  const totalPosCom = numCompliments + numComments;
  const totalNegCom = numComplaints + numComments;
  // Calculate the percentage difference
  const positiveExcessPercentage = (numCompliments - totalNegCom) / total;
  const negativeExcessPercentage = (numComplaints - totalPosCom) / total;
  console.log(positiveExcessPercentage);
  console.log(negativeExcessPercentage);

  if (numCompliments === numComplaints && numComplaints === numComments) {
    return "split";
  } else if (positiveExcessPercentage > 0) {
    if (positiveExcessPercentage > 0.66) {
      return "extremely positive!";
    } else if (positiveExcessPercentage > 0.33) {
      return "very positive!";
    } else if (positiveExcessPercentage > 0.15) {
      return "positive!";
    } else {
      return "slightly positive!";
    }
  } else if (negativeExcessPercentage > 0) {
    if (negativeExcessPercentage > 0.66) {
      return "extremely negative!";
    } else if (negativeExcessPercentage > 0.33) {
      return "very negative!";
    } else if (negativeExcessPercentage > 0.15) {
      return "negative!";
    } else {
      return "slightly negative!";
    }
  } else {
    return "neutral";
  }
};
```

Figure 26 Code snippet of sentiment calculations.

To calculate this sentiment, the sum of compliments and comments was subtracted from the number of complaints. While the sum of complaints and comments was subtracted from the number of compliments. These figures were divided by the sum of total feedback received. This provided the excess percentage of positive or negative feedback.

If the number of comments, complaints and compliments was equal then sentiment was “split”. If the number of compliments was higher than the sum of comments and complaints, then the positiveExcessPercentage would be greater than 0. The varying degrees of which would correspond to the returned message. The same process was done if the number of complaints was higher than the sum of compliments and comments.

Header and Footer

The header forms the title banner of the website and contains the link to the survey. It also contains the links to all BCP social media accounts.



Figure 27 Header component.

The footer contains the purpose statement of the application and a contact email address.

User Interface

The development of the user interface used the wireframes produced as the blueprint of both site layout and component design. Material UI (MUI) provided a React component library that was utilised to deliver a clear and effective UI.

The Box component was used as an alternative container to the <div> tag, allowing the grouping of other MUI components within. Typography allowed consistency across all text elements, with flexibility to style individual elements where appropriate and necessary.

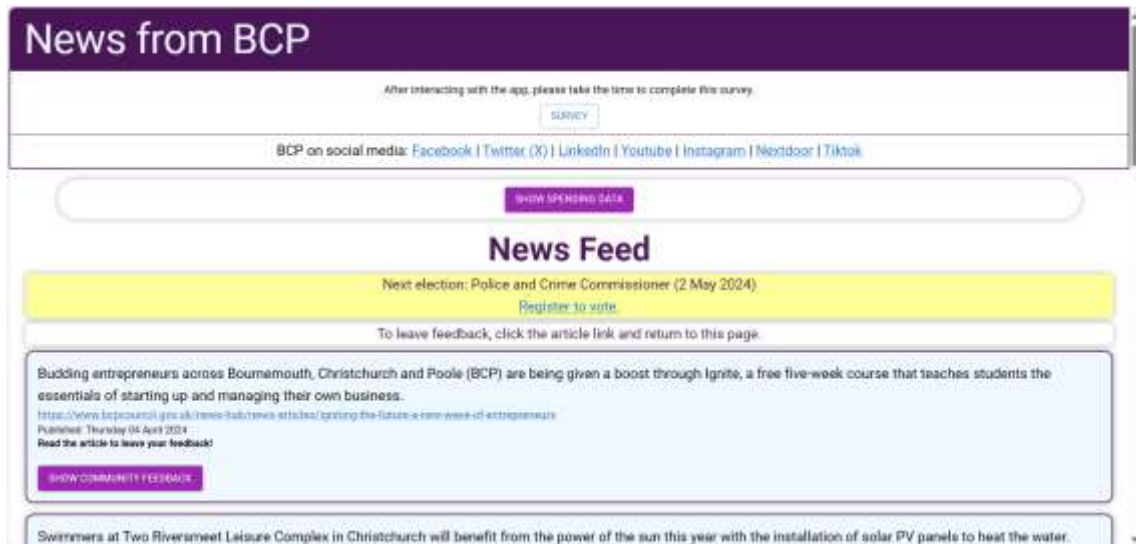


Figure 28 Final UI design of web application.

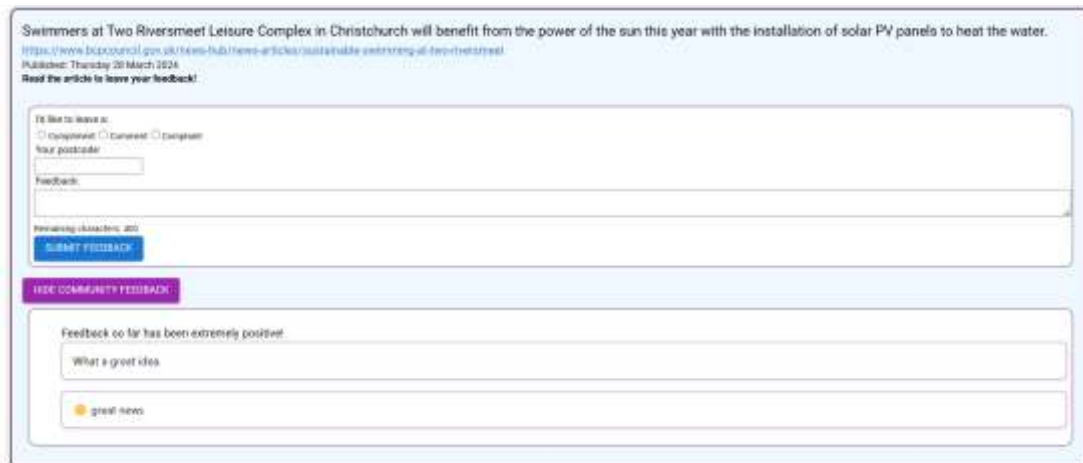


Figure 29 Final design of FeedItem and Feedback components.

Each component could be styled using in-line styling to create a design that was reactive to window size, allowing users the ability to use the same features of the application regardless of device. CSS files were still used, to set defaults

across the <body> tag of the application. Features of the UI were tested using a combination of automated Jest tests and manual tests, checking that components and elements rendered correctly and responded as expected when interacted with.



Figure 30 User interface on simulated mobile browser.

Deploying the Application

With development complete and testing passed, the web application was deployed. As Firebase was installed already, installing the Firebase CLI, console line interface, allowed the interaction with Firebase's deploy tools. Logging into Firebase, the Firebase base project was connected to the local depository and root folder specified. Using the deploy command, the application was

deployed to Firebases' hosting service. The Firebase Spark plan allowed for free hosting with CRUD limits and a cap on data storage, the parameters of which were deemed more than necessary.

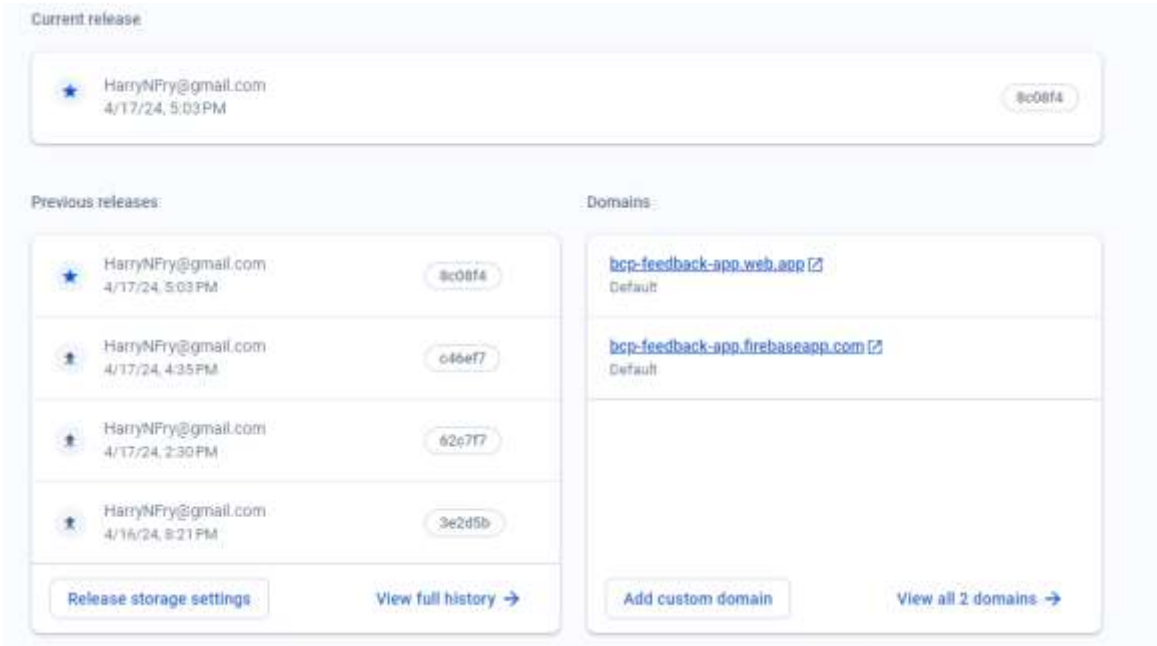


Figure 31 Deployment snapshots.

