UNIVERSITY OF CAMBRIDGE

IfM MANAGEMENT TECHNOLOGY POLICY

Briefing Note

Pandemic Vaccination Programme Design: Lessons from COVID-19

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This briefing note is written based on a dissertation for a Master of Philosophy degree at the University of Cambridge.

Introduction

Since early 2020, the death toll from the coronavirus pandemic has exceeded 4.5 million globally. In this situation, COVID-19 vaccination programmes are regarded as the best solution for returning to normality. Almost 50% of people in the world have received at least the first dose of a COVID-19 vaccine. To maintain protection against coronavirus, many countries considered as examples for their vaccination programmes have announced plans for booster programmes; in particular, the UK government started to invite people who are more vulnerable to the coronavirus for a booster vaccination in September 2021. These circumstances pose a question: How to plan and scale up the COVID-19 vaccination programme strategically and effectively? This is a critical question for better preparation for the current booster programme and, even more, for tackling future pandemics. This briefing note aims to deliver the lessons learnt from the UK and South Korean COVID-19 vaccination programmes.

This briefing note is based on interviews with participants involved in vaccination programmes in the UK and South Korea and retrospective reviews of both country cases. Lessons are identified in three areas, concerning factors that affect 1) demand dynamics, 2) supply dynamics, and 3) confidence levels for the vaccination programme. A holistic roadmap for strategic decision-making is presented, reflecting the enumerated factors.

Takeaway 1: Demand

The number of cohort groups determines a target demand for a vaccination programme, which diminishes to the actual demand depending on how five identified demand-influential factors interact.

Takeaway 2: Supply

The total volume and type of vaccines available varies between nations according to existing vaccine development technologies, vaccine procurement portfolio, domestic production capacity, and approval process. Seven capacity-influential factors in vaccine rollout convert this into the actual supply.

Takeaway 3: Confidence

Vaccination programmes expand as public confidence in the programme grows, while low trust in vaccines and irregular supply can impede this process.

Policy Framework: Roadmapping

The three takeaways above are incorporated into the proposed roadmap, enabling users to establish an appropriate and timely strategy within one comprehensive picture.

Key Considerations for Designing a COVID-19 Vaccination Programme

The key performance indicator for COVID-19 vaccination programmes is vaccine uptake, for both the UK and South Korea. According to their experience, maximising the actual demand and supply and maintaining confidence play a pivotal role in achieving vaccine uptake in terms of both scale and pace. Figure 1 outlines how demand, supply and confidence are formed and integrated. The following three boxes describe each of these dynamics in detail, which policymakers should consider when establishing strategies.

