NeXt Warning System

Environment Agency

Discovery // Mini report

March 2020

Summary

This document contains a summary of the findings from the NeXt Warning Systems (XWS) Discovery that took place over 10 weeks between January and March 2020. This Discovery report outlines our findings and proposes recommendations on how we can build a next generation flood warning system to support the needs of our users, the business and wider government.

Where we are now

Under the Flood and Water Management Act 2010 the EA takes a lead role on river and coastal flooding in England whilst lead local flood authorities (LLFAs) take a lead role on local flood risk, including surface water, groundwater, and minor watercourses. To provide flood forecasting and warning services to its users, the Environment Agency (EA) manages a complex technology estate, provided by a variety of suppliers and partners. This estate includes telemetry systems, forecasting systems and services all feeding into the decision making that then triggers messages being issued from the flood warning systems.

In the Flood Warning System (FWS), we currently have a system which provides a secure, resilient, accurate and timely service for our users. This system is however almost entirely flood focussed and is becoming inflexible to changing user needs. The introduction of the Incident Management and Resilience (IM&R) function in the Operations directorate of the EA means we have a greater opportunity to expand our horizon to include other environmental impacts across the EA - and potentially Defra, even the wider government.

Drivers for change

The Environment Agency aspires to be a forecast-led organisation that responds to the growing demands of climate change and extreme weather. We have seen a big increase in demand for our services and matched by a change in user expectations – as an organisation it's vital we respond to those user needs and think about our entire incident management response, and not just focus on floods. The introduction of the Incident Management and Resilience (IM&R) department in the Operations directorate was a step towards enabling better response across the business, for all incidents.

Met Office predictions on future scenarios for rainfall and runoff are highly uncertain, but there is less doubt that the future has greater variability in extremes of rainfall, both in terms of flood and droughts. During this Discovery phase, the UK experienced three successive large storms affecting England, Scotland and Wales - Storms Ciara, Storm Dennis and Storm Jorge. A total of 16,054 messages were sent between 8th February 2020 and 1st March 2020 inclusive. These include 25 individual severe flood warning messages and 1,121 individual flood warning messages. A total of 3,150,858 calls were sent to users.

The Government Digital Service (GDS) have approved funding to extend the FWS contract through December 2022 on the provision that XWS address the shortcomings of the current service as outlined in a 2016 service assessment. Fujitsu is an excellent supplier and we could still expect to work with them in the future. Over the next 2.5 years we'll work with Fujitsu to deliver continuous improvement of FWS that can feed directly into our ambitions for XWS. GDS are key partners for ensuring that the services we provide the public are fit for purpose, affordable and delivering user needs. We need to move away from the 'black box' from a dominant single supplier and we won't be able to tackle some of the fundamental challenges we face if we replace like for like.

Our approach to Discovery

Our Discovery took place over 10 weeks and followed the GDS Discovery process, which focuses on; identifying potential end users of a service and what they're trying to achieve, understanding constraints that may affect the service, including departmental and agency policy intent and looking for opportunities to improve things.

Before starting our research, we needed to create a problem statement to help us frame the challenge we face, what our ultimate goal is and to provide a solution agnostic way of describing the issue.

> *How can users at risk of flooding (or other hazards), receive relevant, useful and timely warnings so they can take appropriate action? What are we not currently doing to meet these needs?*

To answer this problem statement, we need to focus on learning about our users and their context, the constraints that affect this problem and what opportunities there are to improve the existing services. We have chosen to focus on 4 key areas to help us answer this problem statement and guide where we place our efforts in Discovery.

- User needs
- Business needs
- Technology
- Data and Processes

What we have discovered

External Users

Whilst users find it easy to register to our flood warning service online we still see only 52% of our users complete the online registration journey. Once registered, they find it very difficult to maintain or remove their details. Further to this, we estimate that there are potentially 20,000 user accounts that are duplicates and were created by users that forgot their login details. This means users receive duplicate messages for the same warning. Passwords also pose a problem, with people unable to remember their password and therefore unable to log in. This causes calls to the Floodline call centre where accounts can be edited by the Floodline staff – approximately 27% of the calls to Floodline since January 2018 have been related to FWS accounts.