Version history could be monitored through the Firebase console, as several iterations of the final artefact were deployed prior to distributing to participants for phase 3, product interaction.

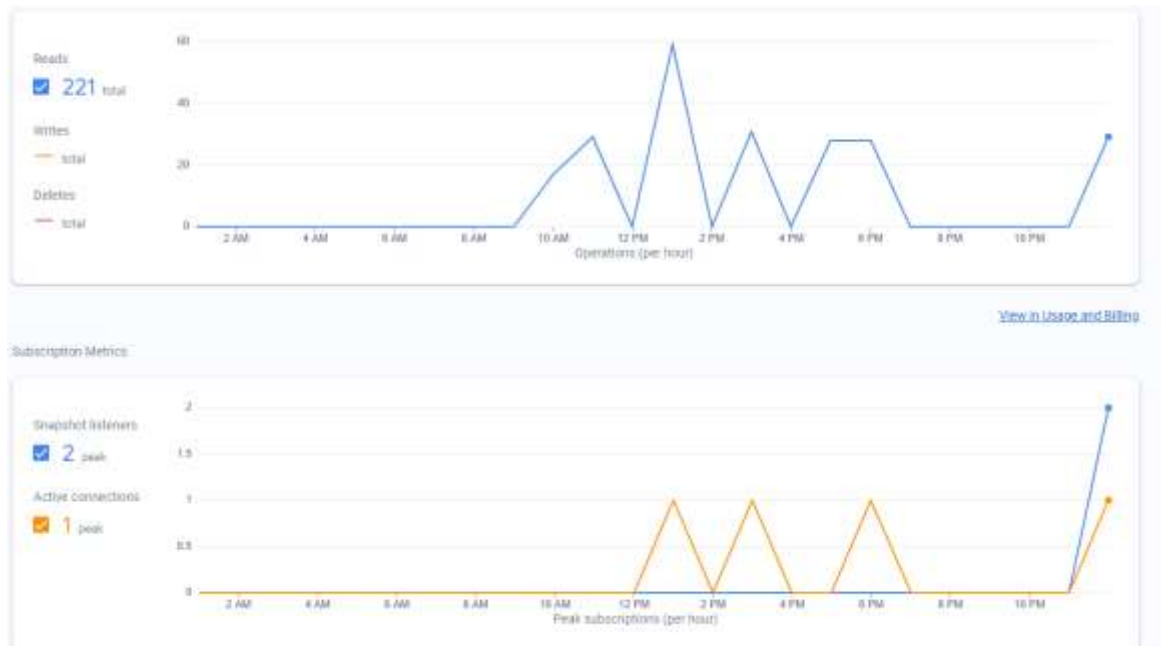


Figure 32 Firestore usage metrics for monitoring.

Usage metrics were viewable through the Firebase console, allowing the application to be monitored throughout phase 3.

6. Results

Phase 1

The phase one survey received a total of 16 responses. Young adults, 30 and under, formed most respondents. No one in the 31-45 age range responded to participate in phase 1. 50% of respondents were full time employed, 25% were students. 88% of respondents had lived in the BCP area over 13 years. Respondents were split 50/50% on having previously voted in a local election.

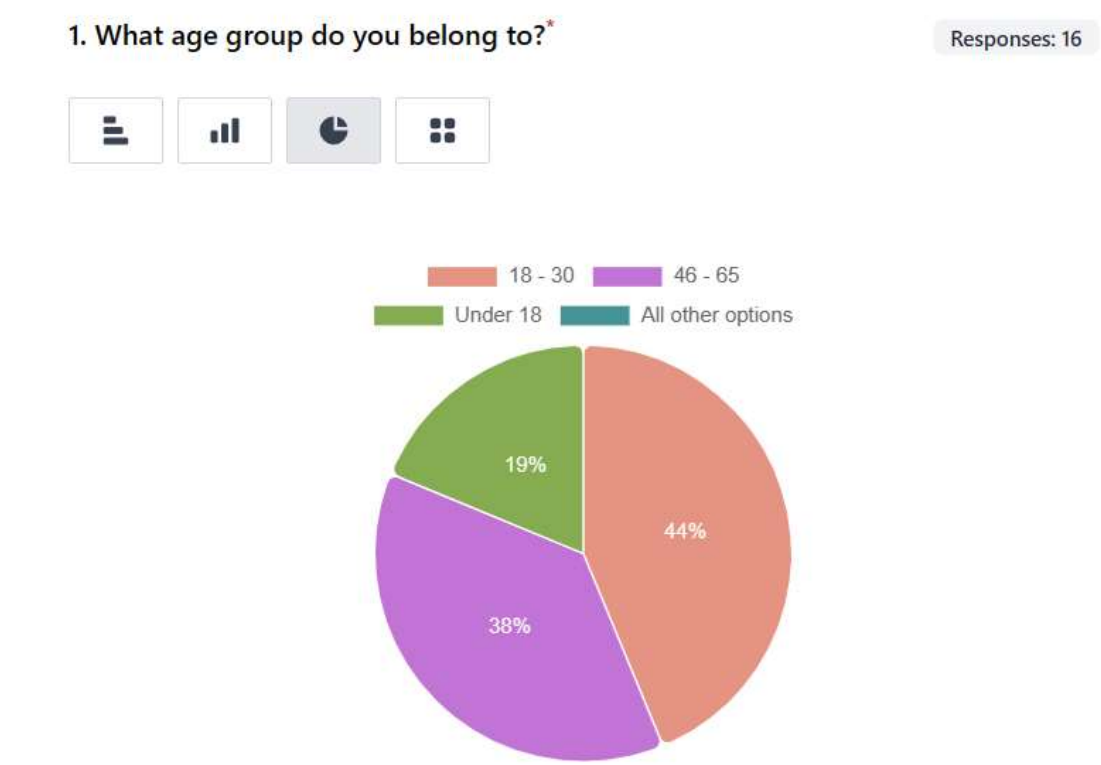


Figure 33 Phase 1 respondents by age demographic.

Participants using technology to access news from BCP used social media websites more regularly, on average, than any other technology. Participants accessed BCP news directly via the source the least on average and through local news websites the most.

Technology	Average 1 - Never, 2 - Rarely, 3 - Occasionally, 4 - Regularly
Social media websites	2.31
Social media apps	2.25
Local newspaper	2.06
Local news website	2.44
Search engines	2.13
BCP website	1.94

On average, respondents disagreed that they receive communications from BCP about accomplishments. On a 5-point scale, those in the 18-30 age range had the lowest average score on ease of providing feedback, 2.43. The average sentiment for receiving election information was highest in 46-65-year-olds but was subsequently reduced in 18-30 and reduced further in under 18s. No one agreed with the statement that they felt informed about current local issues.

