Loughborough University

ResilienceDirect during Covid-19: understanding and enhancing digital collaboration

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1.0 Executive Summary

The Covid-19 pandemic has been labelled as the largest peacetime emergency that Britain has faced in the last 100 years.[1] The complexity and scope of the Covid-19 pandemic has required close collaboration between a diverse array of organisations from the emergency services, multiple levels of government, private and charitable organisations, and an assortment of experts and specialist bodies. ResilienceDirect has been a crucial technology enabling and enhancing communication, coordination and collaboration across the highly diverse bodies which have been required to work together to respond to the challenges of the Covid-19 outbreak within the UK.

This report communicates the findings of a research project that analysed and evaluated how the ResilienceDirect platform was used within the UK's Covid-19 response. It was found that ResilienceDirect was applied in many innovative ways to support the response and over 92% of users recognised it as vital to enabling collaboration during the Covid-19 pandemic.

The research highlights areas where the potential of ResilienceDirect to develop collaboration could be enhanced. Importantly, while the file storage function of ResilienceDirect is well used and understood, some of the more advanced and emergency specific functions are not yet fully utilised and require further support and development. There is also significant potential for further development of ResilienceDirect to support organisational learning and knowledge, particularly by further developing and integrating the Joint Organisational Learning function. Above all, ResilienceDirect needs to continue to be supported by central government who recognize its immense value and potential to the emergency community.[2]

This report highlights both the current value of ResilienceDirect to support collaboration and how the technology and its use could be improved in the future. The report is also concerned with developing broader insights into the potential of digital technologies to facilitate emergency collaboration. Covid-19 has demonstrated that technologies such as ResilienceDirect can become a critical piece of national infrastructure underpinning emergency planning, response, and recovery activity. However, ResilienceDirect will need to continue to adapt to fulfil this function in the years ahead. The report concludes with ten recommendations to support the role of ResilienceDirect in underpinning and enhancing UK resilience into the future.

2.1 Introduction

ResilienceDirect was launched by the UK Cabinet Office in 2014 as a means of facilitating collaboration during the preparation for, response to, and recovery from an emergency. Designed to replace the National Resilience Extranet (NRE), ResilienceDirect provides a secure digital platform for emergency response agencies to exchange information and develop shared situational awareness.

Within the UK, there are considerable local and regional variations in how emergency planning and response is organised and funded. There are also considerable differences in the variety and frequency of multi-agency emergency events that agencies located in different regions have experienced. Given these differences, the use of ResilienceDirect and the modes of collaboration have always varied significantly across the country.

Collaboration is a recognised challenge within multi-agency emergency responses.[3] Public reviews of previous UK emergency responses have repeatedly identified persistent problems in joint working between emergency responders, including: the 2005 London Bombings; the 2007 summer floods; the 2017 Grenfell Tower fire; and the 2017 Manchester bombings.[4] Often the diverse reasons for these multi-agency failings, from technological interoperability to operational culture, have only become known after the response.[5] Although ResilienceDirect contains unique potential to foster collaboration within and between an emergency response by mitigating technical interoperability challenges, previous evidence suggests even seemingly minor variations in its use can have a significant influence on joint working with national-level consequences.[6]

In August 2020 the Economic and Social Research Council (ESRC) awarded the research team 14-months of funding to conduct research on how ResilienceDirect was being employed to support multi-agency collaboration within the UK's Covid-19 response.[7] The national scale of the Covid-19-response was recognised as a unique opportunity to study collaboration within and between emergency response agencies across the whole of the UK, including all of the UK nations, British Overseas Territories and Crown Dependencies. Moreover, the complex challenges posed by the Covid-19 response, the diverse variety of specialist agencies collaborating within the response, and the long-time scales of the event itself presented unique challenges to collaboration which ResilienceDirect needed to attend to. Over the course of this research six reports were published by the research team directly to the ResilienceDirect community which aimed to highlight best practices which could be usefully employed to further enhance collaboration within the Covid-19 response.[8]

The research underpinning this report consisted of a mixed methods study of the use of ResilienceDirect across a significant period of the UK's Covid-19 response (August 2020-September 2021). This approach combined a quantitative survey of 494 ResilienceDirect users and 66 qualitative interviews with a diverse selection of users from different agencies and regions. This research was contextualised via a review of policies and documentation.[9] A state-of-the-art literature review of theories of interorganisational collaboration, including within emergencies, was simultaneously undertaken to direct analysis of this dataset. This research constitutes the first independent evidence base for emergency practitioners, national policymakers, and scholars, to understand how ResilienceDirect shapes emergency collaboration.

This summary report will present the findings of this research. This report is structured around six sections. The first section introduces the research context: the Covid-19 pandemic, emergency collaboration, and ResilienceDirect. The second section outlines the methodology of the study, encompassing data collection, analysis, and research ethics. Sections three, four and five each discuss three key sets of research findings: technology, learning and relationships. Section six will draw out the implications of these elements for emergency practitioners, policymakers and academic researchers and propose policy recommendations. We hope that it offers useful insights into the role of digital collaboration technologies within emergencies which will prove useful in benefitting future responses.

2.2 Covid-19

Covid-19 is an infectious respiratory disease caused by SARS-CoV-2, a previously unknown virus. The virus is transmitted mainly via the air (droplet infection) and also via hands and objects (smear infection). The disease can be accompanied by fever, cough, shortness of breath, loss of taste, diarrhoea and fatigue. In severe cases, Covid-19 can lead to death.[10] The disease is thought to have spread from the Chinese city of Wuhan from December 2019.[11] The World Health Organization (WHO) declared a pandemic in March 2020. By that time, Covid-19 had already spread beyond China's borders to new states around the world. Efforts to contain the spread of Covid-19 have required the introduction of a range of measures, many of which have contributed to massive disruptions to everyday life.

As of mid-May 2022, the number of recorded deaths worldwide is over 500 million people.[12] As the most devastating pandemic of the 21st century, Covid-19 demonstrates the potential of diseases to spread rapidly in an interconnected and globalised world.

The virus reached the UK in late January 2020. By mid-January 2021, the UK was recording more than 1,000 Covid-19 related deaths per day.[13] At a certain point in the pandemic the United Kingdom had the highest number of excess deaths in Europe.[14] Various explanations for this have been offered including: the rapid spread of undetected cases in the early stages of the pandemic; high levels of social and health inequality; underinvestment in health systems; and ineffective policy decisions to protect vulnerable people in care homes.[15] As of the publication of this report (August 2022), the UK has experienced over 23 million confirmed cases and more than 181,000 Covid-19 related deaths.[16]

Any assessment of the UK Covid-19 response must also acknowledge the context in which UK civil contingencies found itself at the start of the pandemic. In 2019 the Global Health Security index ranked the UK as the 2nd most prepared country for a pandemic, partly due to evidence of strong interorganisational collaboration in emergency planning.[17] This optimistic picture can, and should be, balanced against more critical assessment of national pandemic preparedness. Exercise Cygnus took place in October 2016 and concluded that 'The UK's preparedness and response, in terms of its plans, policies and capability, is currently not sufficient to cope with the extreme demands of a severe pandemic that will have a nationwide impact across all sectors'.[18] In particular, the report raised concerns about barriers to collaboration including: 'The lack of joint tactical level plans was evidenced when the scenario demand for services outstripped the capacity of local responders, in the areas of excess deaths, social care and the NHS'.[19] The report listed four areas of 'key learning', including 22 'lessons identified' many of which would be relevant to the Covid-19 response, including; the development of a Pandemic Concept of Operations to enhance multi-agency working, more research on behavioural responses to a pandemic, and planning increases in health and social care capacity.

By 2019 UK civil contingencies were preoccupied with Operation Yellowhammer - contingency planning for a 'no deal' EU Exit scenario. A number of our interviewees identified positive lessons learned from Operation Yellowhammer that benefitted the UK's response to Covid-19.[20] The national scale and long duration of Yellowhammer operations provided many practitioners with useful experience in the years prior to Covid-19.[20] However, others raised concerns that the significant work required for EU Exit preparations may have redirected attention and resources away from other risks and contingency planning activities.[21]

Timeline of Events

31st December 2019
Health official in Wuhan, China, report they are treating multiple people infected with novel coronavirus.

29th January 2020
First reported cases of Covid-19 in the UK.

3rd February 2020
A public health information campaign encouraging handwashing is launched.

11th March 2020
The World Health Organisation declares a pandemic.

23rd March 2020
UK enters first lockdown. Prohibitions on non-essential travel and social contact between households. Mandatory closures of non-essential workplaces and other places of assembly. Remote learning for most children and students. People with symptoms and their households are required to isolate. Vulnerable people are asked to shield at home. UK international borders remain open but most other nations close their borders.

25th March 2020
Coronavirus Act 2020 is passed through Parliament and grants the four UK governments emergency powers to combat the spread of Covid-19, including enabling furlough funding, remote court trials, school closures, election suspensions and the creation of lockdown regulations.

June-July 2020
Following a decline of daily cases and deaths, UK lockdowns are gradually lifted.

September 2020:
Schools reopen for all children. Cases gradually increase across the UK.

2nd December 2020
UK becomes the first country to approve a coronavirus vaccine for a mass vaccination programme. By early 2021, the UK had one of the highest vaccination rates in the world and the highest in Europe.

December 2020
The 'Alpha' Covid-19 variant is identified in cases in Kent and contributes to an increase during the second lockdown. Regional measures are introduced across UK nations in response to local concentrations of cases. Travel bans are imposed on the UK.

December – January 2021
Lockdowns introduced across all four UK nations

March 2021
Schools re-open and lockdowns are gradually lifted. The more transmissible 'Delta' variant enters the UK and became established, leading to a further increase in cases.

July 2021
All mandatory measures lifted, except isolation and testing requirements.

December 2021
Omicron variant circulating across UK and some measures on mask wearing and larger events reintroduced.

15th February 2022
All legal coronavirus measures lifted in Northern Ireland.

24th February 2022
All legal coronavirus measures lifted in England.

28th February 2022
All legal coronavirus measures lifted in Wales

1st May 2022
All legal coronavirus measures lifted in Scotland.

2.3 Emergency collaboration: definitions, challenges, and solutions

Life today is supported by a complex web of essential services – from energy infrastructures to transportation grids, to food supply networks.[22] The rising prevalence of crises that span physical and technological boundaries[23] including Covid-19, is indicative of how crises can quite easily cascade across these systems in ways that are difficult, if not impossible, to predict in advance. Within a highly interconnected and globalised world, crises become increasingly complex. As such, there is a need for emergency responses to become increasingly complex and adaptive so as to respond to the unique unfolding of a complex emergency event.[24] Increasingly complex crises inevitably demand collaboration across multiple organisations. These large 'collaborative networks' put additional pressure on the emergency services, various levels of government and other service providers to organise and oversee complex response operations.

