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Immunity Passports as Complex Systems: Applying systems approaches to explore needs, risks, and unintended consequences

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COVID-19 immunity certificates as complex systems

Applying systems approaches to explore needs, risks, and unintended consequences.

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Implementing COVID-19 immunity certificates without careful consideration of user needs and human factors could put public health at risk, infringe privacy and lead to societal inequalities. There are polarised and complex views among different stakeholders (including academic researchers, service providers and the public) about the feasibility and the ethical, safe, trusted and fair use of immunity certificates. Therefore, there is a clear need to understand the needs, unintended consequences, and risk of implementing immunity certificates before designing services around them. This understanding will prevent compromising human rights and civil liberties, and at the same time, help protect public health and return to normality. This paper presents the application of systems/service approaches as part of the IMMUNE project, a research project funded by the UK Arts and Humanities Research Council (AHRC). IMMUNE has investigated the design of services for immunity certificates in the UK. This research has generated recommendations meaningful to the post-pandemic systems/service design, emphasising the tensions and intertwinement of public health with everyday life.

Keywords: public health; immunity certificates; synthesis map; COVID-19

Introduction

Since the declaration of COVID-19 as a global pandemic by the World Health Organisation (WHO), multiple preventive public health strategies and interventions have been deployed to control the spread of the virus and its pressure on the national health systems. Initially, these strategies were focused on personal hygiene (like guidance for careful hand washing and thorough cleaning of surfaces) and social distancing measures before moving to nationwide lockdowns. Subsequently, test and trace services and several symptom monitoring apps were launched to help monitor and constrain the virus. Recently, the rollout of viral vector and mRNA vaccines has offered new effective alternatives to slowing the spread of the virus and reaching herd immunity. The interventions mentioned above have made possible the gradual exit from national lockdowns and the re-opening of the economy. As part of their plans for a safe return to normal activities, several governments have proposed the use of immunity certificates. These immunity certificates (also referred in the literature as immunity passports or vaccination certificates) would allow individuals who have antibodies of the SARS-COV-2 or who are not carriers of the virus to return to work, travel or socialise without restrictions (Eichenberger et al., 2020).

Although some evidence in the United Kingdom suggests positive attitudes towards immunity certificates among the population (Lewandowsky et al., 2021), immunity certificates face questioning as more uncertainties and concerns have arisen (Brown et al., 2020). The most common concerns include: the lack of clear evidence about how long does immunity last and what are the differences in the presence of antibodies between people who have had the vaccine or recovered after contracting the virus (Chen et al., 2020); fair access to safely acquire immunity (Brown et al., 2021); uncertainty about how effective are the existing vaccines against the new variants of the virus (Karim, 2021); availability of reliable serological tests to prove immunity status; growing public disbelief about the effectiveness of existing technology to guarantee the confidential and trustworthy sharing of information about the immunity status of an individual, or the falsification of this information (Bansal et al., 2020); and finally, challenges related to the implementation of immunity certificates within the existing business models or various service providers across the travel, cultural, sports and other event management sectors (Makarona & Kavoura, 2021). Failing to address these concerns will inevitably result not only in the low uptake of

immunity certificates but could trigger adverse and unintended consequences for public health, leading to inequalities in society and stigmatisation (Voo et al., 2021).

The inconsistent arguments, concerns, and mixed evidence around immunity certificates have made evident the need to understand this phenomenon within a complex systems lens. By doing this, a holistic understanding of conflicting perspectives and elements can be exhibited. Still, most importantly, a complex systems approach may uncover tacit knowledge, identify evidence gaps, and unveil unvoiced concerns and risks that should guide the design of services around immunity certificates. Specifically, to investigate immunity certificates as a complex system, we will address the following two questions:

1. First, what are the possible risks and unintended consequences of immunity certificates?

2. Second, what are the key requirements, resources, technologies, and processes needed from different stakeholders to design services around immunity certificates to mitigate any unintended consequences and risks?

First, this paper presents the methodology followed to address the research questions, listing the methods that facilitate the investigation with a complex systems approach. Then, one example of the synthesis map is presented (concept of immunity). Finally, the research outputs are described, and preliminary benefits and implications are discussed.

Methodology

The methodology reported in the present paper was conducted between February-November 2021 in the United Kingdom as part of the IMMUNE (Immunity Passport Service Design) project. This project was funded by the UK'S Arts and Humanities Research Council (AHRC).