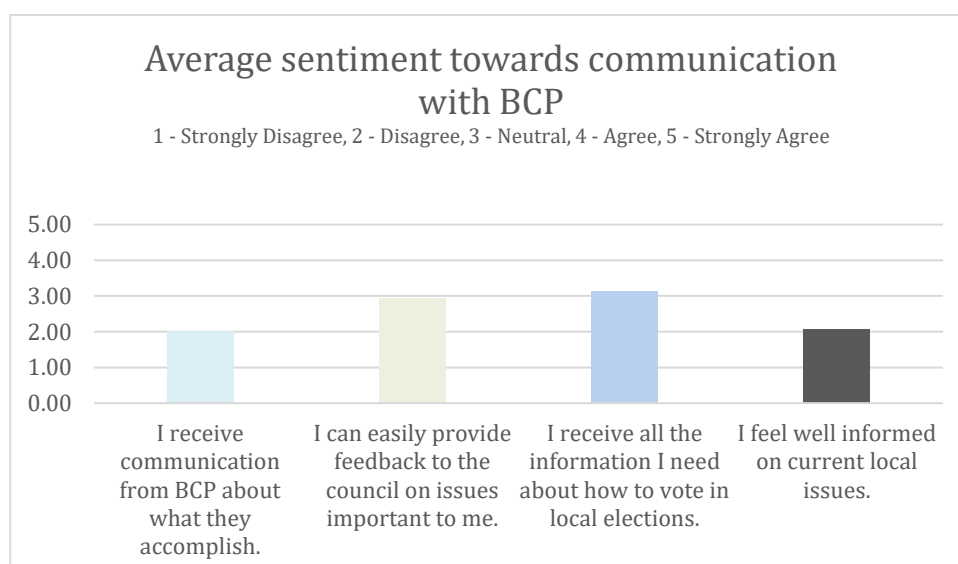


Figure 34 Chart showing average sentiment towards BCP communication.

Using a 4-point scale, participation in political behaviours and events on average were low. The 2 outliers in this category were searching for BCP news and offline discussion. Offline discussion’s most frequent answer was Occasionally.

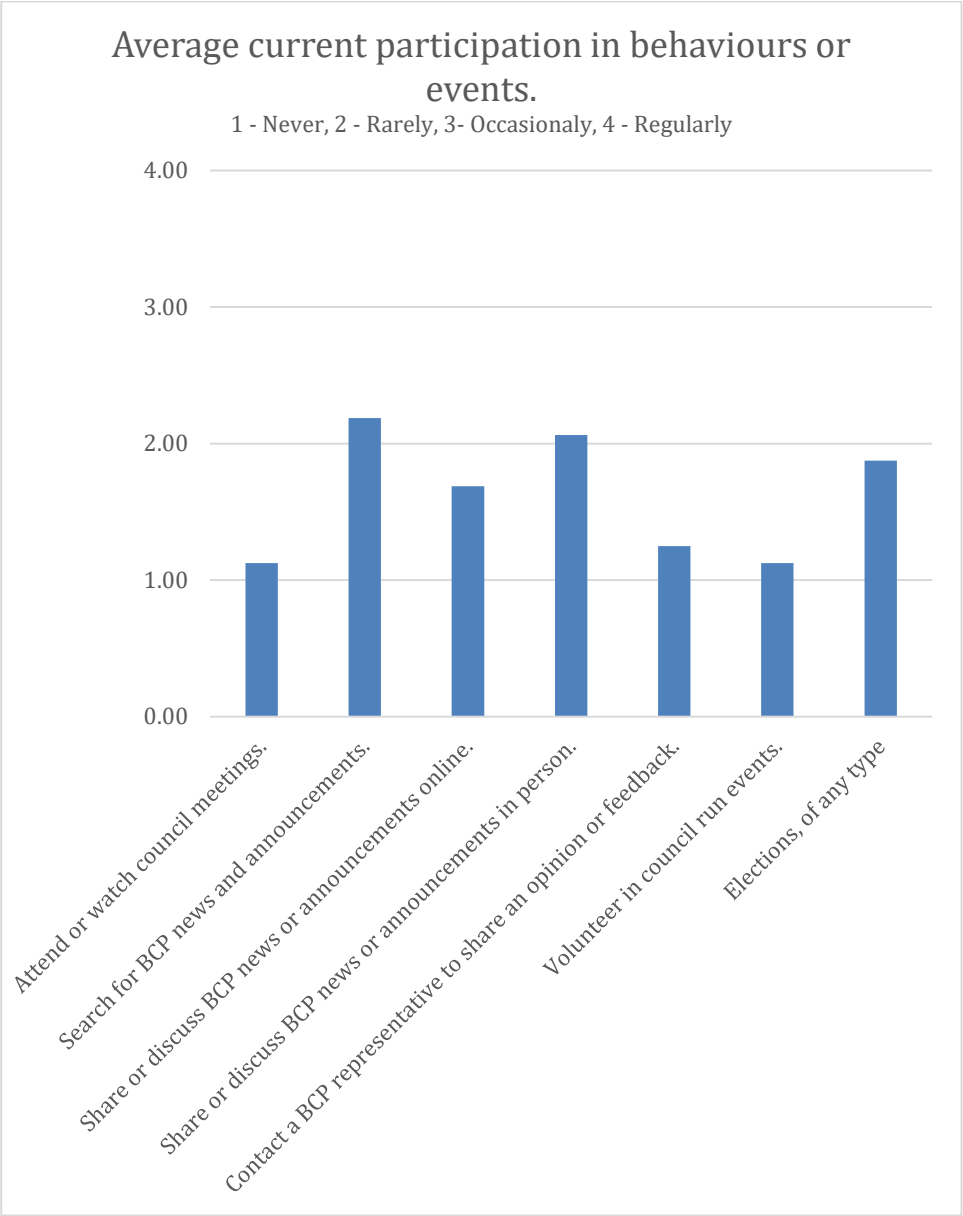


Figure 35 Average participation in political behaviours and events.

When asked how often they participate in elections, 63% of all respondents answered Never, with 19% answering Regularly. This is separated into age demographics:

Age	Median 1 - Never, 2 - Rarely, 3 - Occasionally, 4 - Regularly	Average 1 - Never, 2 - Rarely, 3 - Occasionally, 4 - Regularly
<18	1 (Never)	1.33
18-30	1 (Never)	2.14
46-65	1 (Never)	1.83

When asked how likely it was that they would participate in the next local election, using a 5-point scale, the average response of all respondents was 3.81, the median was 4 and mode 5. When separated by demographics:

1 - Very Unlikely, 2 - Unlikely, 3 - Neutral, 4 - Likely, 5 Very likely

Age	Median	Mode	Average
<18	4	4	3.67
18-30	2	2	3.14
46-65	5	5	4.67

Employment	Median	Mode	Average
Student	4.5	5	4.25
Full-time	3	2	3.25
Other	4.5	5	4.5

Residence in BCP	Median	Mode	Average
<4	2	2	2
5-12 years	2	2	2
13-24 years	4	4	3.75
25+	5	5	4.2

Previously voted	Median	Mode	Average
Yes	5	5	4.6
No	2.5	2	3

None of the respondents agreed with the statement “My opinion matters to BCP”. On average, participants felt more likely to vote when feeling informed or heard.

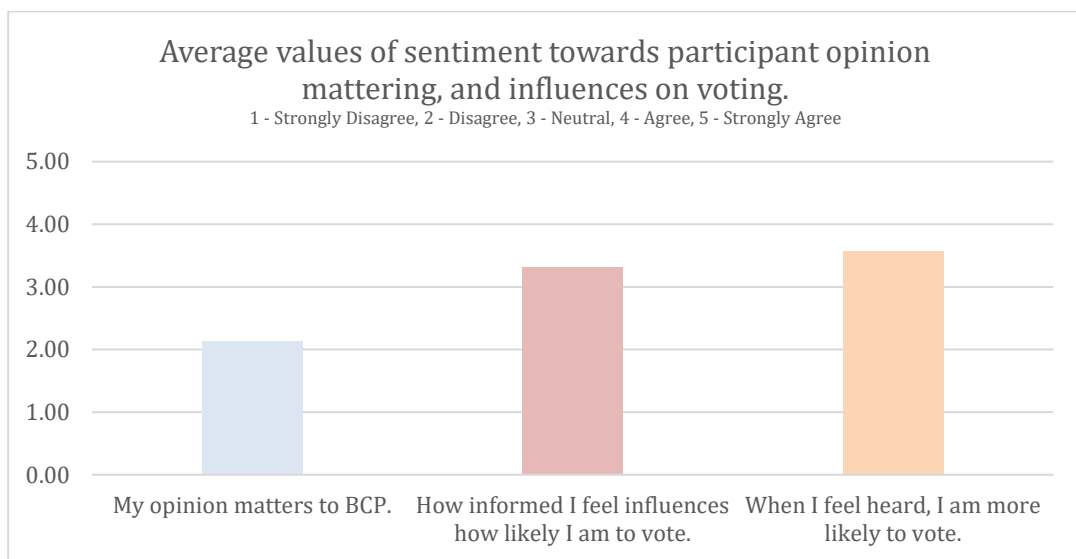


Figure 36 Chart of sentiment towards opinion value and voting influences.