Within an unfolding emergency event, the success of a response hinges on the ability of different organisations (e.g. Police, Fire, Ambulance) to quickly organise an effective, well-integrated response within a rapidly evolving and highly uncertain environment. Effective multi-agency collaboration within an emergency response allows for information to be shared, decisions to be distributed and redundancies to be eliminated. This can have the effect of enhancing the overall speed, efficiency, and effectiveness of an emergency response.[25] However, there are a number of factors that can complicate collaboration in this environment and undermine its overall effectiveness. The 'collaborative networks' which form to respond to an event typically comprise a variety of different organisations; each with their own organisational structures, cultures, working practices and areas of expertise.[26] These organisational differences create challenges to collaboration that may only be rendered apparent within the context of a live response. In the UK, barriers to collaboration have been repeatedly identified in reviews conducted after major emergency events.[27]

There is now a large body of research on interorganisational collaboration, including within emergencies, which helps to understand how organisations work together to solve problems, mitigate risks and exploit opportunities in an ever more complex world.[28] Collaboration is here defined as the sharing of resources, power and trust between organisations.

Figure 1.0. Framework for understanding collaboration

Any of these three elements can be shared between organisations within a collaboration but collaboration is stronger if all three are involved. This is because these elements are mutually connected. For example, the sharing of resources, such as finances, knowledge, or physical space, is often a precursor or consequence of the sharing of power and trust.

The term 'collaboration' is sometimes used interchangeably with other terms such as 'interoperability', 'multi-agency working' or 'joint working'. These other terms are familiar to emergency practitioners, particularly through the 'Joint Emergency Services Interoperability Programme' (JESIP).[29] However, there is little academic consensus on how these other terms can be understood and they are often less familiar to practitioners and researchers outside the emergency services. For this reason, we employ the more holistic term 'collaboration'. Indeed, while there are unique dimensions to collaborating within an emergency, many experiences and challenges within emergency collaboration have parallels with other domains where collaboration between organisations is also vital – for example corporate research and development, construction, even the creative arts.

Another useful way of understanding collaboration is to distinguish it from other forms of relations between organisations. Organisations also relate to one another through market relationships between suppliers and firms and hierarchical relations between central and local government. Sometimes collaboration is contrasted strongly to these other relationships. However, in practice these different forms of relations often overlap. For example, suppliers and firms may collaborate alongside their contractual obligations to supply new products, and central and local government will collaborate beyond legal duties to provide public services, including within emergency response. Therefore, across this report collaboration is understood as occurring alongside these other forms of interorganisational relations.

Collaboration is often framed as positive, yet almost all academic research acknowledges it is far from easy to establish and sustain. Interorganisational collaboration is beneficial because it allows individual organisations to solve problems, mitigate risks and exploit opportunities in an ever more complex and interdependent world. Many challenges faced by society today, such as climate change or social inequality, are large and complex and cannot be tackled by a single organisation. Sometimes these challenges are described as 'wicked problems'[30] as they involve factors that are uncertain and beyond the comprehension and control of a single organisation. Large scale emergencies, including pandemics, can also be described as 'wicked problems' and thus require interorganisational collaboration. Despite these benefits, interorganisational collaboration is often challenging to initiate and sustain.

Academic research suggests there exist some key barriers to interorganisational collaboration:

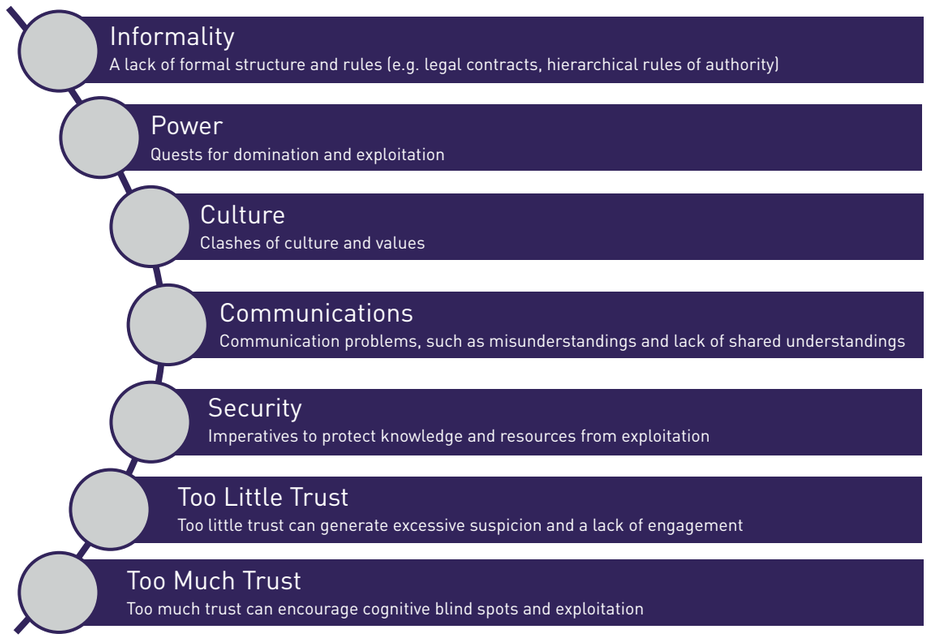


Figure 2.0. Barriers to interorganisational collaboration

All of these factors can generate barriers to the establishment of a collaboration or prevent it being sustained. However, an interorganisational collaboration can be designed to mitigate these barriers – for example agreements can be made to provide a common understanding of a problem, communications can be harmonised, and the healthy and natural scepticism of new partners can be normalised rather than viewed as damaging suspicion. Another widespread solution is to develop and use collaboration digital technologies – such as ResilienceDirect. These technologies can allow information to circulate to enable shared knowledge and joint decision-making, allowing optimal forms of trust to circulate.

Within the UK the need to enhance collaboration within emergencies has become particularly acute given changes to the architecture of UK Civil Contingencies since 2001. Following the 2001 Emergency Planning Review, efforts were made to shift UK emergency management away from the top-down hierarchical models of command and control that dominated civil defence, towards a model of Integrated Emergency Responses (IEM) premised on principles of collaborative, bottom-up, self-organising.[31] These changes were reflected in the 2005 Civil Contingencies Act (CCA) which set out a single legislative framework for UK emergency management. The CCA required responder agencies to 'co-operate with each other'[32] to plan and prepare for risks, warn and inform the public, and develop and exercise plans for emergency response and recovery.[33] Decision making powers were devolved via the principle of subsidiarity, which stipulated that 'decisions should be taken at the lowest appropriate level, with co-ordination at the highest necessary level'.[34] New responsibilities were conferred on local governments and the devolved regions and local resilience bodies (e.g. Local Resilience Forums) were established throughout the UK as the 'principal mechanism for multi-agency collaboration and co-ordination'.[35] Recognition of the critical need to improve collaboration has encouraged the Cabinet Office to develop National Resilience Standards which support three solutions.[36]

1. The CCA requires all Category 1 responders (emergency services, local authorities) to meet together to exercise and develop emergency plans and procedures.[37] This requirement has led to the establishment of Local Resilience Forums in England and Wales, Local Resilience Partnerships in Scotland and Emergency Planning Groups in Northern Ireland. Within this report this array of agencies are referred to as 'local resilience bodies'.
2. The Joint Emergency Services Interoperability Programme (JESIP) was created in 2012 to set a national standard for multi-agency working in UK emergency response. JESIP is a non-statutory framework to encourage local resilience bodies to standardise processes by advancing a joint decision-making model (JDM) and five key principles designed to enable partnership working during a response.[38]
3. For enhancing collaboration in emergencies ResilienceDirect (RD) was introduced in 2014 as a secure digital collaboration platform. ResilienceDirect provides a secure online space for nominated civil protection practitioners to communicate, collaborate and share classified (official sensitive) information in real time.

The next section will explain the history, policies, and capacity of ResilienceDirect.

2.4 ResilienceDirect: an evolving capability

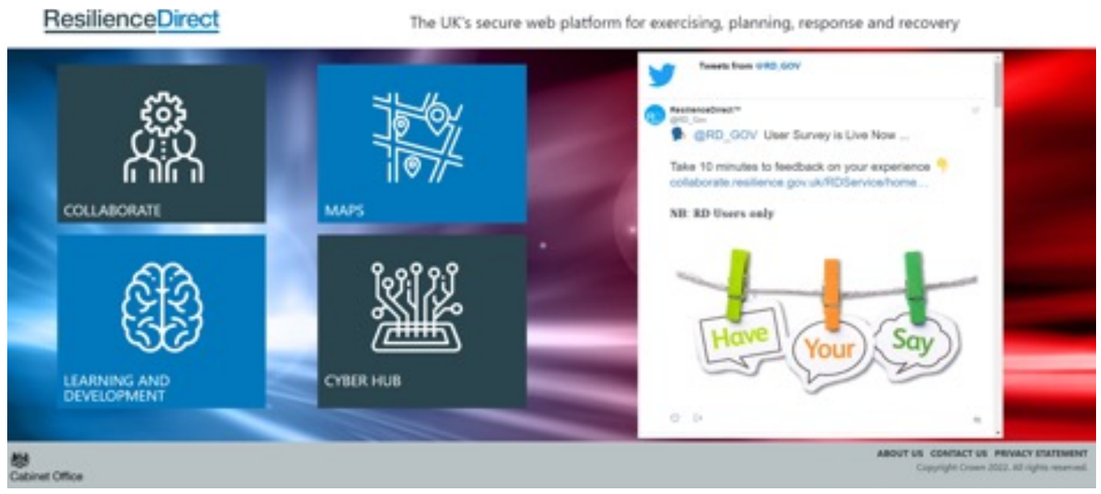
Emergency coordination is underpinned by communication. The CCA requires that emergency responders co-operate and share information in order to manage emergencies efficiently and effectively. However, in the dynamic and rapidly evolving environment of an emergency event, the 'information available will often be incomplete, inaccurate or ambiguous, and perceptions of the situation may differ within and between organisations'.[39] Incomplete or contradictory information can, in turn, hamper decision-making on the ground.[40] Information technologies are championed as a means of 'overcoming some limitations in human information processing that have long stymied organisational action in complex environments'.[41] These technologies promise to provide easier access to more, quality information and to present this information in a digestible manner.[42] Enhancing quality and access to information is understood to enhance both individual and collective decision-making and permit the devolution of decision-making within an emergency response.[43] Rather than being confined to the individual, problem-solving can be distributed through a network of agencies comprising diverse specialisms, skills and expertise. This, in turn, accelerates emergency responses: permitting emergent challenges to be responded to quickly and decisively, while allowing different response activities to be pursued concurrently, rather than sequentially, across a response network.[44]

The purpose of ResilienceDirect is to meet these opportunities. The platform was introduced in 2014, replacing the National Resilience Extranet (NRE) which was established in 2009. The NRE was designed to address the problem that many of the UK's emergency services, local authorities and essential services relied on different information systems. Some of these systems were not sufficiently secure, inhibiting information sharing and collaboration across agencies.[45] The NRE was created to provide a secure online collaboration environment to enable responders to share key information up to and including RESTRICTED level and enhance multi-agency working. The NRE was to be used by all Category 1 and 2 responders; government departments and agencies; and other key organisations in the UK resilience community. It allowed these parties to work collaboratively in routine planning, share best practice plans and documentation, and enable the timely communication of documents such as the Commonly Recognised Information Picture (CRIPs) and Situation Reports (SitReps) within a live incident.[46] However various problems, including login difficulties and expense (£99 a licence), discouraged take-up and engagement within the resilience community.