Citizens are generally dissatisfied with the quality of the real time information provided in our flood warning messages. The need for messages to be updated more frequently was the biggest contributor to negative feedback about message quality. Message content was the next biggest issue our external users had with our message quality. We have found that users need more information in the message content to help them understand the flood event. Citizens are dissatisfied with being warned about flooding when the perceived risk is low and showed an overwhelming preference for flood warnings and other emergency alerts to arrive automatically to their handsets.

Professional Partners displayed similar concerns – the message content we provide is not always read by Professional Partners or not deemed meaningful enough to have any practicable use in response activities. Faster and more accurate predictions during incidents would be appreciated particularly on the number of properties affected, or projected to be affected. Users of the Targeted Flood Warning Service (TFWS) generally liked the service, but there were still issues. The take up of TFWS is low in the Professional Partner community due to costs applied to some users of the service - removing the cost may make the service more attractive to Professional Partner users. Since the service only sends emails to partners, some would still like text and telephone channels so remain on the Flood Warning System.

Internal Users

The creation and dissemination of flood warnings is the core service offering to citizens. These tasks are completed by a Duty Officer (DO) and an Assistant Duty Officer when flooding is forecast to happen (or has actually happened). Providing accurate and relevant real-time information messages is vital for providing a meaningful response from users. Having an intuitive and simple system for sending messages is critical for ensuring timeliness of our warning messages.

Through research with DOs we discovered issues with the current message sending process, including serious issues with the scripting tool. Having to leave FWS to use the tool created a bottleneck in the message sending process, and the output from the tool was often not deemed suitable and too “robotic”. Real time citizen feedback on the message content is not commonly used when creating real time information and we feel this is a huge missed opportunity. User feedback is also not a metric used when scoring message content – again we feel this should be a vital addition.

The process of updating or removing messages already in force was time consuming. We should look to limit the number of steps a Duty Officer should go through to update or remove existing messages, this would increase efficiency and free up Duty Officer time. In some cases, the automated updating or issuing of messages would be a big benefit to Area teams. This would work for areas that have predictable flooding impacts, but requires further investigation in Alpha.

Another large blocker to providing a first class warning service is the process for creating and updating warning areas. Our existing TA go live process is too long winded, and means that Area teams cannot make changes to the flood warning service in real time – this limits the accuracy of our service.

Business Needs

For some time, policy decisions for the flood warning service have been driven by the systems. This is largely due to the fact that the systems have been delivered faster than policies have been reviewed and updated – this needs to change. The consequence is that the design of the service has been retrospective after the systems have been developed. All parts of the business involved with flood incident management policy and teams involved with system support and development need to work much closer together. The symbiotic relationships between policy, services and systems support necessitates closer, frequent working to deliver exactly what our users want, and ensure that our policy, services and systems reflect real-world needs.

We also observed issues both internally and externally with our existing 3 tier warning codes. The timeliness, accuracy and reliability of forecasts vary across the country – our current three tier warning service does not provide enough scope to provide accurate and meaningful information to our users. During the February flooding event we saw evidence of real-time information inputted by the Duty Officers being contradictory to the “core” advice associated with the flood warning codes. We also saw evidence in our user research that many users do not understand the difference between a Flood Warning and Flood Alert, in fact, more than half believe that Flood Alert is a higher severity message. During user testing sessions, we asked the users which they believed to be a higher severity – Flood Alert or Flood Warning. 5 of the 6 user testing sessions said Flood Alert, and the final user could not say either way.

The Flood Warning Expansion Project (FWEP) team are planning to experiment with the use of the global alerting standard Common Alerting Protocol (CAP) alongside the existing flood warning codes. The CAP structure contains a more granular definition of risk by explicitly providing an estimate on urgency, certainty and severity as well as the response required. By testing the use of CAP, we will be able to see if users find the more granular information we can provide useful – XWS should be designed to support this approach.

The Environment Agency’s current position statement on its response to flooding from surface water states that where possible it will add local value to forecasts and share intelligence on potential localised flooding.

The Incident Management & Resilience Service Management team intend to update this position statement to improve clarity. Any new warning system should also be designed with enough flexibility that it could be used for issuing surface water flood warnings from 2025 onwards.

Technology

All technology design should begin with user needs and that we shouldn't just re-create the same system with new technology. Careful consideration should be taken to understand the service, and what user needs that service is providing before design and deployment of the supporting system(s) takes place.