69% of participants responded that a web application focused on communication BCP activity would improve how informed they felt towards local issues. 75% of participants responded that an application allowing them to provide feedback on BCP activity would make their opinion feel more valuable.

Phase 3

The application was distributed to participants, prior to being surveyed in phase 4. They could interact with the site in their own time and without demonstration. Participants were noted to only be leaving feedback on most recent articles.

Responses were received from 2 of the councillors contacted for comment. Councillor 1, who wished to remain anonymous, expressed an aversion to apps but did provide insights into levels of proactive engagement of the community. It was their opinion that it is only controversial topics that see community engagement (Appendix E).

Councillor 2, Millie Earl, portfolio holder for connected communities, responded very positively to the web application. She noted current political apathy and disenfranchisement in communities and making information easier to access directly through the source, rather than local media, is a welcome way to improve engagement (Appendix F).

Phase 4

The response rate to the phase 4 was lower than in phase 1, with 8 total respondents to the survey. These responses came from multiple demographics with the highest number of respondents, 63%, in age were young adults in the 18-30 range. No one in the under 18 age range responded to the survey. 88% of respondents were in full-time employment. 75% of respondents had resided in BCP for over 13 years. 75% of respondents had previously voted in a local election. 100% of respondents had never submitted feedback to BCP through their official website. As the sample size was smaller than phase 1, respondents would remain grouped together.

Participants agreed on average that the application made communications easy to locate, that they were more aware of local issues and that feedback could be left easily on issues that the felt were important to them.

Participants trended slightly above responding neutrally to feeling informed about the next election, with no response disagreeing.

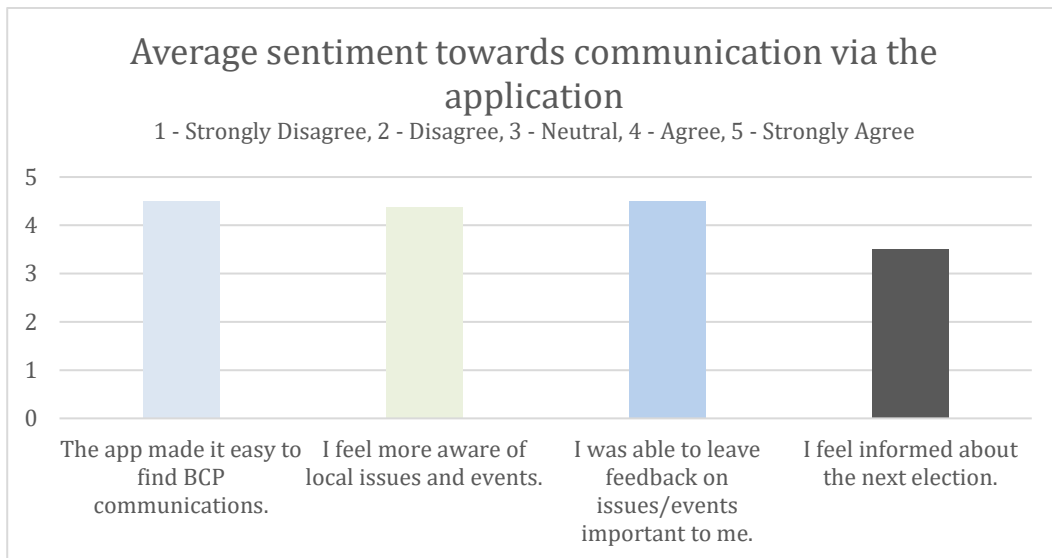


Figure 37 Average sentiment towards communication via the application.

Results of post application interest in behaviours saw positive interest on average to most political behaviours. However, attending or viewing council meetings received no positive interest. Searching for BCP news and announcements saw the most positive response, with all but one respondent answering 4 or 5.

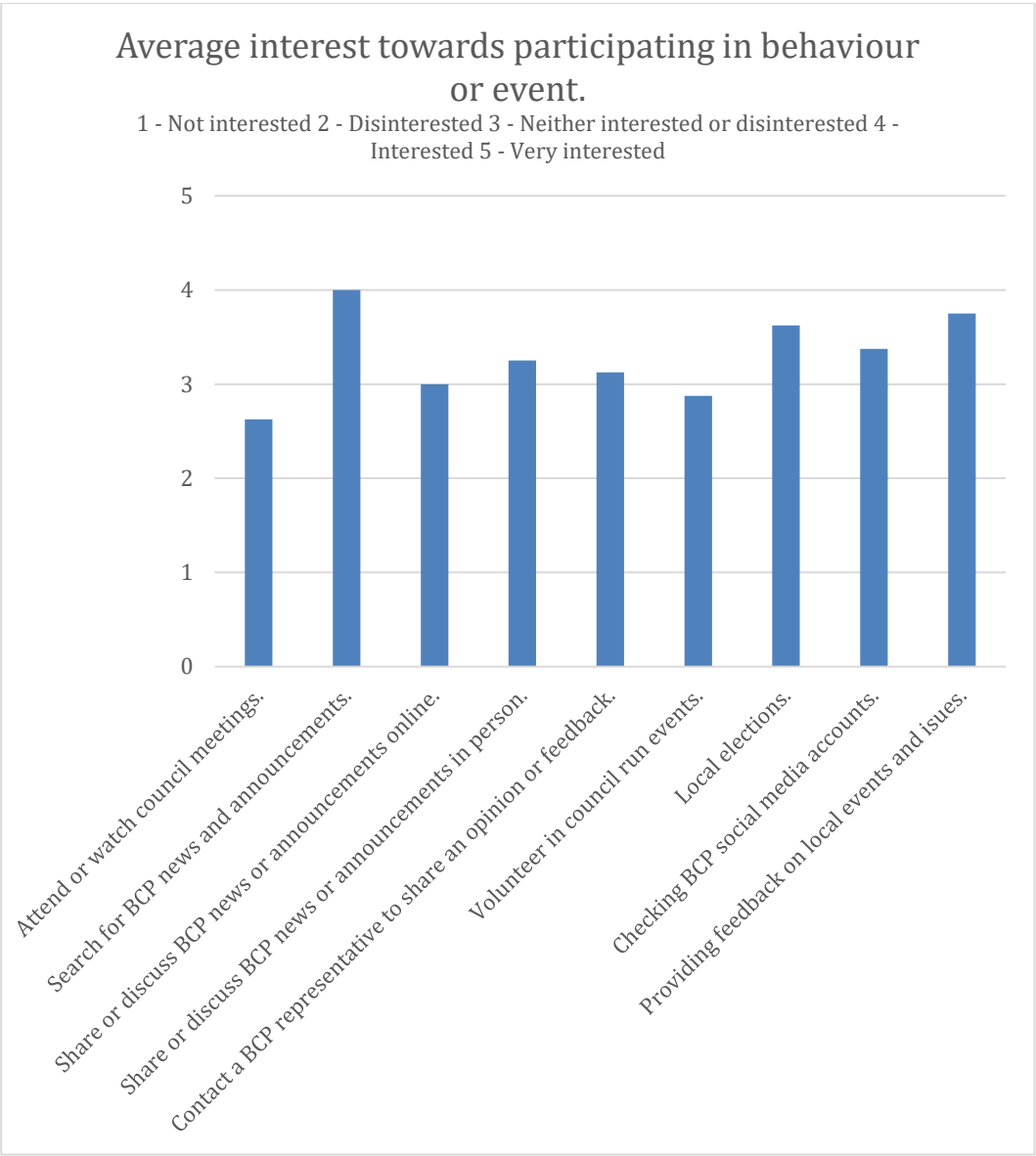


Figure 38 Average interest in behavioural participation post application use.

The participation data of the respondents was standardised through the removal of the neutral option, 3, and shifting each response of 3 or above down by 1 to conform to a 4-point scale, as was used in phase 1. For example, a participant answering that they were very interested (4) would perhaps occasionally (3) participate. This would provide an indication of how interest would translate to actual participation.