In 2013, The Defence Science and Technology Laboratory (DSTL) commissioned Niteworks – a body of industry experts – to review the NRE and advise the Cabinet Office on the options available to them. Recognising that existing technologies (e.g., Microsoft SharePoint) were proprietary and thus prohibitively expensive it was decided to develop ResilienceDirect as a free service available to all local resilience bodies. The DSTL funded the development of ResilienceDirect, which was to be launched on the advice of 'Niteworks' to promote the development of collaboration, mapping and other capabilities. As with the NRE, ResilienceDirect aimed to provide a secure online environment for information-sharing – however it would be free for local resilience bodies to use. Ideas from military and civil emergency management systems were adapted and adopted to optimise the ability of the system to generate a 'Common Operating Picture' across the diverse agencies involved in UK emergency management.[47]

ResilienceDirect was designed as a private online network which UK emergency responders can use to freely and securely share information in the preparation, response and recovery phases of an emergency. Since its creation in 2014 ResilienceDirect has operated as the principal information technology mediating joint working within and between local resilience bodies. Although the platform currently has over 95,500 users, and use is encouraged by the National Resilience Standards, there has never been any mandatory requirement for ResilienceDirect to be used. All users are free to upload and manage their information independently of the Cabinet Office, while remaining compliant of the End User Agreement. All content uploaded to ResilienceDirect remains owned by its users, however the platform itself is owned and managed by the Cabinet Office. The platform contains four main services: Collaborate, Maps, Learning and Development, and the Cyber Hub. These services are linked by a dashboard page.

Figure 3.0 ResilienceDirect dashboard page (May 2022)



Collaborate is structured around sites that contain pages displaying text, images, and links to documents. The pages also contain templates and functions to allow reports to be cascaded across pages and groups of users – for example the Situation Reporting (SitRep) function. These sites are only accessible within the ResilienceDirect platform and access can be restricted by local site administrators to ensure only those users with a need can access information. Each local resilience body within the UK and all government departments and agencies have a ResilienceDirect site. In addition, ResilienceDirect also hosts sites created by working groups on specific emergency topics and organisations.

The Maps service runs on a separate system to Collaborate and allows ResilienceDirect users to generate, use and share maps. Learning and Development links to the Emergency Planning College site on Collaborate and the separate Joint Organisational Learning database for sharing experiences and lessons learned after a response. The Cyber Hub provides current guidance on cyber resilience and is hosted within the Collaborate system.

ResilienceDirect is accredited as 'Official Sensitive' by the National Cyber Security Centre (NCSC), part of Government Communications Headquarters (GCHQ). By facilitating the circulation of information in real time, ResilienceDirect improves multi-agency communications, enhances shared situational awareness, and enables joint decision-making within an emergency response.

Since its creation ResilienceDirect has continued to evolve. In July 2014 a new mapping tool was added to ResilienceDirect. In August 2015 the Joint Organisational Learning (JOL) database service within JESIP was added to the ResilienceDirect platform. And in 2020 the Cyber Hub was added to provide guidance to local resilience bodies on cyber threats and security. Alongside these significant additions, ResilienceDirect has also undergone more incremental technical upgrades, including the ability to archive pages and improvements in security.

Despite its longevity, growing userbase, and prominence in National Resilience Standards, prior to the Covid-19 response there has been no dedicated independent research into the efficacy of ResilienceDirect to enable collaborative working. The next section introduces the research project exploring ResilienceDirect during Covid-19.

Researching ResillienceDirect

3.1 Project overview, aims and objectives

The research findings presented in this report were generated within the ESRC funded research project 'Enhancing the use of ResilienceDirect in the Covid-19 response: a comparative analysis of Local Resilience Forums'.[48] The project was funded as part of the rapid response call for academic research that would support the response to Covid-19. The research was initially designed to be undertaken over 12 months and only involve a study of English Local Resilience Forums. Given the strong support of all stakeholders and the ESRC, the study was extended to 14 months and was able to explore the use of ResilienceDirect across all UK nations, and some British Overseas Territories and Crown Dependencies. All of the research was undertaken by Loughborough University. The study was led by Dr Dan Sage (School of Business and Economics) and Dr Chris Zebrowski (School of Social Science and Humanities). Nina Jörden (School of Business and Economics) was the Research Assistant.

Research aims

1. To understand how ResilienceDirect is used during the Covid-19 response.
2. To develop recommendations to local resilience bodies, the Cabinet Office, and other project stakeholders, to enhance the use of ResilienceDirect during and after the Covid-19 response.
3. To contribute to academic knowledge on the role of digital technologies within interorganisational collaboration and emergency collaboration.

Research objectives

1. Data	Collect data from ResilienceDirect users and management, and the ResilienceDirect pages and policies. Review academic literatures and policies on emergency collaboration and interorganisational collaboration.
2. Network	Create and maintain a ResilienceDirect project page and develop our network across the emergency community.
3. Collaborate	Collaborate with ResilienceDirect users and management to ensure our findings are useful and beneficial for all stakeholders.
4. Share	Share findings through monthly reports on ResilienceDirect. Share findings through academic publications. Produce and share a summary report on our findings on ResilienceDirect.

Figure 4.0. Barriers to interorganisational collaboration

Despite its longevity, growing userbase, and prominence in National Resilience Standards, prior to the Covid-19 response there has been no dedicated independent research into the efficacy of ResilienceDirect to enable collaborative working. The next section introduces the research project exploring ResilienceDirect during Covid-19.

3.2 Data Sources

Data was collected for the study from a wide variety of sources. Semi-structured interviews were conducted with 66 ResilienceDirect users and the ResilienceDirect management team. Most of the participants in the interview study were from England (58), with further participants from Scotland (7) and Wales (1). All interviews were conducted on Microsoft Teams and lasted approximately 30 minutes. The interviews were recorded and digitally transcribed.

In addition to the interviews a survey was undertaken with 494 ResilienceDirect users during the summer of 2021. This is a statistically significant sample of ResilienceDirect users. The survey was undertaken using Microsoft Forms. Figure 1 provides an overview of survey participants:

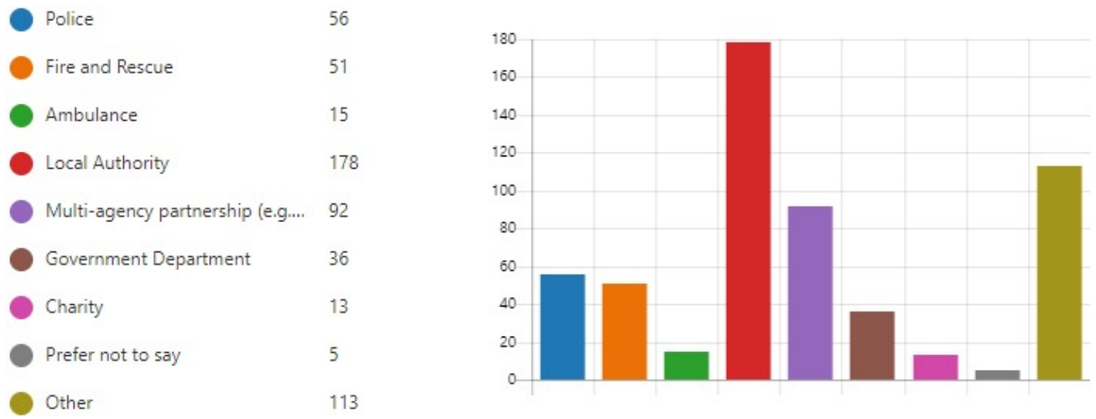


Figure 5.0 ResilienceDirect survey participants by organisation.

3.3 Research ethics and data management

The research was undertaken in full compliance with all UK data protection legislation, the Loughborough University Ethical Policy Framework, and the ESRC framework for research ethics. The project gained ethics approval via the Loughborough University Ethical Approvals Sub-committee (Human Participants) in July 2020. Participants provided verbal or written informed consent before participating in each stage of the research. Names of people and organisations contained within this report and other project publications are pseudo-anonymised to enable the confidentiality of all participating people and organisations. Interviews were scheduled to take 30 minutes to minimise the time demands on those participating in the Covid-19 response. During the second peak of Covid-19, in January and February 2021, the project team agreed to pause data collection to minimise the demands of the research on emergency practitioners. Primary data collected during the project is held on password protected and encrypted Loughborough University servers.

3.4 Data Analysis and Themes

Interviews were analysed thematically using the qualitative analysis package QSR Nvivo12. This analysis consisted of two stages. First, patterns were identified in responses to generate high-level themes. Second, the data was analysed to explain these patterns. These explanations were based upon a combination of theories of collaboration, the history and context of emergency planning and response, and cross-referencing across the dataset. Survey data generated descriptive statistics and qualitative comments on the use of ResilienceDirect during Covid-19. This analysis generated a framework for understanding ResilienceDirect and emergency collaboration.

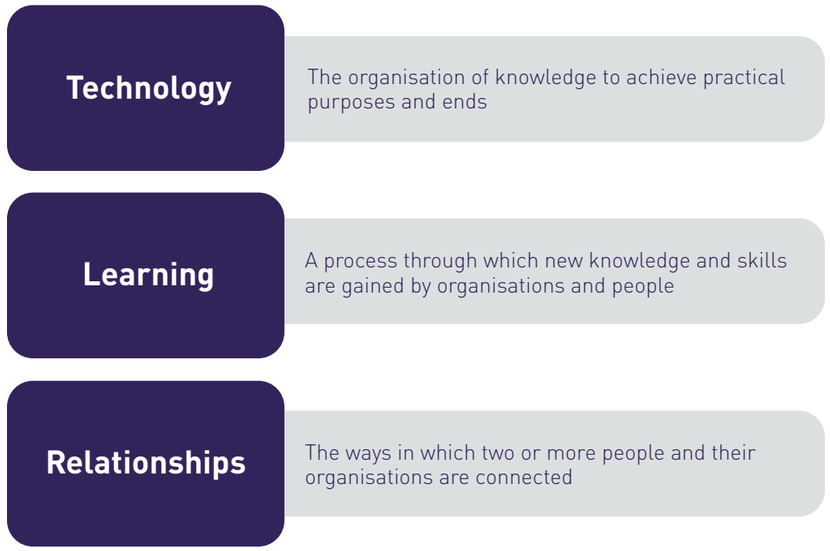


Figure 6.0. Framework for understanding the use of ResilienceDirect.

The analysis revealed three key factors that shaped how ResilienceDirect was used collaboratively during the Covid-19 response.