A series of studies engaging with multiple stakeholders were conducted as part of this research (Figure 1). The stakeholders were members of the public (including patient groups), service providers (focus on tourism, cultural, sports, travel, hospitality sectors), and experts in virology, public health, policymaking, bioethics, law, data science and artificial intelligence. Working with such heterogeneous groups required applying methods that provide adaptability to overcome the lack of a shared knowledge base and facilitate balance participation and knowledge translation. Thus, the research design combines interviews, nationwide, large-scale online questionnaire surveys, focus groups, and participatory design workshops. Due to the COVID-19 restrictions in place in the UK, all the studies were conducted online.

Figure 1 summarises the research process. The remainder of this paper focuses on explaining the methods of focus groups and participatory workshops, as these methods required a higher level of preparation, adaptation and planning to study the complex and conflicting needs of different groups of stakeholders. Nonetheless, the other methods used, interviews and online questionnaire survey, also informed the outputs of the research, but their description is out of the scope of this paper.

Figure 1. Overview of the research design.

The first method of data collection used was a focus group. The aim was to collect data about the first research question (i.e. what were the risks, concerns and unintended consequences of immunity certificates). The focus group was split into two sessions that took place one week apart. A total of 23 individuals participated attended both sessions: eight service users, ten service providers (three from the tourism sector, three from the cultural and creative industries, one from the local council who represented businesses, one from the aviation industry, two from sports and events management representatives), three experts (in public health, bioethics and secondary care) and two representatives of patient groups. In each session, participants were split into two groups of 4-6 participants each. The decision to split participants into smaller groups was made in order to allow more chances for them to contribute to the discussion and articulate their thoughts. The focus group took place remotely via the MS Teams platform. To stimulate the activities of the focus groups, it was important for all participants to share a consistent internal representation of the phenomenon under investigation. This was achieved using a synthesis map (explained in the next section of the present paper). An online collaboration tool (Miro) was used to facilitate brainstorming and sharing of knowledge and ideas. Specifically, the online collaboration tool contained a series of templates created to collect data about participants' perceptions about the risks, concerns, and unintended consequences of using immunity certificates. Examples of such templates included visual metaphors (icebergs), used to motivate the expression of unintended consequences, and matrices, used to facilitate group decision-making about which concerns were perceived to be riskier and likely to happen.

Following the focus group sessions, three online participatory workshops were conducted, each focused on examining the use of immunity certificates in a different industry. It was decided to start with the sports context since this sector was the first to pilot the immunity certificates in the UK (e.g., EURO2020 and Wimbledon 2021). A total of seven people participated in this first workshop, including three attendees, three experts (one expert in bioethics, one in public health, one virologist) and one sports event organiser. At the beginning of the workshop, a speculative journey map was presented in the form of a video (https://youtu.be/nvmJOYls6Z8). The video illustrated how immunity certificates could be used, emphasising critical moments when decisions and dilemmas were faced. Then, participants discussed the journey, codesigned alternatives and raised more concerns using the same online collaboration platform used for the focus groups. The subsequent two workshops followed the same procedure. The second workshop examined the use of immunity certificates in indoor events, using as an example the visit to a theatre, while the third workshop was focused on the design of immunity certificates for nightclubs.

In the aforementioned data collection activities, an effort was made to recruit participants that were typical of the following three types of personas: 1. healthy individuals of all ages who have been double vaccinated or acquired immunity through natural infection; 2. clinically vulnerable groups of patients; and 3. healthy individuals aged between 18-24 years old who have an active night social life, attending nightclubs and other similar events frequently. These personas emerged from the findings of the initial focus group, the literature and content analysis of recent news items that appeared in the press during the period between April – July 2021.

Finally, following the results of the initial focus groups and the workshops, it became clear the need to run another focus group with people considered clinically vulnerable (to be high risk for hospitalisation or even death

if contracting the virus). Specifically, the aim of this focus group was to understand their concerns around the use of immunity certificates and how they might be designed to increase the sense of safety among this group of people. The focus group took place remotely using MS Teams with six participants. The discussion followed a series of questions and voting of preferred options.

Data was analysed using a combination of internal (research team members) open sense-making techniques, such as affinity diagramming, open mapping, and synthesis maps (Jones & Bowes, 2017). Data collected was translated/adapted into user journey maps and service blueprints .