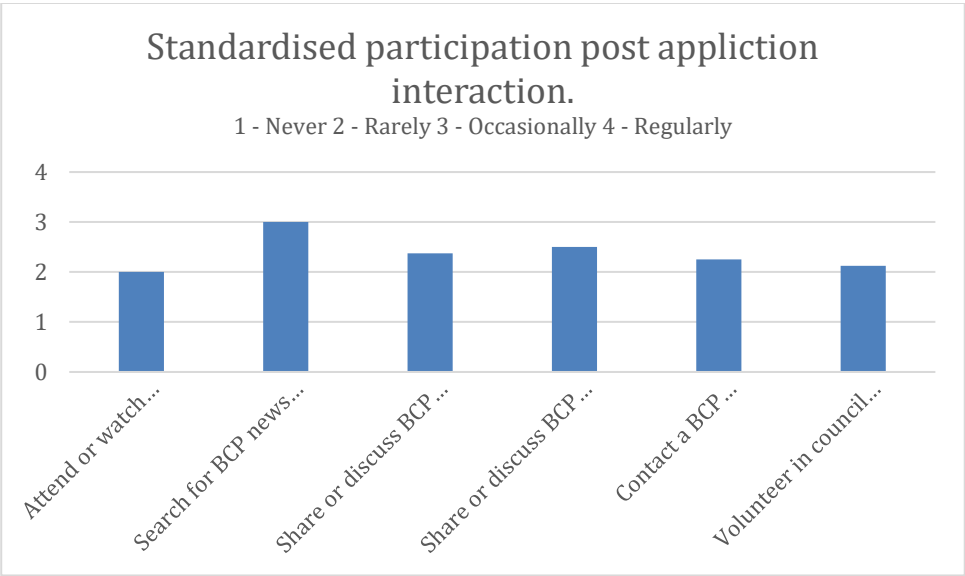


Figure 39 Standardised results of phase 4 participation to a 4-point Likert scale.

Interaction with the application saw participants respond positively towards features. Sentiment towards political participation, engagement and election information skewed positively. Communication features were also received positively, no participant disagreed with the statements towards application interaction.

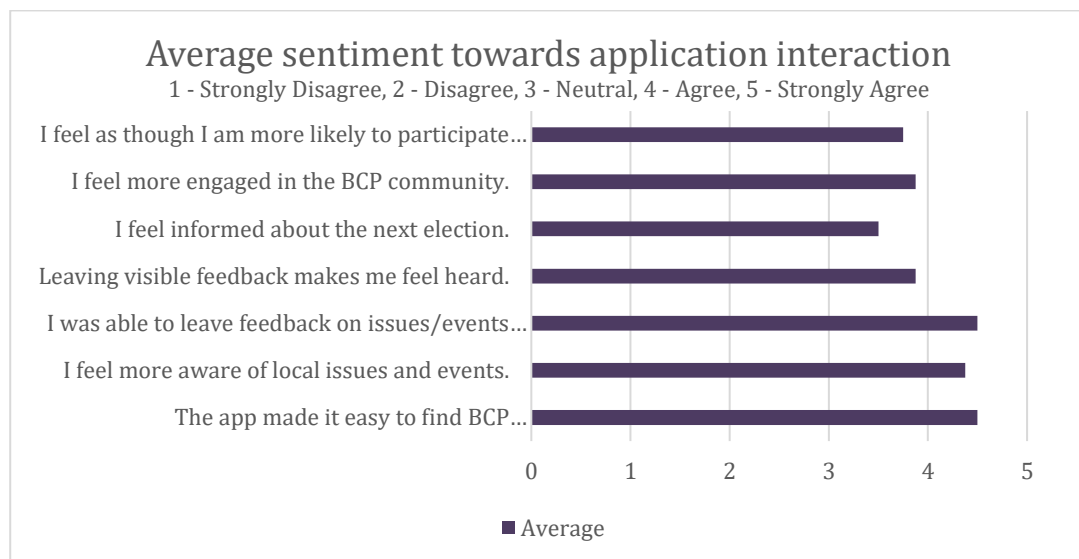


Figure 40 Average sentiment towards interaction with the application.

The effect of other people's feedback on the participant's own opinion was undetermined, with most participants answering neutrally. Participants responded that having to access the article before being allowed to leave feedback made them feel more informed on the topic. The method of feedback delivery was also received positively, as respondents on average agreed that they were able to leave the exact type of feedback they wanted to.

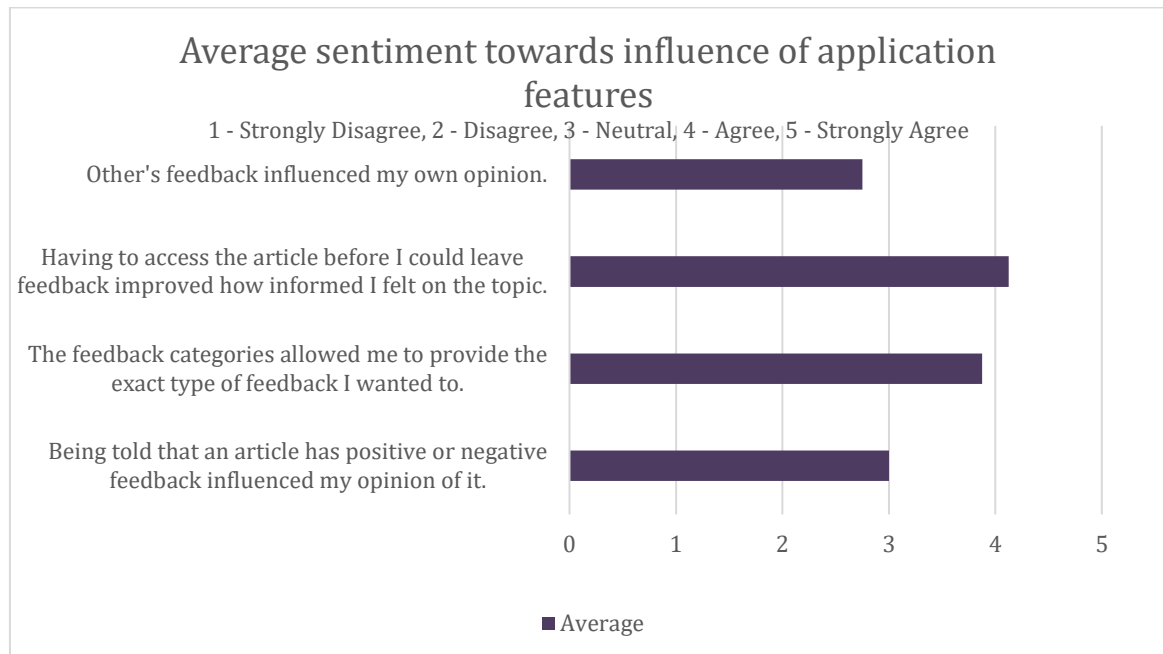


Figure 41 Average sentiment towards influence application features had.

When asked if participants would continue to use an application that operated in this way, 100% of respondents answered yes.

Phase 5, Comparison and Analytical Discussion of Results

As the sample size decreased for phase 4, so did the potential demographic data. The 18-30 demographic was the least changed in sample size, whereas 46-65 and under 18s saw a large reduction in population. This reduction did not overly modify the distribution of demographics that have resided in the BCP area, as over 25 years remained the largest, with 13-24 years second. The reduction in older participants may be due to the added interaction with the application of phase 3, where the cost of effort was too high prior to the survey in phase 4. A major demographic shift was in participants that had voted before in local elections. 75% had voted in phase 4, versus 50% from phase 1. This shift may be due to participants who are willing to take part in a political study are already more likely to indulge in the political process of voting.

The technology usage gathered in phase 1 showed that there is a precedent for using websites and applications as a tool to interact with BCP council news. As there is an audience using this technology, it aids the justification of developing a web application for communication and engagement.

Participant sentiment towards the communication tools at their disposal to receive information from the council show that there can be improvements made by the council to inform residents about their accomplishments. Equally, the sentiment towards feedback tools shows that participants believe that providing feedback is not as easy as it should be. After interacting with the web application, an increase in the attitude towards communication was recorded. This showed how sentiment towards communication methods between participant and council can be improved with the right tools.

After interacting with the web application, participants showed a positive level of interest towards participating in most political behaviours in phase 4.

Participating in searching for BCP council news saw the highest interest, with local elections and discussion on and offline following. Compared to phase 1, where actual current levels of participation were low. The positive response to the applications function show how participants can be engaged with tools that can provide effective communication between the council and themselves.

Providing these communication tools should be important to the council, as it was noted through phase 1 and 4 that participants feel more likely to vote when they feel their opinions are valued and voices are heard. On average, participants also felt more likely to vote when they feel well informed about local issues.

The responses from councillors in phase 3 were mixed, with councillor 1 sceptical that routing council news would not receive traction with the public. However, Cllr Mille Earl's comments clearly recognise the potential that direct communications can have with engagement in the community. Development of these tools to communicate not just council news and feedback but recognising the opinions of the community may create a positive feedback loop where the community feels valued and is thus more likely to be engaged politically.