This research found broad user agreement on the benefits of ResilienceDirect as a tool for enhancing collaboration in emergencies in general, and in the Covid-19 response. However, users also agreed on a number of specific issues and areas which were constraining the capacity of ResilienceDirect to enhance collaboration further. Through the analysis, responses were grouped under three themes: technology, learning and relationships. Collaboration can be understood as a function of all three themes. It should be noted however that technology, learning and relationships are not mutually distinct categories. The design of ResilienceDirect as a technology has implications for training and learning: for example, by making the technology more or less intuitive to use. Likewise, relationships within and across local resilience bodies can impact the potential of ResilienceDirect to enhance collaboration within an emergency response. Conversely, problems arising in any one of these categories might constrain or limit the benefits to collaboration afforded by another. For example, excellent training might be undermined if the user interface is found to be unintuitive.

A detailed discussion of each of these themes is presented below. Each section presents the findings, identifying both the strengths of ResilienceDirect in enhancing emergency collaboration as well as areas where improvements could be made. Anonymised quotes are drawn on from users to provide a first-hand account of how these issues have been experienced by them. Academic research is drawn upon, where appropriate, to further inform and frame the findings sections. Ten recommendations are provided at the end of this discussion which we hope will be useful in informing the development of ResilienceDirect so that it may realise its full potential in enhancing collaboration in future emergencies.

Technology

4.0 Technology

Technologies, such as ResilienceDirect, have become indispensable to enabling collaboration between organisations. During the Covid-19 pandemic almost all organisations experienced a significant shift in their use of technologies such as Microsoft Teams and Zoom. These were vital to sustain collaboration during periods of Covid-19 related restrictions on social mixing. Technologies have significant potential to enhance emergency collaboration by augmenting the quality of information and facilitating shared situational awareness, thus improving the speed, sustainability and effectiveness of a response.[49] Research on emergency collaboration suggests that technologies can play a particularly important role in information sharing only if certain factors are met, including the ease of use of the technology, the integration of the technology into daily routines, and that information is shared fairly between all partners.[50] Customisable interfaces can enable these systems to work with the different cognitive problem solving approaches of their users. Such adaptations also help users to mitigate information overload and allow improvisation in response to unpredictable and complex events.[51] Broader research on the use of technologies within organisations explains that technologies are only used and useful if they enrol users in support, while those systems must evolve to keep those users enrolled.[52] This is because the needs of users change as do the potential capacities of technologies. In other words, technologies are not simply understood as fixed tools that solve fixed problems – such as information sharing and collaboration. Rather technologies should adapt and evolve to ensure that any changes in the way those problems are framed by their users becomes embedded into the design of the technologies.

4.1 Interface Design

ResilienceDirect contains three distinct interfaces for Collaborate, Joint Organisation Learning and Mapping. Respondents focussed on the design of the Collaborate interface. This reflects the dominant use of the Collaborate information sharing function within ResilienceDirect, including during the Covid-19 response.

88.4% of surveyed users agreed that ResilienceDirect allowed them to share information effectively during the Covid-19 response:

in terms of getting to grips with the actual software [it] is quite simple ... in terms of the user interface. I thought [it] was quite simple in the way that it was fairly easy to edit pages. It was fairly easy to add pages. There wasn't a lot to get confused about (IT support officer, English Local Resilience Forum).

I find it easy to navigate. And I've said, my competence skills fall well below that of a seven-year-old. So, yeah, I think it's a great system (Resilience Officer, English Local Resilience Forum).

Despite widespread satisfaction with the efficacy of ResilienceDirect, some users noted that the Collaborate interface could be improved:

in the covid context, because there are so many sub folders and because navigating between folders can be long winded, then people just lose the will to live and give up trying. (Planning Officer, English Local Resilience Forum).

It's clunky ... it's a library without the index, it's like going into my local library when the computer's down, so you've got to go on the shelves and look for the book you want. That to me is probably the issue I think RD [ResillienceDirect] has too many possibilities with the repository, you know, the different titles for different ways in which you can do pages, etc.. I think that confuses people (Manager, English Local Resilience Forum).

a lot of people and officers do see that it's hard to navigate and to find the documents that they want to find very quickly, particularly ...during an incident and they don't have time (Manager, Scottish Regional Resilience Partnership).

it is not particularly intuitive when you first start using it, ...but there's no layout that sits on it, that makes it user friendly, it isn't user friendly. It doesn't teach you as you go. It doesn't explain any of its thought processes. It doesn't explain (Officer, English Local Resilience Forum).

Users also explained that they thought ResilienceDirect did not compare well to other software platforms:

I still find it quite clunky and kind of time and labour intensive sometimes to get into things. And when you're used to working with Microsoft and, you know, these different software companies, it just feels a wee bit different, and it feels a wee bit more long-winded, and heavy going you know (Emergency Officer, Scottish Regional Resilience Partnership).

if you're involved in planning and you're collaborating around a plan then you want a system which is 21st century in terms of being able to update a document. Well, any really basic functionality that you could get out of Google Docs or anything else could be used so that people could work on documents together and collaborate in that way. I think for people who are only ever going to use the system infrequently, I think you probably want to have some sort of arrangement around bookmarks or something like that. That would be a way for an infrequent user to quickly be taken to the particular folder or section or pages that are relevant to them (Director of Public Health, English Local Resilience Forum).

The Collaborate interface has remained largely unchanged since its launch. This lack of visible change was sometimes identified as a problem in and of itself as it conveyed a lack of development:

You know, people are used to seeing software developing and ResilienceDirect kind of looks the same as four years ago (Manager, Scottish Local Resilience Partnership).

I think nowadays people are much more used to visualisations, you know, to little mini graphics and things like that. So, I think it's still very—I wouldn't dare say old fashioned—in that respect (Officer, English Local Resilience Forum).

Many file management platforms use a 'drag and drop' interface to allow users to move files and change folder structures. Within ResilienceDirect documents are displayed within parent and child pages, accessed through a linking index. Command menus are used to upload documents. Some users were critical of the lack of 'drag and drop' interface as it introduced delays when file structures had to be reorganised by local administrators:

On the main page, we decided we needed to create more child pages and put the meetings for August, March, April, May, June, in child pages. There's no ability to drag. You have to download everything onto your desktop and then you have to reupload it to ResilienceDirect. It's clunky. It takes time. To be able to have that simple drag and drop as an administrator would be much, much easier (Manager, English Local Resilience Forum).

We expect to be able to go on and create a folder and put the documents in there. We expect to be able to just drag and drop them (Manager, English Local Resilience Forum).

You know, like in [Microsoft] SharePoint, you can move files and re-order them. It's not possible to do that in an easy way on ResilienceDirect. And so, if a page in repository hasn't been well designed from its initiation, it can be very difficult and time consuming to go back and fix those things. So, you can't like drag and drop (Planning Officer, Scottish Local Resilience Partnership)

In response to such concerns, some local resilience bodies have looked to improve the Collaborate interface by creating tiles and buttons to replace the standard file structure:

We spent a lot of time writing the HTML code and the CSS code to style it to paste into the page just because we want it to have a bit of customisation. Now, we've only been able to do that because I know the code. You can't do that generally on the system ... So we have been able to do some customisation on it and make it easier to link between our different pages and make them look slightly better (Manager, English Local Resilience Forum).

Concerns with interface design are driven by expectations. Users expect ResilienceDirect to allow easy and effective access to information, including during a fast-moving response. When these expectations are not met, concerns are generated. Given that ResilienceDirect was widely used during the Covid-19 response and almost all users felt it was effective, it is important to reflect on whether these concerns regarding the interface are significant. Indeed, there is very little evidence that concerns regarding the interface have reduced overall engagement with ResilienceDirect. However, there is evidence that a more intuitive interface, including 'drag and drop' functionality, could have some benefits, including: (a) reducing training demands, (b) promoting access to less used services (e.g. SitReps), and (c) allowing file structures to be customised to match the evolving needs of users during a response. If ResilienceDirect does not evolve there is an increasing potential that users will turn to other collaborative technologies that are viewed as being more intuitive and capable. There is some evidence from our interviews that increased familiarity with other platforms during the Covid-19 response has already encouraged some local resilience bodies to reduce their engagement with ResilienceDirect.

4.2 Standardisation and customisation

The relationship between standardisation and customisation is an important consideration in the development of all information technologies. Interfaces that are customisable to individual users can be beneficial, particularly within the context of emergency response as they can foster greater alignment with the problem-solving capacities of users and reduce cognitive overload. ResilienceDirect does not currently allow individual interface customisation. However, it does allow local resilience bodies to customise file and page structures.

Anyone that says local resilience forums, local resilience partnerships, blue lights, agencies, everyone else works the same. That is not true. Everyone adapts to their own way of working (ResilienceDirect management team).

Many users have welcomed the capacity for customisation within ResilienceDirect:

You might get somebody that just wants to use it for the mapping tool. They don't have anything to do with multiagency response and they don't need the ResilienceDirect alerts coming in … You know, they can turn the alerts off. But again, that's something else that administrators need to advise them how to do (Resilience Officer, English Local Resilience Forum)

We don't like the way the national model is … the kind of situation reports and templates. We've got our own model, which we think works better and with a more advanced approach (Manager, English Local Resilience Forum).

We've also reworked the pages so that they are a bit more intuitive and user friendly, we did away with the kind of generic indexes on the side and child pages and so on. It's a wee bit more intuitive and user friendly to get into (Co-ordinator, Manager, Scottish Regional Resilience Partnership).

Despite these advantages, the capacity for customisation can generate challenges in accessing information for users working across multiple local resilience bodies:

… you know, they'll have different things in different places on their Covid pages. And if you are trying to look across the board to see what's happening across all the Local Resilience Forums, you know, you're hunting up and down into different folders. And some might not even have published anything on their SharePoint, on their ResilienceDirect sites. So, again, you then have to email that Local Resilience Forum to get that information, but you can go on ResilienceDirect for another one. So, you know, if anything, it's consistency that that makes these structures of value to the to the person accessing them (Emergency planner, central government agency).

if I go … and help them out, I need their ResilienceDirect pages to look and feel similar. Otherwise, I'm fighting against technology (Resilience Officer, English Local Resilience Forum)

Every LRF does their page differently …. and that can be quite tough if I want to go and find a plan … For example, if you follow the logic of what ResilienceDirect presents you, you'd expect to go finding files, plans you like. I know that route, but other Local Resilience Forums have changed their approach and they just have a front page with a link to plans that goes somewhere else. The logic just isn't consistent. It would be useful if it was a consistent logic (Emergency planner, central government agency).

Standardisation and customsation are not necessarily mutually exclusive. For example, there is potential to create ResilienceDirect pages that contain a degree of standardisation to benefit those who are working across multiple local resilience bodies and customised areas that are more exclusively used within a local resilience body. Such an approach is not currently undertaken as there are no national agreements on how ResilienceDirect might be standardised. An agreement on standardisation could be beneficial to increase the speed of response. The full benefits of customisation, to align with the problem-solving capacities of users and reduce cognitive overload, can only be realised by allowing users to create their own customised interfaces.