A synthesis map of the concept of immunity

As explained in the previous section, in the case of the focus group, a synthesis map was used to help participants situate immunity certificates in the wider context of COVID-19 immunity. The map included the concept of immunity, the social determinants that can influence immunity, the different threats to immunity, the strategies in place to retain immunity, and the impacts on the healthcare system. Following the results of a narrative review, we mapped the concept of immunity as a complex system in the form of a synthesis map (Figure 2) (available also at: https://doi.org/10.17028/rd.lboro.14572545.v1). The map was shared with participants in the focus groups, accompanied by a video (https://youtu.be/6nFhz9KXqUU).
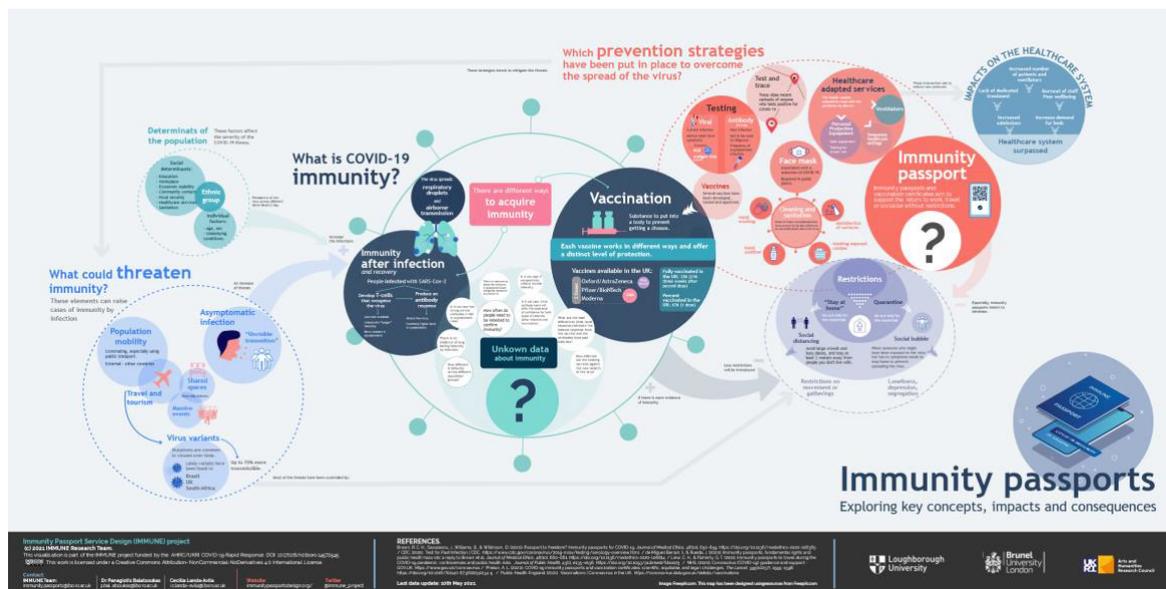

Figure 2. Synthesis map of immunity certificates (first version).

During the different stages of the data collection process described above, this synthesis map evolved and acted as a dialogical device for the research team to reflect as part of the data collection and analysis process. The latest version of the map now presents more details. Specifically, the map helps visualise the complex relationships of the key requirements, resources, processes, and technologies needed to design immunity certificates. Also, the map defines requirements for systems/service design across the different sectors (including sports, culture, and nightclubs).

Expected outputs and way forward.

This research project explored immunity certificates as a complex system to understand possible unintended consequences and risks and how we might design systems/services around them to mitigate these risks and consequences. Throughout this research project, the involvement of a variety of stakeholders with ill-defined and conflicting needs have required for systems-oriented methods that not only help to make sense of the complex situation but to assist a balanced power dynamics of the different participants, invite the discussion of conflicting views, deal with the uncertainty, and envision unexpected consequences.

The outputs of this research primarily contribute to the understanding of immunity certificates from a systems/service design point of view. Secondly, the research documented a "complex systems" oriented research process, developed bespoken sense-making visual tools, and generated recommendations on facilitating participatory sessions with heterogeneous groups. These recommendations are specifically meaningful to the post-pandemic systems/services design, which will emphasise the tensions and intertwinement of public health protection with human rights and civil liberties.

In addition, the research also identified the limitation of tools such as user journey maps. Journey maps fall short in communicating the diversity of paths that people should face, and there is a tendency to perceive that the journeys occur in a linear way. To address this problem, a new type of 'integrated journey maps' is proposed as a novel way to document the complexity of immunity certificates. These integrated user journey maps allow the mapping of multiple personas at once, contrasting points of conflict between different personas and across the stages of the journey. In addition, the integrated user journey maps compare similarities and differences, bringing personas with similar journeys together and distancing those with the most differences.

The authors of this contribution propose to focus the panel discussion at RSD10 around the following questions:

- How could systems/service methods facilitate the discussion of tensions and conflicting opinions for health systems design?

- How do the research outputs (e.g., integrated journey maps and video storytelling) help to communicate the complexity of immunity certificates, and how these outputs could be improved?

- What are the future research directions in the phenomena of immunity certificates as a strategy to advance the development of more resilient health systems?

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