Through the standardisation of participation results, the potential increase in participation if the responses translate into behaviours can be loosely predicted. This standardisation does not create a true representative view into actual behaviours as the participants of phase 4 were asked about their interest in participating. However, if the improved interest in political participation can be maintained and encouraged then it could be used an indication of how participants may be more likely to be politically engaged in the community.

Statement	Standardised phase 4	Phase 1	Difference	% change
Attend or watch council meetings.	2.00	1.13	0.87	43.50
Search for BCP news and announcements.	3.00	2.19	0.81	27.00
Share or discuss BCP news or announcements online.	2.38	1.69	0.69	28.84
Share or discuss BCP news or announcements in person.	2.50	2.06	0.44	17.60
Contact a BCP representative to share an opinion or feedback.	2.25	1.25	1.00	44.44
Volunteer in council run events.	2.13	1.13	1.00	46.82

When comparing changes in voting behaviour, participants of phase 1 were asked for their participation rate in elections, of any type. 18-30 on average were the most regular voters, but total participation rates were low, with 63% of respondents saying they do not participate in elections, 13% occasionally and 19% regularly.

This contrasts with the information supplied in the demographics section, where 50% said they had previously voted in a local election. This raises an interesting point, what does the participant believe is participation in voting? Perhaps differing views on what constitutes an active role in political participation can lead to confusing results. Future research may wish to consider including more specific questions on voting patterns to provide clarity to the participant. One such question included in the survey was the likelihood of voting in the next local election.

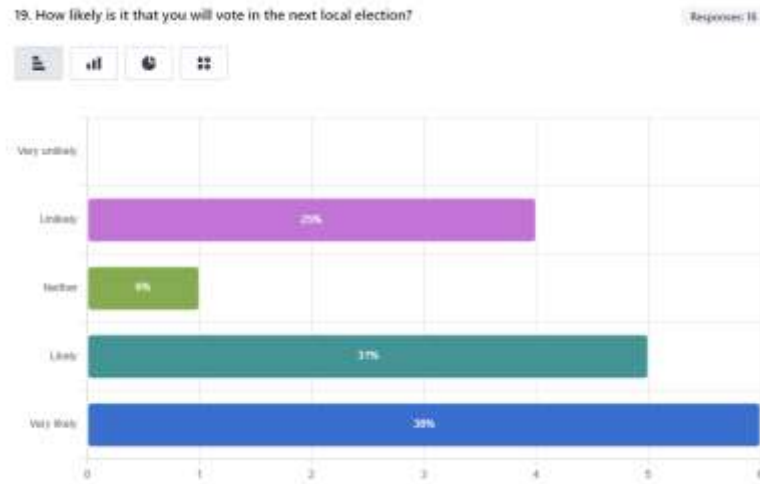


Figure 42 Likelihood of voting in the next local election.

Here we can see the change in potential voting participation once more, where 69% responded that they are likely or very likely to vote in the next local election. These figures may be representative of wider attitudes towards voting, where a majority feel likely to vote, but there may be reasons that stop them participating on election days. After interacting with the web application, the results suggest that interest in local elections, specifically, did not see an overly large amount of participation interest. However, the lack of disinterested responses may indicate that the tools provided by the web application could have the effect of reducing disenfranchisement towards local elections.



Figure 43 Interest in local elections after interaction with the web application.

7. Conclusions

Evaluation of project

The project methodology laid out a 5- phase process to gather data, develop an application and conduct analysis, project management outline the means and tools to deliver the project. Even though risk mitigation was in place for phase 4, a reduction in participation was observed with the loss of certain demographics taking part. Young adults, 18-30, were the largest demographic that completed phases 1 and 4, suggesting that as they were the most responsive the proposed web application may be most effective at engaging those in this age band. The results of phase 1 and phase 4 were comparable as an indication of future participation and engagement. However, interest in future participation in voting cannot be proven as a direct translation to real participation during the project without an election occurring and asking if the participant voted.

Evaluation of web application

When asked about their interactions with the web application, the responses about features were very positive. Participants found BCP communications easy to find and felt more informed, they could leave feedback and leaving said feedback made them feel heard. After using the application, 88% of participants felt more engaged in the BCP community, and 75% felt more likely to participate in the next election. All participants agreed that accessing the article made them feel more informed on the topic, a statement that Cllr Millie Earl mirrored in recognising the value of the public interacting with the source of information.

The application appears to improve willingness to interact with communication channels, with participants showing interest in providing feedback in the future

and in utilising BCP social media accounts as a source of information. 100% of participants that interacted with the application stated that they would continue to use an application that provided the same tools. As such, the application could be considered a success, as it performed its intended aim to improve communication and community engagement.

Conclusion

The use of a web application, designed as such, to improve how communication is conducted between the local council and residents of its' wards appears to be a currently untapped resource of community engagement, especially in young adults who appear to be most responsive to this technology. Users of the web application appeared to feel more informed, engaged and interested in the local community and in participating in political behaviours. By leaving feedback visible to the council, participants appeared to feel as though their voice was heard. Through more consistent use, a more engaged community could benefit the local council too, as users are more willing to provide feedback on issues important to them. Interest in participating in voting, while higher than current turnout percentages, is indeterminate in translating directly to participation. However, a cycle of local councils being responsive to community feedback, providing clear communication methods and re-engaging residents in the political process may foster an environment where voter turnouts increase.

8. Recommendations

Project recommendations

When conducting further research using this methodology, modifications to the survey process could be made. The surveys used were designed to be concise, aiming to retain the participant throughout multiple phases, 1, 3 and 4.

However, questions about election participation could be expanded, asking about specific elections and more in-depth voting history for example. The Likert scales used could also be modified, using a consistent scale, which would remove the need for standardisation of results.

Distribution could also be modified to gather data from a larger sample size. If this received support from the local council, they may provide resources to gather data from a larger and more diverse population. As such, it may be beneficial to reach out to councillors earlier in the project.

Web application recommendations

The web application could be developed further, with a future component already in place for an iframe to embed BCP council's YouTube channel latest video. This can be expanded to include the latest content from all social media accounts. Designing a filter system to search for specific topics in the articles would allow users a more customisable experience with the communication they find important. Features that were recommended by users include the expansion of the spending chart feature, to provide further breakdown of sector spending, as well as notifications when a new article is published.

If deployed to the wider public, as a tool used by the council, additional security features would have to be added. Users would have to be authenticated, as bad faith actors could manipulate feedback otherwise.

Councils use authentication towards their advantage as personal information, like the ward users live in, could be used to track sentiment towards topics by location or even demographic.

9. Reference list

BARTLETT, J. and H. GRABBE, 2015. *E-democracy in the EU : the opportunities for digital politics to re-engage voters and the risks of disappointment*.

Working Paper [viewed 16 February 2024]. Available from:

<https://cadmus.eui.eu/handle/1814/38765>

BATEMAN, J. and T. DALE, 2021. *Election 2021: Why is turnout so low in one Hull ward?* - BBC News [viewed 18 April 2024]. Available from:

<https://www.bbc.co.uk/news/uk-england-humber-56735787>

BCP COUNCIL, 2019a. *General elections (elections to the UK Parliament) results (12 December 2019)* [viewed 3 May 2024]. Available from:

<https://www.bcpCouncil.gov.uk/councillors-committees-and-elections/elections-and-voting/past-election-and-referendum-results/general-elections-elections-to-the-uk-parliament-results-12-december-2019>

BCP COUNCIL, 2019b. *Local and Parish Council election results (2 May 2019)* [viewed 18 April 2024]. Available from:

<https://www.bcpCouncil.gov.uk/councillors-committees-and-elections/elections-and-voting/past-election-and-referendum-results/local-and-parish-council-election-results-2-may-2019>

BCP COUNCIL, 2023. *Local and Parish Council election results (4 May 2023)* [viewed 16 February 2024]. Available from:

<https://www.bcpCouncil.gov.uk/councillors-committees-and-elections/elections-and-voting/past-election-and-referendum-results/local-and-parish-council-election-results-4-may-2023>

CAMPANTE, F., R. DURANTE and F. SOBBRIO, 2018. Politics 2.0: The Multifaceted Effect of Broadband Internet on Political Participation. *Journal of the European Economic Association*, 16(4), 1094-1136

GAVAZZA, A., M. NARDOTTO and T. VALLETTI, 2019. Internet and Politics: Evidence from U.K. Local Elections and Local Government Policies. *The Review of Economic Studies*, 86(5 (310)), 2092-2135

GIBSON, R. and M. CANTIJOCH, 2013. Conceptualizing and Measuring Participation in the Age of the Internet: Is Online Political Engagement Really Different to Offline? *The Journal of Politics*, 75(3), 701-716

GIBSON, R.K., W. LUSOLI and S. WARD, 2005. Online Participation in the UK: Testing a 'Contextualised' Model of Internet Effects. *The British Journal of Politics and International Relations*, 7(4), 561-583

GOV UK, 2010. *Building the Big Society* [viewed 3 May 2024]. Available from: <https://www.gov.uk/government/publications/building-the-big-society>

GOV UK, 2022. *Levelling Up the United Kingdom* [viewed 3 May 2024]. Available from: <https://www.gov.uk/government/publications/levelling-up-the-united-kingdom>

LOCAL GOVERNMENT FINANCE ACT 1988, CH 41, SS.114.