Another significant consideration is the question as to whether the use of ResilienceDirect should be mandated as a standard for UK resilience. The use of ResilienceDirect for establishing shared situational awareness is already promoted within the National Resilience Standards for Local Resilience Forums.[53] However, ResilienceDirect is not covered by any legislation or mandatory regulation. This inevitably means that some local resilience bodies and government departments do not use ResilienceDirect which can cause difficulties in sharing information:

I think there needs to be a one single approach for everyone using ResilienceDirect…. I think what we have at the moment is that some local resilience forums are using it more than others. Some government departments will be more attuned to it than others are. So, there's a little bit of a disconnect between the amount of people that are using it and how people are using it. I think you'll probably see variations right across the country of how many how many Local Resilience Forums actually engage with it (Emergency officer, central government agency).

In the early stages of the Covid-19 response information was reported from English Local Resilience Forums to central government using Excel spreadsheets uploaded to ResilienceDirect. A decision was then taken to switch to using the reporting system DELTA[54]:

It became fairly apparent that the Excel spreadsheet way of working didn't quite work for our analysts. So we moved over to a system that we use for local government … called DELTA. It's more user friendly for our analysts and data people to actually extract the information onto: you know, whatever applications they use to manipulate information and present it and analyse it…. With the Excel method was a case of going into each folder, downloading the spreadsheet, uploading it, so on and so forth (Emergency officer, central government agency)

Central government agencies have tended not to use ResilienceDirect for sharing and processing information. However, ResilienceDirect was never intended to be used within a single agency or indeed across central government:

We don't really have a great deal of policy on the use of ResilienceDirect internally …. There's no corporate direction of how we should use ResilienceDirect …. [We] don't use it for response at all. They're not using it during Covid-19 at all. All of our stuff is either coming out via emails or going on to SharePoint sites (Emergency officer, central government agency).

… We do not use ResilienceDirect as a means to communicate … because we have got multiple tiers of secure systems for doing that already…. Across government it is used with some misgivings about ease of use by some across government communities for official sensitive material. Where I find it exceptionally helpful is working across the broader resilience community with whom I share no ICT provision at all (Manager, central government department).

ResilienceDirect was created to support multi-agency collaboration between local and national agencies within emergency planning, response, and recovery. The decision to switch away from ResilienceDirect for information reporting during the Covid-19 response stemmed from specific technical requirements within central government. Notwithstanding the technical rationale, this decision became a source of concern for many users:

We ended up going into the DELTA system for reporting, which is completely outside of ResilienceDirect. Why the hell are you doing that? There is seventy thousand of us on ResilienceDirect. And now quite a lot of us have got to learn this new system for reporting. Why have you not designed and put that in on ResilienceDirect? (Manager, English Local Resilience Forum).

We all feed up through these DELTA reports, not even on ResilienceDirect, this drives me insane (Manager, English Local Resilience Forum).

The daily reports that we had to send in for quite some time … you then have to log into a different system to submit your SitRep … all on this DELTA system rather than on ResilienceDirect. And if we're using one system, there should be a way for that kind of functionality [to be included] within that as well, rather than having to log in to multiple structures to be able to draw down.. to get the consolidated information …. [You need to] go into ResilienceDirect, because that's where they publish their collated findings but in order to put it in, we have to do it through this DELTA system (Manager, English Local Resilience Forum).

The problem is I guess from a PR perspective, both for the ResilienceDirect team and government as a whole: if it's the government's preferred solution for information sharing, why is the government not using it? And if the government response is: it doesn't deliver what they need, then what is government doing to make sure it does deliver what they need in the future? (Manager, English Local Resilience Forum).

These concerns demonstrate the attachment that users within local resilience bodies have towards ResilienceDirect. When decisions are taken not to use ResilienceDirect it is important that these decisions are fully explained to avoid disengagement.

4.3. ResilienceDirect and live response

ResilienceDirect is intended to enable information sharing during the planning, response and recovery phases of an emergency. Many users feel that ResilienceDirect would benefit from further development to fulfil its function during emergency responses:

we're in response mode. We're not really in planning mode. And there's very little use I make of ResilienceDirect. It doesn't have on it anything except plans which are useful in the planning phase but [that] you need infrequently when you're in response…[such as] records of meetings. Well, things are moving so fast in covid response … and ResilienceDirect is so clunky that I don't really make any use of it. Almost no use of it at all (Resilience Officer, English Local Resilience Forum).

We use it but we don't use it when we are in response because we have our own mechanisms, we have our own systems and anything multiagency they know to refer to (Resilience Officer, English Local Resilience Forum).

ResilienceDirect does not support live document editing or live incident updates. This was viewed by some users as an important reason why ResilienceDirect was understood to have reduced functionality during a response:

Where it falls apart: It's not dynamic, it's not a collaboration space (Resilience Officer, English Local Resilience Forum).

As things are evolving you wonder whether it could be more live time? Meetings are now being held virtually, documents can be shared virtually and some of our cells are storing files in the cloud….I think the opportunities for more instant information sharing should be utilised as much as possible … the ability for agencies to share a Common Operating Picture at the point its opened and share in its construction rather than one agency constructing it, uploading and alerting via ResilienceDirect, thus allowing more 'live time' information, can only be a good thing (Resilience Officer, English Local Resilience Forum).

If you've got three Silvers [Silver responders] around a car and one of them making notes, what happens? At the moment it's going to my yellow book. If I was typing, it could it be typed in a way that gets published straight away onto a log … it's written down for the moment I've written it at the scene it's on ResilienceDirect for the gold commanders and other people, the MAIC, the media people. Sort of lifetime updating log or something like that (Resilience Officer, English Local Resilience Forum).

What you would want is ResilienceDirect building on [Microsoft] Teams and the current ResilienceDirect functionality, so that actually in terms of managing events going forward, it's putting us in control of what we're doing. So, with Teams, you can get information, livestream, from the scene, manage events. You've got good first-hand intelligence, which is coming to commanders (Resilience Officer, English Local Resilience Forum).

We need live collaboration. Other systems are far more powerful than ResilienceDirect. It will get to the point of all of us using Office 365 (Manager, English Local Resilience Forum).

ResilienceDirect is of its time. I've heard it said that ResilienceDirect is a secure Dropbox. It's fine for that but it's not a live data system (Manager, central government department).

ResilienceDirect does not currently support live data editing and streaming, but this functionality is now standard in other collaborative platforms. Adding this functionality to ResilienceDirect would require strong justification, especially as almost all users already have access to other systems offering these services. During Covid-19 ResilienceDirect users made use of several other platforms that supported live data editing and streaming.

4.4 Recommendations

1. Develop a more intuitive interface within Collaborate to: (a) reduce training demands, (b) promote access to less used services (e.g. SITReps, Incident Logs), and (c) allow file structures to be changed more easily during a response to match changing needs. Local resilience bodies should ensure pages are well organised and members are regularly engaged (e.g. by survey) to ensure pages are fit for purpose.

2. Work with users who access information across multiple local resilience bodies to create guidance on standardised folder and file structures to facilitate quick access to information. ResilienceDirect interface to provide a page structure overview to allow local resilience bodies to compare page organisation.

3. ResilienceDirect should be the primary technology to share information during a response. When decisions are made within central government departments not to use ResilienceDirect these decisions should be fully explained to all users through the ResilienceDirect notification system. Consider whether different government information systems can be better integrated to reduce duplication of effort and facilitate information sharing (e.g. link to DELTA on ResilienceDirect dashboard). Local resilience bodies should encourage the use of ResilienceDirect to share information during a response, even if that duplicates other local arrangements.

4. To enhance the effectiveness of ResilienceDirect during response, a review should be undertaken to consider adding individually customisable interfaces, live document editing and streaming functionality within ResilienceDirect (including apps on other platforms).

Learning

5.0 Learning

The dataset allowed us to both explore how ResilienceDirect facilitated wider collaborative learning concerning emergencies, as well how learning about ResilienceDirect influenced its use. Learning is a process through which new knowledge and skills are gained by organisations and people. Learning is often a driver for collaboration – allowing organisations to acquire and generate knowledge they do not possess.[55] Within emergency response this learning may include the creation of new emergency plans, the development of shared situational awareness, and the exchange of lessons learned from an emergency. ResilienceDirect aims to support collaborative learning through the exchange of new emergency plans, common operating pictures, and maps; the sharing of lessons learned through Joint Organisational Learning; and the dissemination of guidance, such as the Cyber Hub. Learning is best enabled through the exchange of diverse views and ideas. For this reason, collaborations that aim to generate new learning will often have to be more tolerant of conflict and less consensual.[56] Learning is also said to require optimal levels of trust. This is because partners who are too distrustful will lack sufficient transparency to share knowledge, while those who are too trusting will be too easily exploited.[57] Learning can involve the exchange and creation of explicit knowledge, such as written emergency plans, and tacit knowledge, such as best practices for developing effective emergency plans. When more tacit knowledge is shared within a collaboration there is evidence that it will increase levels of trust between partners.[58]

5.1 Learning and using ResilienceDirect within Covid-19

During the Covid-19 pandemic the number of users of ResilienceDirect increased from approximately 68,600 to 93,800. Some of these users had no or little experience of ResilenceDirect prior to the pandemic. New users were added to ensure the response could be sustained over a longer time period, whilst others were added as the complexity of the response extended and new organisations were engaged. Some existing users were also required to engage with ResilienceDirect more often or in new ways. For example, individuals may have been required to upload and organise information on ResilienceDirect whilst previously they had only used ResilienceDirect to access information. Other users may have previously relied upon other individuals in their organisations to access information from ResilienceDirect. Remote working often limited those arrangements and thus increased the need for users to become more proficient in their use of the system.

The research indicates that 70% of ResilienceDirect users agree that the training provided by their organisation (i.e. their local resilience body) was sufficient to enable them to use the platform during the Covid-19 response. 13% of users said they felt that they had not received sufficient training on ResilienceDirect from their organisation prior to Covid-19. These new users had to quickly become comfortable with the system. Despite these challenges, this process of extending the number of users during the response was perceived as beneficial:

more people have become comfortable with it and we have used it for a lot of information sharing, information gathering, information storage. It has been a lot more widely used. I don't know what we would have done without it … If they don't turn up for training, then they're not going to know where things are. So, it has been a steep learning curve, I think, for some people … But I think in a good way, because I think it will encourage them to use it in the future (ResilienceDirect administrator, English Local Resilience Forum)

we've got a lot more people coming on board who have never seen ResilienceDirect before. And it was a very steep learning curve for them, very, very steep. And we could have done ourselves a favour, but we didn't have a crystal ball, so we didn't know this was going to happen this year or we would have really pushed the training (ResilienceDirect administrator, Scottish Local Resilience Partnership).

Despite the demands of the response, many local resilience bodies also continued to offer some training materials for new users and also directed them to Cabinet Office training guides and the ResilienceDirect Help Desk.