Through discussion with local technology experts in the EA, DDTS and Natural Resources Wales (NRW) we feel that designing a horizontally scalable micro services system will allow for "peaks" in the message sending without additional unnecessary cost and use of multi cloud providers for our system components may increase our overall resilience. By using smarter system design, we can speed up the time it takes to issue, update and remove messages and by allowing Duty Officers to use mobile devices, they can more quickly update and issue messages "on the go" rather than using cumbersome EA kit and network requirements. A streamlined mobile friendly design would also increase the speed at which messages can be sent.

It was felt that a combination of "in-house" and third party delivery would be required to build XWS within the allotted time scales. Our "in house" capability is dramatically improved since the last time we designed and deployed a warning system, and the internal teams have experience building, managing and running complex services in the flood estate. Very careful consideration needs to take place to avoid a "big bang" release – a strong criticism of the GDS Standard Assessment. We need to carefully plan how we move from the existing systems to any new systems designed as part of XWS, this includes migrating Target Area data and most critically customer data.

Data and processes

Having the right data in a system is critical for enabling more efficient and effective services that respond to user needs. We need to review how our data is stored, processed and used so we can remove duplication, overlap and contradiction in the datasets we use. Data acts as the foundation upon which our systems, and our services are built.

During Discovery the team met with internal stakeholders responsible for the processing and maintenance of flood related data. We tested our assumptions about data flows from FWS to other services and discussed blockers and challenges in moving to a new service that meets the needs of users.

We think that removing unused data sets will reduce the overhead of maintaining the service in the future, and providing a centralised system to produce all the required data for downstream systems would enable live Target Area updates and a data synced flood estate. We may be able to retire supporting systems that currently do this work. Providing "self-service" reporting options will lower the overall overhead on the Digital Services team and provide a more consistent reporting overview for National and Area teams.

Other alerting needs

Although Discovery is focused on flooding, we've kept an open mind regarding its potential use across government as an open source and reusable product. It was encouraging to learn that other potential beneficiaries of a generic warning service had similar needs and challenges - almost all these services fundamentally want to provide the same core experience – issuing a message to an audience in a location via user defined channels. This is the what, who, where. This is broadly similar to the flood warning service. In Alpha, we would recommend that any alerting platform is designed in a "hazard agnostic" manner – so that others could use the design for non-flood related messaging.

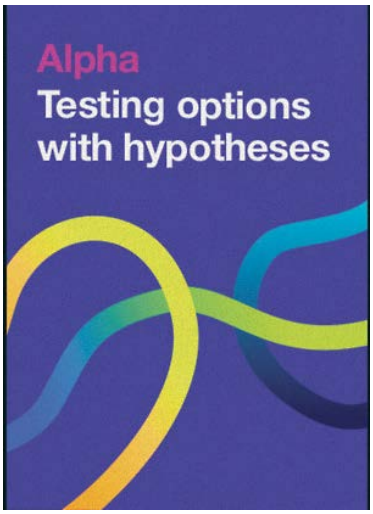
Recommendations for Alpha phase

The Alpha stage is where we seek to test 'how' we might meet the user needs we have identified in Discovery. Conducting the Alpha stage will allow additional user testing to help to confirm user needs and shape any proposed design and development of a warning system.

We recommend breaking down an Alpha phase into three distinct parts, each focussing on an area of development highlighted as an issue in Discovery. Our proposed Alpha phase prototypes are (provisionally):

1. A redesigned message sending process for staff to simplify and speed up the sending process and improve message quality for users
2. Refining a new online registration mechanism and user data model to allow a simple, easy to manage process for registering to the service
3. Designs for the "core engine" at the heart of the warning system. This is where the relationship between the what, where and who is calculated

By proceeding in a low risk step by step approach, we can test the various products and delivery permutations and carry out essential additional user testing throughout the Alpha phase. Testing our most challenging assumptions and approaches in Alpha will allow us to find and rectify bottlenecks with our services and systems before we commit to our final design. These prototypes will allow us to identify problems in the key parts of the system as early as possible so we have time to decide how we will solve them.



We expect some of the components to be designed and developed in-house, some elements we are likely to outsource as small packages of work to suppliers on the G-Cloud framework (or similar). In line with the GDS service standard, we would seek to own (and share) the code, designs and output of anything developed by a supplier. By the end of Alpha we will be in a position to decide which of the ideas we have tested are worth taking forward to Beta.

Following completion of the Alpha phase an "End of Alpha" report will encapsulate the findings of this phase, allowing decisions about whether the project proceeds to recommend development of a Beta (trial production service) capability.