HIRZALLA, F. and L. van ZOONEN, 2011. Beyond the Online/Offline Divide: How Youth's Online and Offline Civic Activities Converge. *Social Science Computer Review*, 29(4), 481-498

HODDINOTT, S., 2023. *Local government section 114 (bankruptcy) notices* [viewed 19 April 2024]. Available from: <https://www.instituteforgovernment.org.uk/explainer/local-authority-section-114-notice>

LOCAL GOVERNMENT ASSOCIATION, 2024. *Building council and place narratives* | Local Government Association [viewed 2 May 2024]. Available from: <https://www.local.gov.uk/our-support/communications-and-community-engagement/building-council-and-place-narratives>

PALESE, M., 2022. Democracy Made in England Where Next for English Local Government?

PIZER, L., n.d. *EAST GOSCOTE'S MOBILE APP - IS THIS A PARISH COUNCIL FIRST?*

POTTS, L. and T. EDINGTON, 2021. What is council tax, how much has it gone up, and how is it calculated? [viewed 18 April 2024]. Available from: <https://www.bbc.co.uk/news/uk-politics-55765504>

SMETS, K., 2014. *VUK0021 - Evidence on Voter engagement in the UK* [viewed 16 February 2024]. Available from: <https://committees.parliament.uk/writtenevidence/48776/html/>

UBEROI, E., 2024. *Turnout at elections* [viewed 16 February 2024]. Available from: <https://commonslibrary.parliament.uk/research-briefings/cbp-8060/>

WILLETT, J. and J. CRUXON, 2019. Towards a participatory representative democracy? UK Parish councils and community engagement. *British Politics*, 14(3), 311-327

ZHURAVSKAYA, E., M. PETROVA and R. ENIKOLOPOV, 2020. Political Effects of the Internet and Social Media. *Annual Review of Economics*, 12(1), 415-438

10. Bibliography

ABRAMOV, D., 2021. *Running Tests | Create React App* [viewed 26 April 2024]. Available from: <https://create-react-app.dev/docs/running-tests/>

ALHASSAN, I. *et al.*, 2023. THE LIKERT SCALE: EXPLORING THE UNKNOWNNS AND THEIR POTENTIAL TO MISLEAD THE WORLD

APPLETON, J., 2022. *Week 5: Introduction to Testing* [viewed 18 April 2024]. Available from: https://joeappleton18.github.io/devops_2022_2023_notes/week-5/#lesson-dependencies-%F0%9F%94%A8

BABE;, 2024. *What is Babel? · Babel* [viewed 26 April 2024]. Available from: <https://babeljs.io/docs/>

BCP COUNCIL, 2019. *No Party Takes Overall Control In First Ever BCP Council Local Elections* [viewed 18 April 2024]. Available from: <https://www.bcpCouncil.gov.uk/news-hub/news-articles/no-party-takes-overall-control-in-first-ever-bcp-council-local-elections>

BCP COUNCIL, 2024. *Executive posts* [viewed 18 April 2024]. Available from: <https://democracy.bcpCouncil.gov.uk/mgResponsibilitiesIndex.aspx?type=x&bc r=1>

COM422 23/24 W1.3 - Venv, 2023 [film] [viewed 18 April 2024]. Available from: <https://www.youtube.com/watch?v=oQY7vLFbl3s>

COM422 23/24 W2.1 - Unit Testing, 2023 [film] [viewed 18 April 2024].

Available from: https://www.youtube.com/watch?v=mzGA5_MBLm0

COPEs, F., 2020. *React for Beginners - A React.js Handbook for Front End Developers* [viewed 26 April 2024]. Available from:

<https://www.freecodecamp.org/news/react-beginner-handbook/>

GEEKSFORGEES, 2021. *Python Web Scraping Tutorial* [viewed 18 April 2024].

Available from: <https://www.geeksforgeeks.org/python-web-scraping-tutorial/>

GOOGLE, 2024. *Firestore | Firebase* [viewed 18 April 2024]. Available from:

<https://firebase.google.com/docs/firestore>

JEST, 2024. *Jest* [viewed 26 April 2024]. Available from: <https://jestjs.io/>

JISC, 2024. *Discovery tool security* [viewed 25 April 2024]. Available from:

<https://digitalcapability.jisc.ac.uk/our-service/discovery-tool/discovery-tool-security/>

JOSHI, A. *et al.*, 2015. Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology*, 7, 396-403

KARRYS, L., 2021. *Getting Started | Create React App* [viewed 18 April 2024].

Available from: <https://create-react-app.dev/docs/getting-started>

LOCAL GOVERNMENT ASSOCIATION, 2024. *What is local government? | Local Government Association* [viewed 18 April 2024]. Available from:

<https://www.local.gov.uk/about/what-local-government>

LOWNDES, V. and L. PRATCHETT, 2012. Local Governance under the Coalition Government: Austerity, Localism and the 'Big Society'. *Local Government Studies*, 38, 21-40

MEHULMPT, 2020. *Web Scraping Python Tutorial - How to Scrape Data From A Website* [viewed 18 April 2024]. Available from: <https://www.freecodecamp.org/news/web-scraping-python-tutorial-how-to-scrape-data-from-a-website/>

MORTON, B., 2024. Council financial crisis 'out of control', MPs warn. [viewed 18 April 2024]. Available from: <https://www.bbc.co.uk/news/uk-politics-68159001>

MOZILLA, 2024. *CSS: Cascading Style Sheets | MDN* [viewed 26 April 2024]. Available from: <https://developer.mozilla.org/en-US/docs/Web/CSS>

MUI, 2024. *Overview - Material UI* [viewed 18 April 2024]. Available from: <https://mui.com/material-ui/getting-started/>

NAYAK, M. and N. K A, 2019. Strengths and Weakness of Online Surveys, 24, 31-38

SOLENT UNIVERSITY, 2024. *Research integrity* [viewed 24 April 2024]. Available from: <https://www.solent.ac.uk/research-innovation-enterprise/research-at-solent/support/ethics-and-integrity>

WHITEFLUFFY, 2018a. Answer to 'Infinite loop in useEffect'. In: *Stack Overflow* [viewed 18 April 2024]. Available from: <https://stackoverflow.com/a/53074436>

WHITEFLUFFY, 2018b. Infinite loop in useEffect. In: *Stack Overflow* [viewed 18 April 2024]. Available from: <https://stackoverflow.com/q/53070970>

11. Appendices

Appendix A: BCP election results and growth

<i>Ward</i>	<i>2019 (%)</i>	<i>2023 (%)</i>	<i>Growth (%)</i>
Alderney & Bourne Valley	28.21	25.81	-2.40
Bearwood & Merley	39.70	33.48	-6.22
Boscombe East & Pokesdown	30.86	31.9	1.04
Boscombe West	23.47	21.67	-1.80
Bournemouth Central	25.86	21.99	-3.87
Broadstone	49.67	43.28	-6.39
Burton & Grange	33.46	25.42	-8.04
Canford Cliffs	40.58	37.99	-2.59
Canford Heath	32.51	31.34	-1.17
Christchurch Town	38.20	37.24	-0.96
Commons	40.53	37.13	-3.40
Creekmoor	31.26	29.52	-1.74
East Cliff & Springbourne	24.02	23.99	-0.03
East Southbourne & Tuckton	38.64	42.66	4.02
Grange ward	25.33	18.83	-6.50
Hamworthy	30.43	24.25	-6.18
Highcliffe & Walkford	44.22	44.05	-0.17
Kinson	26.54	23.21	-3.33
Littledown & Iford	32.62	31.89	-0.73
Moordown	29.17	31.71	2.54
Mudford, Stanpit and West			
Highcliffe	44.95	39.3	-5.65
Muscliff & Strouden Park	32.32	28.41	-3.91
Newtown & Heatherlands	29.91	24.15	-5.76
Oakdale	32.81	29.08	-3.73

Parkstone	36.79	34.53	-2.26
Penn Hill	34.86	34.24	-0.62
Poole Town	33.41	28.44	-4.97
Queen's Park	30.30	31.69	1.39
Redhill & Northbourne	34.39	28.71	-5.68
Talbot & Branksome Woods	31.50	29.34	-2.16
Wallisdown & Winton West	27.87	28.79	0.92
West Southbourne	33.27	37.94	4.67
Westbourne & West Cliff	30.83	28.72	-2.11
Winton East	29.97	24.74	-5.23
Mean	33.19	30.75	-2.44
Median	32.42	29.43	-2.33
Low	23.47	18.83	-8.04
High	49.67	44.05	4.67

Appendix B: Ethical Release Form

Ethical clearance for research and innovation projects

Project status

Status

Approved

Actions

Date	Who	Action	Comments
12:59:00 09 February 2024	Darren Cunningham	Supervisor approved	
11:14:00 09 February 2024	Harry Fry	Principal investigator submitted	

Get Help

Ethics release checklist (ERC)

Project details

Project name:

Dissertation Project

Principal investigator:

Harry Fry

Faculty:

Department of Science and Engineering

Level:

Undergraduate

Course:

Computing

Unit code:

COM616

Supervisor name:

Darren Cunningham

Other investigators:

Checklist

Question	Yes	No
Q1. Will the project involve human participants other than the investigator(s)?	<input type="radio"/>	<input type="radio"/>