We point people towards the help pages on ResilienceDirect … And there are PowerPoint presentations that I've created that we have people have got a certain amount of knowledge … [and] we do point people towards the Help Desk (ResilienceDirect administrator, Scottish Local Resilience Partnership). What I've been able to do is to utilise some of the training materials that were previously developed and put them together as a sort of user guide to actually support people who are new and actually sort of help guide them through (ResilienceDirect administrator, English Local Resilience Forum).

There is considerable evidence that the majority of existing and new users of ResilienceDirect were able to quickly learn to use the system to meet their needs. For the vast majority of users this means the training is sufficient to enable them to share and store documents on Collaborate. Indeed, the research indicates that most users of ResilienceDirect use it to upload and access documents on Collaborate. This can mean that other functions – such as the situation reporting function – that require more training tend to not be used:

… you tend to get people who aren't involved in the planning aspect, and they only come in response. And if they're not intuitive, they're not going to get us … we found very, very quickly, certainly by mid-March, use of the SitReps fell off the system and it reverted back to the manual process of collating and putting them on, which is a shame. (Local Resilience Forum manager, English Local Resilience Forum)

Normally we would produce a Local Resilience Forum sit rep. Well, a Strategic Coordinating Group sit rep and a Tactical Coordinating Group sit rep using the features of the system directly after those meetings. But because that didn't become standard practice from the outset … So for me, that would be that would be the biggest failing this time around is that we didn't make use of the built in situation reports (Emergency Officer, Scottish Regional Resilience Partnership).

Alongside these functions within Collaborate, around a third of users surveyed also acknowledged they have never used the mapping function. Many of these users would like more training on mapping and other functions:

Few of our incident responses use the site functions – recent major incident have no METHANE[59] input, no SitReps, no reports, no incident log. Users just upload word docs instead. So clearly, we need to train some trainers (Anonymous user survey response).

Some users expressed a desire for more personalised training to be offered, whether nationally or locally, potentially allowing users to identify their basic training needs and any developmental opportunities:

What do you want that training for? What do you want to use it for rather than just pushing it out, right? (Manager, English Local Resilience Forum)

[we need] a training portal to help users understand and measure their expectations of the system. So, what are they using it for? What? Where do they need to get to? How do they get there? (Emergency Planner, Scottish Local Resilience Partnership)

There is also evidence that the lack of useability of the platform increased the demand for training during the response:

using ResilienceDirect on top of what we've been through … it would have been a nightmare… Training people completely from scratch to use it - it's very difficult. (Manager, English Local Resilience Forum).

If the system wasn't so clunky, they wouldn't be such a need for training people - just go in and use it. And it's because actually people don't have a lot of time to learn a new system (Planning Officer, Scottish Local Resilience Partnership).

[mapping is] not as intuitive and equally sometimes that, um, the icons they need to be relevant to our organisation … Now, why can't we customise it a bit more? (Resilience office, English Local Resilience Forum).

Summarising, there is strong evidence that current training provision is sufficient to support the needs of most users: the sharing and storage of documents on Collaborate. Moreover, this training is sufficient to support growth in new users during a large-scale, complex response. However, there is evidence that current training is not supporting users to confidently operate other ResilienceDirect functions, including mapping and the situation reporting function. Many users recognise there is a need for more accessible training – both locally and nationally – to support and develop the use of these functions. This finding is consistent with academic research on the use of technology, where a lack of engagement with the needs and expectations of users will prevent new technologies from being used or will diminish how they are used.[60]

5.2 Collaborative learning with ResilienceDirect

Learning is best enabled through an exchange of diverse views, and this can often occur through interorganisational collaboration. Local resilience bodies are encouraged to mobilise ResilienceDirect to facilitate such learning, whether before, during or after a response. The Joint Organisational Learning (JOL) function of ResilienceDirect provides a database to share lessons learned to the whole ResilienceDirect community. However, the use of JOL to share lessons related to the Covid-19 response has been limited. 80 lessons were published on JOL between March 2020 and March 2022, yet only 6 relate explicitly to Covid-19. These 6 lessons concerned: the use of stickers for personal protective equipment; a Covid-19 debrief by the ambulance service; a report of the fire service supporting an ambulance, two updates on virtual JESIP training, and the release of three operational reviews conducted by the C19 National Foresight Group.[61]

There are several reasons why engagement with JOL is limited. Academic research on emergency collaboration suggests that unless technologies are used regularly before a response (e.g. to record lessons from an exercise), they will be unlikely to be used during an emergency.[62] Since its launch in 2013 JOL has received 284 submissions. This suggests that its use and value has not become widely embedded within the ResilienceDirect user community and thus it is unlikely to be used during an emergency where resources to understand new systems are extremely limited. A practical reason given by many users for the lack of engagement with JOL is that respondents explained they usually set up bookmarks to quickly access the pages they needed on ResilienceDirect (i.e. a response page) and thus will by-pass the ResilienceDirect dashboard where JOL can be accessed. Despite the lack of engagement with JOL, some ResilienceDirect users have access to pages other than their own, which can enable learning to be shared more widely:

I don't know how I would communicate with other LRFs as frequently if we didn't have ResilienceDirect … I'll go and look at their page, but there's no way of kind of giving them feedback unless you've had that alert, or you already have a contact with them. So, if I look at one of their response pages, it's just me viewing their information (Emergency resilience officer, English Local Resilience Forum).

Notwithstanding the limited use of ResilienceDirect to share learning it is very evident that informal networks and communities of practice exist outside of ResilienceDirect that are facilitating the sharing of learning within and between local resilience bodies:

rather than trying to come up with a kind of single voice, … [what we do is] let everyone share good practice and share challenges with each other (Manager, English Local Resilience Forum).

we create our own substructures … the chairs of the SCGs [Strategic Coordinating Groups] in the [region] meet together, the chairs of the SCG in the [neighbouring region] meet together. And LRF people like me as in the LRF partnership managers. We have these networks as well (Manager, English Local Resilience Forum).

we have links with England and Wales through the police structure, which are formal and we do report through, but that's not ResilienceDirect's focus specifically. And I have had contact with neighbouring LRFs on the border to Scotland. (National Control Centre Manager, Scotland)

These networks and communities of practice are crucial conduits to enable learning to be shared and developed. If ResilienceDirect is to continue to help facilitate collaborative learning, then the design of the system should develop with the needs and expectations of these networks and communities of practices in mind.

5.3 Recommendations

5. Increase support for local resilience bodies to develop training on the benefits of less used ResilienceDirect functions (e.g. SitReps, Mapping, Joint Organisational Learning). Support could be developed by the Cabinet Office ResilienceDirect team or other relevant bodies (e.g. the Emergency Planning College, National User Group).

6. Review the use of Joint Organisational Learning and add a link on all Collaborate pages. Users should be promoted to upload information to Joint Organisational Learning when uploading response/exercise debrief on ResilienceDirect. Joint Organisational Learning email notifications should provide a short summary of content.

7. Consider renaming ResilienceDirect 'Working Groups' as 'Communities of Practice' to encourage sharing of learning. Identify and invite existing informal networks, particularly at regional level, to share learning with all ResilienceDirect users within new 'Communities of Practice' group category on ResilienceDirect.

6.0 Relationships

Relationships refer to the diverse ways in which two or more people and their organisations are connected within a collaboration. Collaboration is not possible without active relationships between individuals and organisations. These relationships can be characterised in many ways, for example their duration, their depth and breadth, the exchange of trust, and commonalities in values, cultures, and norms. By facilitating the sharing of knowledge and decision-making ResilienceDirect influences relationships between emergency practitioners and their organisations. These relationships can also influence how ResilienceDirect is used. Academic research on collaboration explains how the nature of these relationships can impact how any collaboration proceeds. Collaborations that are deep (long duration and strong levels of involvement) allow resources to be shared. Collaborations that are broad (extensive links across and within organisations) facilitate the sharing of power. And collaborations that are deep and broad enable learning.[63] The sharing of trust – confidence in the benevolence and competence of others – is often associated with strong collaboration. However, too much trust can invite exploitation and generate cognitive blind spots in understanding, while too little trust can produce excessive suspicion and conflict.[64] Moreover, the focus on trust in a collaboration can leave individuals to overreact to the emergence of any distrust, fear and suspicion rather than view such experiences as a normal part of any collaboration.[65] Accordingly, effective collaboration should involve trust being exchanged at an optimal level, for example by benchmarking performance, setting challenging yet realistic expectations, encouraging consistent criticism, and making no initial assumptions of opportunism or loyalty.[66] Another important balance to strike within any effective collaboration is that between the interests of their own organisations and the collective. This balancing act requires partners to both be uncompromising in defending their own interests while also willing to compromise to develop collective group positions.[67]

6.1 Trust and resource sharing

Achieving an optimal level of trust between individuals and organisations – understood as confidence in the benevolence and competence of others – is vital to the collaborative sharing of resources and power. ResilienceDirect relies upon an optimal level of trust being developed between individuals and organisations. The presence of too much trust might encourage organisations and individuals to share sensitive information without sufficient safeguards. Conversely, insufficient trust can prevent critical information from being shared. ResilienceDirect supports the accomplishment of optimal trust by allowing local administrators to manage exactly who can access what information. However, despite the technological flexibility of ResilienceDirect, perceptions of optimal trust can vary and be difficult to align. These lived experiences of trust are discussed in this section.

In principle ResilienceDirect can enable optimal trust to develop through the management of access permissions to circulate information. However, the way in which trust, and thus also power and resources, are shared are strongly influenced by pre-existing individual and organisational behaviours and structures. One of the most revealing aspects of the challenges of trust within the Covid-19 response concerned the restriction placed on the circulation of Covid-19 Reasonable Worst-Case Scenarios in England. In the early stages of the pandemic a cautious approach was taken by central government to reduce the risk of sensitive information being circulated more widely. Practitioners within local resilience forums were highly critical of this decision to restrict information:

there was a chunk of information that we desperately needed that was withheld, which was … what is the worst-case scenario here? … I'm about a security cleared, as you can possibly be. Yet, I can't be told how many dead bodies there might be when I'm chairing a meeting, which is supposed to decide what the bloody hell are we going to do with them? (Chair, English Local Resilience Forum).

… we get exactly the same as public communications. And they don't like to give something that's different to public communications because they think it will leak (Manager, English Local Resilience Forum).

we put together a letter that said: these are things that we think we're planning for, is that correct, or should we be planning for something different? We never get replies … engagement with government … they're very demanding … they don't really share information back down, they want to suck up a lot of information, but they don't really push very much down (Manager, English Local Resilience Forum).

These concerns around a lack of information sharing by central government in England mirror the findings of the C19 National Foresight Group concerning how the principle of 'subsidiarity' within UK resilience policy was undermined by centralisation and local resilience bodies felt they were not trusted.[68] The lack of information sharing in the early stages of the pandemic suggests that there was an absence of pre-existing deep ties and assumptions of opportunism within central government towards local bodies. The lack of pre-existing deep ties was compounded by a rapidly shifting staff of central government liaison officers across English local resilience forums. Both of these factors are counterproductive to the cultivation of trust.