Q1a. Will the project involve vulnerable participants such as children, young people, disabled people, the elderly, people with declared mental health issues, prisoners, people in health or social care settings, addicts, or those with learning difficulties or cognitive impairment either contacted directly or via a gatekeeper (for example a professional who runs an organisation through which participants are accessed; a service provider; a care-giver; a relative or a guardian)?	<input type="radio"/>	<input type="radio"/>
Q1b. Will the project involve the use of control groups or the use of deception ?	<input type="radio"/>	<input type="radio"/>
Q1c. Will the project involve any risk to the participants' health (e.g. intrusive intervention such as the administration of drugs or other substances, or vigorous physical exercise), or involve psychological stress, anxiety, humiliation, physical pain or discomfort to the investigator(s) and/or the participants?	<input type="radio"/>	<input type="radio"/>
Q1d. Will the project involve financial inducement offered to participants other than reasonable expenses and compensation for time?	<input type="radio"/>	<input type="radio"/>
Q1e. Will the project be carried out by individuals unconnected with the University but who wish to use staff and/or students of the University as participants?	<input type="radio"/>	<input type="radio"/>
Q2. Will the project involve sensitive materials or topics that might be considered offensive, distressing, politically or socially sensitive, deeply personal or in breach of the law (for example criminal activities, sexual behaviour, ethnic status, personal appearance, experience of violence, addiction, religion, or financial circumstances)?	<input type="radio"/>	<input type="radio"/>
Q3. Will the project have detrimental impact on the environment, habitat or species?	<input type="radio"/>	<input type="radio"/>
Q4. Will the project involve living animal subjects?	<input type="radio"/>	<input type="radio"/>
Q5. Will the project involve the development for export of 'controlled' goods regulated by the Export Control Organisation (ECO)? (This specifically means military goods, so called dual-use goods (which are civilian goods but with a potential military use or application), products used for torture and repression, radioactive sources.) Further information from the Export Control Organisation ¹	<input type="radio"/>	<input type="radio"/>
Q6. Does your research involve: the storage of records on a computer, electronic transmissions, or visits to websites, which are associated with terrorist or extreme groups or other security sensitive material? Further information from the Information Commissioners Office ²	<input type="radio"/>	<input type="radio"/>

Declarations

I/we, the investigator(s), confirm that:

☒ The information contained in this checklist is correct.

☒ I/we have assessed the ethical considerations in relation to the project in line with the University Ethics Policy.

☒ I/we understand that the ethical considerations of the project will need to be re-assessed if there are any changes to it.

☒ I/we will endeavor to preserve the reputation of the University and protect the health and safety of all those involved when conducting this research/enterprise project.

☒ If personal data is to be collected as part of my project, I confirm that my project and I, as Principal Investigator, will adhere to the General Data Protection Regulation (GDPR) and the Data Protection Act 2018. I also confirm that I will seek advice on the DPA, as necessary, by referring to the [Information Commissioner's Office further guidance on DPA](#) and/or by contacting information.rights@solent.ac.uk. By Personal data, I understand any data that I will collect as part of my project that can identify an individual, whether in personal or family life, business or profession.

☒ I/we have read the [prevent agenda](#).

Appendix C: Manual Test Results

Test	Expected Result	Actual	Status: ✓ ✕
Python script to scrape BCP news	Link, Overview, Timestamp is extracted in .json format	Data is extracted correctly.	✓
Upload scraped data to firestore.	For each object in .json file, a document is uploaded with the attributes: link, description and datetime.	Data is correctly uploaded into Firestore, articles collection	✓
Retrieve data on page load.	Data is read from articles collection and stored as a list of objects in state.	Data is correctly read and stored.	✓
Render feed and feeditems	Data is passed as props to feed component. ForEach prop, feeditem is passed obj and rendered	Correct number of feed items are rendered and all obj data is displayed.	✓
Show/Hide feedback button	When clicked, feedback for article is shown/hidden depending on state.	State tracks correctly, feedback is shown or hidden correctly.	✓
Click link to display form	When article link is clicked, new tab opens with article and feedback form appears	New tab opens and feedback appears	✓
User submits feedback on feeditem	User completes form to submit feedback on article, form validates, page	Form data is validated correctly, feedback is written to subcollection of article	✓

	refreshes to update state and display data	document. Page refreshes.	
Fetch and render feedback component	When feeditem is rendered, feedback for article, passed as prop, is fetched and displayed, with error msg if none.	Feedback renders correctly	✓
Feedback sentiment	When feedback is rendered, sentiment is calculated correctly and msg is displayed	Sentiment is displayed correctly	✓
User clicks BCP social links	User clicking on social link opens a new tab to corresponding social media page.	Correct page opens in new tab.	✓
Spending data is displayed on show data button click	On click, spending chart is displayed with next/prev buttons. On click, these cycle spending charts.	Charts and buttons are displayed correctly and navigated through.	✓
Survey button	Link to survey on a button opens in new tab	Survey opens in new tab	✓

Appendix D: Councillor 1 email response

Hi Harry,

Thanks for your email. I have taken a quick look using your link, but I am not necessarily the best person to ask for a view regarding an app. I avoid them as much as possible.

I also find community engagement something that is excellent in theory, but less meaningful in practice – because most people tend to get on with their lives, and do not proactively engage. It is only when a controversial proposal is put forward, such as the building of flats on Southbourne crossroads, that more people engage. Routing council news announcements receive much less traction, and generally with the 'usual suspects' rather than the general public.

This also makes it difficult to evaluate feedback, since at times responses can come primarily from interest groups. People who are unhappy tend to respond more frequently than those who are content.

That said, your format looks clear and accessible, and the feedback button looks promising – although how the feedback is evaluated to provide the one line summary is unclear.

May I wish you success with your project.

Appendix E Councillor 2, Millie Earl, email response

Hi Harry,

Sorry for the delayed response and thank you so much for getting in touch.

I think it's a great idea and can really see the value in encouraging people to come to the source of news rather than the information that our local media selectively supplies via social media. There's a lot of apathy around politics in general with many disenfranchised so any way of making information more easily available and improving engagement is welcome.

I would recommend getting in touch with my Cabinet colleague Cllr . He is the lead for 'customer, communications and culture' and would be the person to find out if there's interest in your app. His email is

Very best of luck with your aim of engaging communities in the work of Local Authorities,

Millie



Cllr. Millie Earl
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Portfolio Holder for Connected Communities
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