The situation in England contrasted to Scotland. There were some important structural reasons for this difference. The Scottish Government has locally embedded co-ordinators within each Regional Resilience Partnership, who then oversee the work of Local Resilience Partnerships. During the early stages of Covid-19, Police Scotland founded the National Coordination Centre and the Multi-Agency Coordination Centre. These centres shared information widely across the national resilience infrastructure:

the National Coordination Centre - my colleagues here would pull that huge dashboard together and we would publish that as soon as we compile that we published it on ResilienceDirect. We created a new response page under Operation Talla, and that's where the portal kicked in so that that wide membership across all Local Resilience Partnerships, all the key people, as well as Scottish government, resilience rooms and the likes, they all got their membership to that (Scottish government emergency planner).

As the Covid-19 response continued into the winter of 2020, the approach in England shifted away from assumptions of opportunism to one closer to optimal trust. ResilienceDirect was instrumental in this shift:

… it is recognised that if someone has a business need to know, a critical need to know, then they can share them with their partnerships … ResilienceDirect has certainly helped with this in that it is our secure platform to share documents on and we can upload it to specific groups on there. So the background to that is that we have now set up shared folders for each LRF. 38 folders have been set up, ranging for all the LRFs, and they can go into their nominated contacts, can go into their access the documents and then share them back with their Multiagency partnerships (Central government resilience advisor).

The functionality of ResilienceDirect to manage access permissions also allowed an optimal level of trust to be developed within local resilience bodies:

… as you can imagine, pretty much everything to do with covid - especially our level - is restricted, confidential. You know, it's a real struggle to actually share information because you try to be ahead of the game. Therefore, you have reasonable worst case planning assumptions and everything like that. So, you can't necessarily just share them widely. ResilienceDirect is the way that we get around that, especially with normal stuff, but also with covid (Emergency planner, English Local Resilience Forum).

As within central government, local decisions around what information to share and not share were often not clear cut and experiences of optimal trust were contingent and sometimes contested, with some practitioners feeling that information on ResilienceDirect was being excessively restricted locally – particularly due to a lack of awareness of ICO (Information Commissioner's Office) guidance on emergencies and GDPR[69]:

I've mentioned GDPR and it's a very important area, but we need to recognise what it is that we're seeking to achieve and that's save lives at the end of the day. And we can't be cavalier with checks and balances. Sometimes the end the end result might mean that we are actually a little less risk averse than we have previously just to enable that effective, functioning within it, because if you put too many restrictions in a) people get fed up and not use it; and b) you know, we don't want a costly inquiry. We don't want people suffering. (Emergency planner, English Local Resilience Forum).

GDPR concerns often resulted in managers and officers within local resilience bodies having to repeatedly circulate ICO guidance which further slowed information sharing.

Other users in England were critical of what they viewed to be a 'restrict by default' approach to information sharing on ResilienceDirect. They proposed a better approach would be 'share by default':

I think the best approach is to have information open unless it has to be closed down rather than closing it down and then thinking whether it ought to be open. I'm starting to get to the point now, having been on ResilienceDirect for a few years and using it within response, I'm starting to say, OK, just make it available to everybody who's got an account, because it just turns out to be too restrictive. You need that balance between, you know, if I only make it accessible to people who have requested access, I've only got about 120 people across the whole of the country who's requested access, but if we make it open to all users, then I'm more likely to get somebody who's got interest and needs to get to find the site and get the information they need. And actually, it's just down to managing the information that we put on there. If there is anything sensitive or of official sensitive nature … then for a particular incident or a particular subject, then we might lock that down, otherwise we keep it open (Senior emergency manager, central government agency).

The functionality of ResilienceDirect to allow partners to access a list of documents but restrict downloads was proposed as one effective solution to support the development of optimal trust:

I think probably everyone that's using ResilienceDirect should understand that some information will be protected. I think sometimes people tend to lock stuff down just in case they need to if that make sense. So instead of locking it down because they know people shouldn't have access, they kind of go, well, we'll lock the whole thing and we're covered then. Which I guess like that is the best way of doing it, because you are covered, but I think it's just about being kind of open about what data you hold, but not necessarily sharing it, if that makes sense. Like if there's a document I want and I know it's on ResilienceDirect, but I can't get access…. It's good to know it's there and how to access it, I think, …, even if it means contacting someone offline (Emergency planner, English Local Resilience Forum).

Technological platforms, such as ResilienceDirect, cannot in themselves determine whether trust exists between agencies to support the sharing of resources and decisions. The sharing of trust is always determined by individual and organisational behaviours and structures. No collaboration technology can generate trust independently of those elements. The contrast between information sharing in Scotland and England in the early stages of the pandemic is highly revealing in this regard. However, technologies can play a role in supporting the sharing of trust – for example by allowing users to restrict access to information or by curating information in a way that allows access to be requested to specific documents. Such functions can allow optimal trust to develop – balancing the risk of too much or too little trust being shared. However, within the context of an emergency the risks of too little trust almost always outweigh those of too much trust. This is because all partners are already working within a shared sense of purpose to reduce serious harm to life rather than having divergent interests and agendas as in corporate collaborations. ResilienceDirect provides an effective means to support the circulation of optimal trust. However, there is potential for improvement as exampled by concerns around GDPR and the 'restrict by default' approach to information sharing, particularly within England.

6.2. Engagement with ResilienceDirect users

Since its launch in 2013, ResilienceDirect has been developed incrementally through engagement with users. This has helped the platform to meet the needs of users and also provided a means of identifying and resolving bugs in new development. There are an array of mechanisms to enable such engagement, including; user feedback via the Help Desk, direct emails to the ResilienceDirect management team, and the work of the National User Group (NUG). These mechanisms are vital as they allow ResilienceDirect to continue to adapt to support the needs of users as they evolve. The research revealed during the start of the pandemic there was an opportunity for increased engagement with users. This opportunity resulted in the creation of a newly structured NUG to develop closer engagement with users. The NUG meets two times per year and includes 8 working groups – covering the development of different ResilienceDirect functions (Collaborate, Best Practice, Cyber Hub, Change Management, Training, Response, Logging and Tasking and Mapping). Membership of the NUG includes representatives from each English region and the devolved administrations, as well as the ResilienceDirect management team.

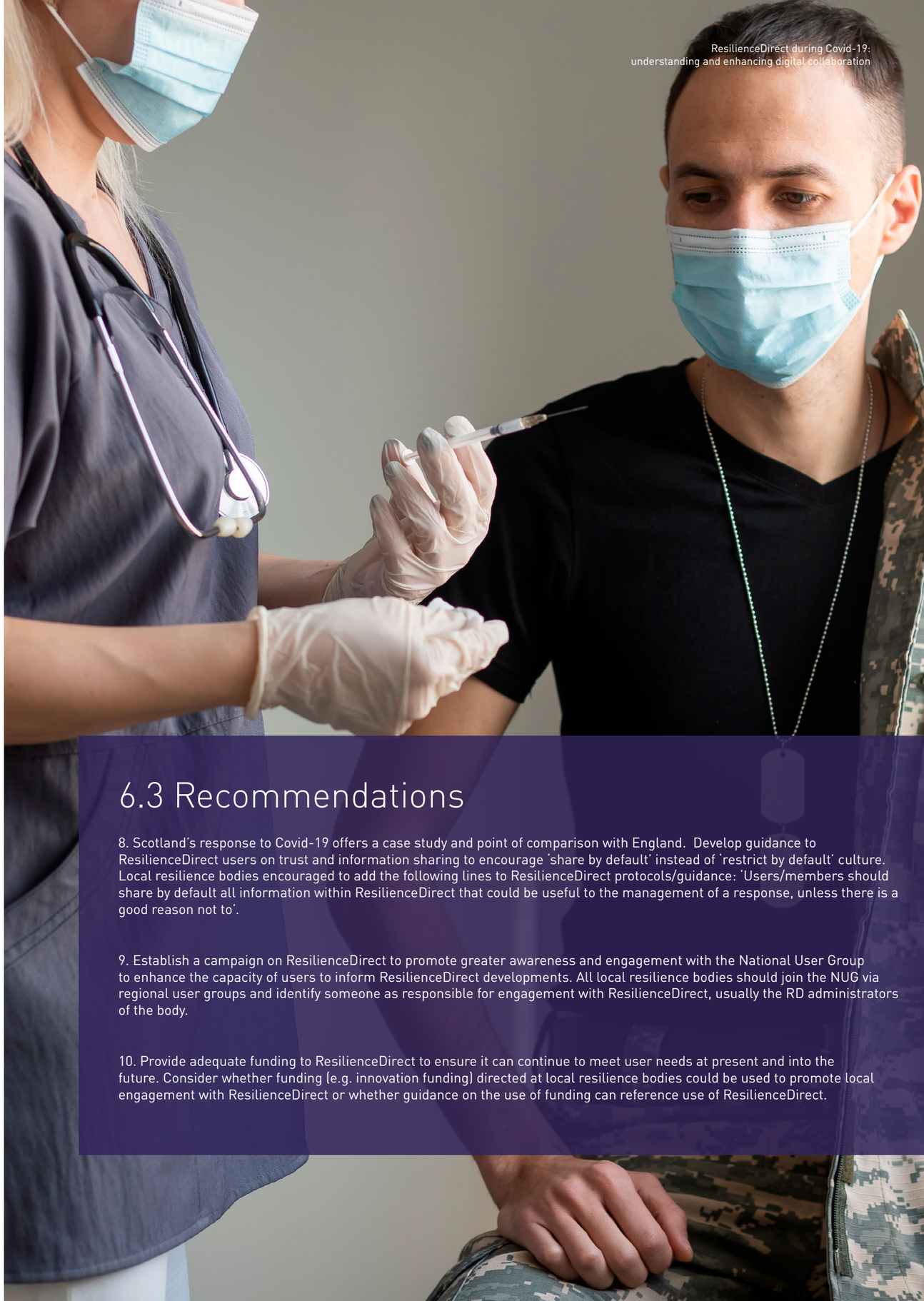
The NUG provides an important forum for users to feedback on how ResilienceDirect is used in practice and to identify areas which users would like to see further development. 92% of users recognised the vital role of ResilienceDirect to enable collaboration during the Covid-19 response. However, some users were concerned that ResilienceDirect had not significantly developed since its launch:

... it's fallen behind over the years and through lack of development from 2015 (Manager, English Local Resilience Forum).

The NUG might provide a means to identify and prioritise these concerns. It is also important to note however that the development of ResilienceDirect takes place within limited resource constraints and that even quite modest developments may require significant expenditure that can be difficult to justify:

... if one enhancement costs a lot of money, is it worth not doing that?... It's always a [matter of] juggling. That's why it's so dynamic. Something that you think is fairly straightforward from a layperson's point of view. Go to the developers and you suddenly find out it's totally right out of scope (ResilienceDirect Management team).

The newly relaunched NUG aims to make UK-wide representation a priority through its regional structure. This is vital because 53% of surveyed ResilienceDirect users were not aware of its existence. The NUG has the potential to help foster deep and broad ties between organisations to enable learning about ResilienceDirect to improve the platform.



6.3 Recommendations

8. Scotland's response to Covid-19 offers a case study and point of comparison with England. Develop guidance to ResilienceDirect users on trust and information sharing to encourage 'share by default' instead of 'restrict by default' culture. Local resilience bodies encouraged to add the following lines to ResilienceDirect protocols/guidance: 'Users/members should share by default all information within ResilienceDirect that could be useful to the management of a response, unless there is a good reason not to'.

9. Establish a campaign on ResilienceDirect to promote greater awareness and engagement with the National User Group to enhance the capacity of users to inform ResilienceDirect developments. All local resilience bodies should join the NUG via regional user groups and identify someone as responsible for engagement with ResilienceDirect, usually the RD administrators of the body.

10. Provide adequate funding to ResilienceDirect to ensure it can continue to meet user needs at present and into the future. Consider whether funding (e.g. innovation funding) directed at local resilience bodies could be used to promote local engagement with ResilienceDirect or whether guidance on the use of funding can reference use of ResilienceDirect.

Conclusions

7.1. ResilienceDirect: Covid-19 and Beyond

During the Covid-19 response ResilienceDirect provided a vital capability for local resilience bodies working in collaboration with national level agencies and departments. ResilienceDirect was a vital conduit for sharing information during the Covid-19 response. If ResilienceDirect had not existed many users would have faced serious challenges in securely and reliably sharing information between multiple agencies. At the time of writing ResilienceDirect has over 95,000 users. During the Covid-19 response alone the platform gained around 25,000 users and since 2018 it has grown from approximately 51,000 users.

Despite these achievements, there are areas where ResilienceDirect could be improved. ResilienceDirect was used by almost all local resilience bodies during the response, however many features and services were much less used – for example SitRep templates and Joint Organisational Learning. Collaborate was used extensively to share documents but many users remained frustrated by an interface widely viewed as considerably less intuitive than alternatives. The use of alternative collaboration platforms, notably Microsoft 365, increased markedly across local resilience bodies during the Covid-19 response. ResilienceDirect has distinct advantages over these single enterprise licensed systems, particularly in terms of the added security of multi-organisation user management. However, these advantages alone may not be sufficient to ensure continued user engagement with ResilienceDirect, particularly as users experience the benefits of other systems. A full cost-benefit review of how ResilienceDirect can be developed to offer added value alongside these other collaborative platforms would enable policymakers to develop a strategic plan for ResilienceDirect. There is also a significant opportunity for ResilienceDirect to support the wider development of a collaborative culture during an emergency. There is evidence of users preferring a 'restrict by default' culture, particularly in England. This approach can cause challenges for users accessing information across local resilience bodies, whether within ResilienceDirect or on other systems. ResilienceDirect could support a switch to a 'share by default' culture if training and learning was provided on ResilienceDirect on the benefits of trust and collaboration.

Academic researchers interested in emergency collaboration have largely overlooked the significance and uniqueness of ResilienceDirect. This is surprising: the platform is the world's only nation-wide multi-agency emergency collaboration technology. ResilienceDirect is a unique platform, both within the UK and globally. Almost all users appreciate that it provides a service that cannot be replicated with other platforms. These achievements are all the more remarkable because ResilienceDirect has been sustained with low levels of public investment and a very small, yet highly skilled and dedicated, management team. The lack of national attention towards ResilienceDirect may reflect its low visibility within central government. Indeed, ResilienceDirect is a support tool aimed primarily at local level multi-agency emergency organising. The purpose of this report is to provide evidence to national policymakers and local stakeholders of the immense value and potential of ResilienceDirect to support emergency collaboration. The Covid-19 response was the largest and most complex emergency to be experienced in the UK in the last century. The effectiveness of the response relied upon a secure, reliable, and common, capability to share information and enable collective decision-making. ResilienceDirect provided that capability. The following recommendations are intended to ensure that ResilienceDirect reaches its full potential to support collaboration within future events.

7.2. Ten recommendations

1. Develop a more intuitive interface within Collaborate to: (a) reduce training demands, (b) promote access to less used services (e.g. SITReps, Incident Logs), and (c) allow file structures to be changed more easily during a response to match changing needs. Local resilience bodies should ensure pages are well organised and members are regularly engaged (e.g. by survey) to ensure pages are fit for purpose.

2. Work with users who access information across multiple local resilience bodies to create guidance on standardised folder and file structures to facilitate quick access to information. ResilienceDirect interface to provide a page structure overview to allow local resilience bodies to compare page organisation.

3. ResilienceDirect should be the primary technology to share information during a response. When decisions are made within central government departments not to use ResilienceDirect these decisions should be fully explained to all users through the ResilienceDirect notification system. Consider whether different government information systems can be better integrated to reduce duplication of effort and facilitate information sharing (e.g. link to DELTA on ResilienceDirect dashboard). Local resilience bodies should encourage the use of ResilienceDirect to share information during a response, even if that duplicates other local arrangements.

4. To enhance the effectiveness of ResilienceDirect during response, a review should be undertaken to consider adding individually customizable interfaces, live document editing and streaming functionality within ResilienceDirect (including apps on other platforms).

5. Increase support for local resilience bodies to develop training on the benefits of less used ResilienceDirect functions (e.g. SitReps, Mapping, Joint Organisational Learning). Support could be developed by the Cabinet Office ResilienceDirect team or other relevant bodies (e.g. the Emergency Planning College, National User Group).

6. Review the use of Joint Organisational Learning and add a link on all Collaborate pages. Users should be encouraged to upload information to Joint Organisational Learning when uploading response/exercise debrief on ResilienceDirect. Joint Organisational Learning email notifications should provide a short summary of content.

7. Consider renaming ResilienceDirect 'Working Groups' as 'Communities of Practice' to encourage sharing of learning. Identify and invite existing informal networks, particularly at regional level, to share learning with all ResilienceDirect users within new 'Communities of Practice' group category on ResilienceDirect.

8. Scotland's response to Covid-19 offers a case study and point of comparison with England. Develop guidance to ResilienceDirect users on trust and information sharing to encourage 'share by default' instead of 'restrict by default' culture. Local resilience bodies should be encouraged to add the following lines to ResilienceDirect protocols/guidance: 'Users/members should share by default all information within ResilienceDirect that could be useful to the management of a response, unless there is a good reason not to'.

9. Establish a campaign on ResilienceDirect to promote greater awareness and engagement with the National User Group to enhance the capacity of users to inform ResilienceDirect developments. All local resilience bodies should join the NUG via regional user groups and identify someone as responsible for engagement with ResilienceDirect, usually the RD administrators of the body.

10. Provide adequate funding to ResilienceDirect to ensure it can continue to meet user needs at present and into the future. Consider whether funding (e.g. innovation funding) directed at local resilience bodies could be used to promote local engagement with ResilienceDirect or whether guidance on the use of funding can reference use of ResilienceDirect.

8.0 Endnotes

1 Health and Social Care and Science and Technology Committees (2021: 5)

2 Findings from statistically significant survey with 494 ResilienceDirect users (August 2021)

3 Kerslake (2017) and Pollack (2017).

4 See for example: the 2005 London Bombings (Coroner's Inquest, 2011; Anderson, 2016); the 2007 summer floods (Pitt, 2008); the 2017 Grenfell tower fire (McKee, 2017); and the 2017 Manchester bombings (Kerslake, 2017). The reasons for these multi-agency failings, include technological interoperability (Coroner's Inquest, 2011) and operational culture (Kerslake, 2017),

5 Coroner's Inquest (2011) to operational culture Kerslake (2017),

6 Kerslake (2017); Pollack (2017).

7 'Enhancing the use of ResilienceDirect in the Covid-19 response: a comparative analysis of Local Resilience Forums' ESRC grant number ES/V010182/1

8 These reports are freely available on the Loughborough University ResilienceDirect page: see ResilinceDirect (2022)

9 Further information on research methods and our dataset is provided in Section 5

10 Mandavilli (2022)

11 New York Times (2020)

12 WHO (2022)

13 Sky (2022)

14 ONS (2022)

15 Dorling (2022) and Charlesworth (2021)

16 WorldData (2022)

17 GHS (2021).

18 Exercise Cygnus Report (2017: 6)

19 Exercise Cygnus Report (2017: 8)

20 UKANDEU (2022)

21 NAO (2021)

22 Cabinet Office (2008)

23 Ansell, Boin, & Keller (2010)

24 Zebrowski, (2019)

25 Zebrowski (2019)

26 Mendonca et al. (2007)

27 Coroner's Inquest (2011); Kerslake (2018); Pitt (2008)

28 Gray (1985); Lam (1997); Owen and Currie (2021), including within emergency organising Kapucu et al. (2010); Roud (2021).

29 JESIP (2022)

30 Rittel and Webber (1973)

31 Zebrowski, (2019)

32 CCA (2005: reg 4(1))

33 Cabinet Office (2013b: 10)

34 HM Government (2009: 64-65)

35 Cabinet Office (2012a: 3)

36 Cabinet Office (2018: 10–11)

37 CCA Reg, 2005.

38 JESIP (2022).

39 Cabinet Office (2013a: 18).

40 Adey & Anderson (2011).

41 Comfort (1993: 18).

42 Comfort (2007), Comfort, Ko, & Zagorecki (2004).

43 Thompson, Altay, Green, & Lapetina (2006).

44 Zebrowski (2019).

45 Cabinet Office (2013b)

46 Cabinet Office (2010: 149).

47 Cabinet Office (2013b)

48 ESRC grant number ES/V010182/1

49 Janssen et al. (2010)

50 Bharosa et al. (2010)

51 Turoff et al. (2014)

52 Callon (1986)

53 Cabinet Office (2020)

54 DELTA is the online system provided Department of Levelling Up, Housing and Communities to facilitate the collection of statistical data and the administration of grant applications.

55 Lam (1997); Bouty (2000) Harrison and Laberge (2000) Jarvenpaa and Majchrzak (2008) Clegg et al. (2002) Hardy et al. (2005); van Burg et al. (2014).

56 Imperial (2005: 311)

57 Larsson et al. (1998)

58 Feller et al. (2013: 318)

59 METHANE is a mnemonic within JESIP (2022) to exchange incident information: (M)ajor Incident declared? (E)xact Location, (T)ype of Incident, (H)azards Present or Suspected, (A)ccess – Routes that are Safe to Use, (Number, type, severity of casualties, (E)mergency services present and those required.

60 Rogers (2003)

61 Foresight (2022)

62 Bharosa et al. (2010)

63 Hardy et al. (2003)

64 Jarvenpaa and Majchrzak (2008)

65 Järvenpää and Majchrzak (2016: 23)

66 Stevens et al (2015)

67 Hardy et al. (2005: 71).

68 Hill, Potter and Pickford (2020: 5-10).

69 ICO (2022)

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