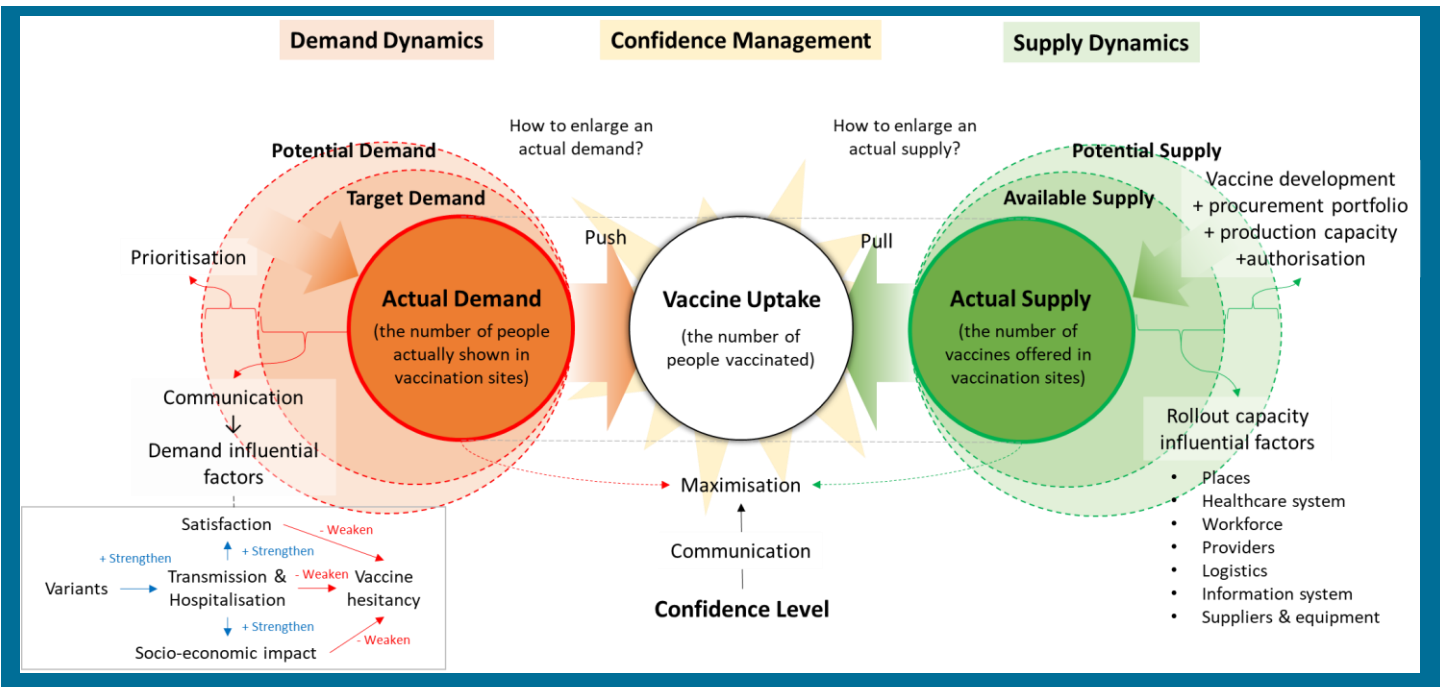

Figure1. Integration and Formation of Demand, Supply, and Confidence

#1. Demand Dynamics

The UK and South Korean experiences revealed that the demand for vaccine rollout has been dynamically changed impacted by vaccination priority strategy and various external factors. In the UK, priority cohorts for vaccination were identified by the Joint Committee on Vaccination and Immunisation (JCVI). Priority cohorts 1-4 aimed to alleviate mortality and hospitalisation from COVID-19, and to protect the UK health and social care system. After meeting this target, rapid and mass vaccine deployment took place on an age-base system, with the oldest adults first. The number of cohort groups in each phase determined a "**target demand**". Hence, policymakers should control the target demand based on the status of supply that a nation has.

An interesting point is that target demand is not identical to "**actual demand**" due to several external factors. Five demand-influential factors were observed in the UK and South Korean cases:

- Satisfaction in contributing to the community
- Volume of transmission and hospitalisation against coronavirus
- Coronavirus variants
- Socio-economic impact
- Vaccine hesitancy.

#1. Demand Dynamics

The above factors are interconnected, as shown in Figure 1. They shape how much of the target demand converts to actual demand in vaccination sites. For instance, public figures in both countries, including the British Queen and President of South Korea, were vaccinated early on to reduce vaccine hesitancy. As such, a communication strategy in accordance with the given circumstances is also essential to enlarge the number of people attending at vaccination sites.

#2. Supply Dynamics

Based on analysis of the UK and South Korean experiences, it was found that the "**available supply**" of vaccines is associated with the capability of a nation in vaccine development, procurement, production, and authorisation. Specifically, it would be helpful to keep tracking the status of

- Competitive advantage in life science for developing a homegrown vaccine
- Procurement portfolio consisting of various types and amounts of vaccines
- Production capacity for manufacturing vaccines at scale
- Approval scheme handling new vaccines quickly

Nevertheless, sometimes the available supply cannot directly achieve "**actual supply**" due to a lack of rollout capacity. Numerous elements impact rollout capacity. Comparing the UK with the South Korean vaccination programme, six capacity-influential factors can be enumerated in common:

- Places (vaccination sites)
- Providers (e.g., physicians and pharmacists)
- National healthcare system
- Workforce (e.g., healthcare workers and volunteers)
- Logistics
- Information system (e.g., booking, recording and reporting system)
- Suppliers and equipment (e.g., needles, syringes and freezer)

Therefore, what policymakers should focus on in terms of maximising supply is how to increase the available vaccine and eliminate obstacles to the rollout capacity influential factors.

#3. Confidence Management

Confidence levels determine the likelihood that a vaccination programme will succeed in a timely manner. According to Chen and Cochi (1994), immunisation programmes evolve through five stages: pre-vaccine, increasing coverage, the loss of confidence, the resumption of confidence, and eradication. Overall, the COVID-19 vaccination programmes in the UK and South Korea have gone through a similar process. However, South Korea shows relatively slow progress with 58.8% of the fully vaccinated population comparing with the 78.5% in the UK in September 2021.

The major differences identified was in the confidence level. While **the UK had the highest trust** (87%) in the COVID-19 vaccines and vaccination programme, **South Korea had the lowest trust,** of 50% (Imperial College London, 2021). As overseas news on adverse events provoked vaccine hesitancy, South Korea citizens lost confidence even before ramping up the vaccine rollout. Furthermore, due to the relatively low number of infected residents, the South Korean government implemented the vaccination programme later with an unstable vaccine supply at the beginning, which impacted credibility of the vaccination programme.

Eventually, the reservation rate dropped below 30% in May 2021, only three months after the first vaccine administration in South Korea. However, the Korean government put much effort in addressing the confidence issue through vaccination incentives, including the exemption of social distancing; it managed to stimulate a virtuous circle by increasing trust in vaccines as more people participate in getting vaccinated. To summarise, policymakers should carefully maintain the confidence level of their programme, affected by both demand and supply dynamics, to reduce its inefficiency.

Strategic Framework for the COVID-19 Vaccination Programme

Based on qualitative analysis of existing vaccination programmes, it can be concluded that there is a lack of strategic tools to encompass various key-decision factors with a comprehensive view, which enable policymakers to plan from A to Z regarding the COVID-19 vaccination. In the light of the three considerations aforementioned, a roadmap for the COVID-19 vaccination programme is proposed. The most important elements of a COVID-19 vaccination programme and how underlying factors interact were explored through construction of concept maps. Roadmapping, which is a strategic planning technique praised for its flexibility and scalability (Phaal and Muller, 2009), enables these key factors to be integrated into a single framework. Figure 2 illustrates the roadmap designed for COVID-19 vaccination programmes.

The roadmap provides a holistic canvas comprised of timeframe (horizontal axis) and thematic layers (vertical axis), helping practitioners formulate vaccination strategies that fit their situation. There are micro-and macro-level maps systematically integrated. The micro-level map zooms in one of the parts of the vaccination programme, vaccine rollout, for in-depth planning. It reflects key dynamics for the maximisation of vaccine uptake within the vertical layers. On the other hand, the macro-level map is designed for higher-level strategies through the whole vaccination programme, from vaccine development, procurement, production, authorisation and rollout to communication. Extensive supervision and planning become possible with the macro map by breaking down silos that hold back an effective strategy. The roadmap can support communication and alignment between key stakeholders involved in the vaccination programme.

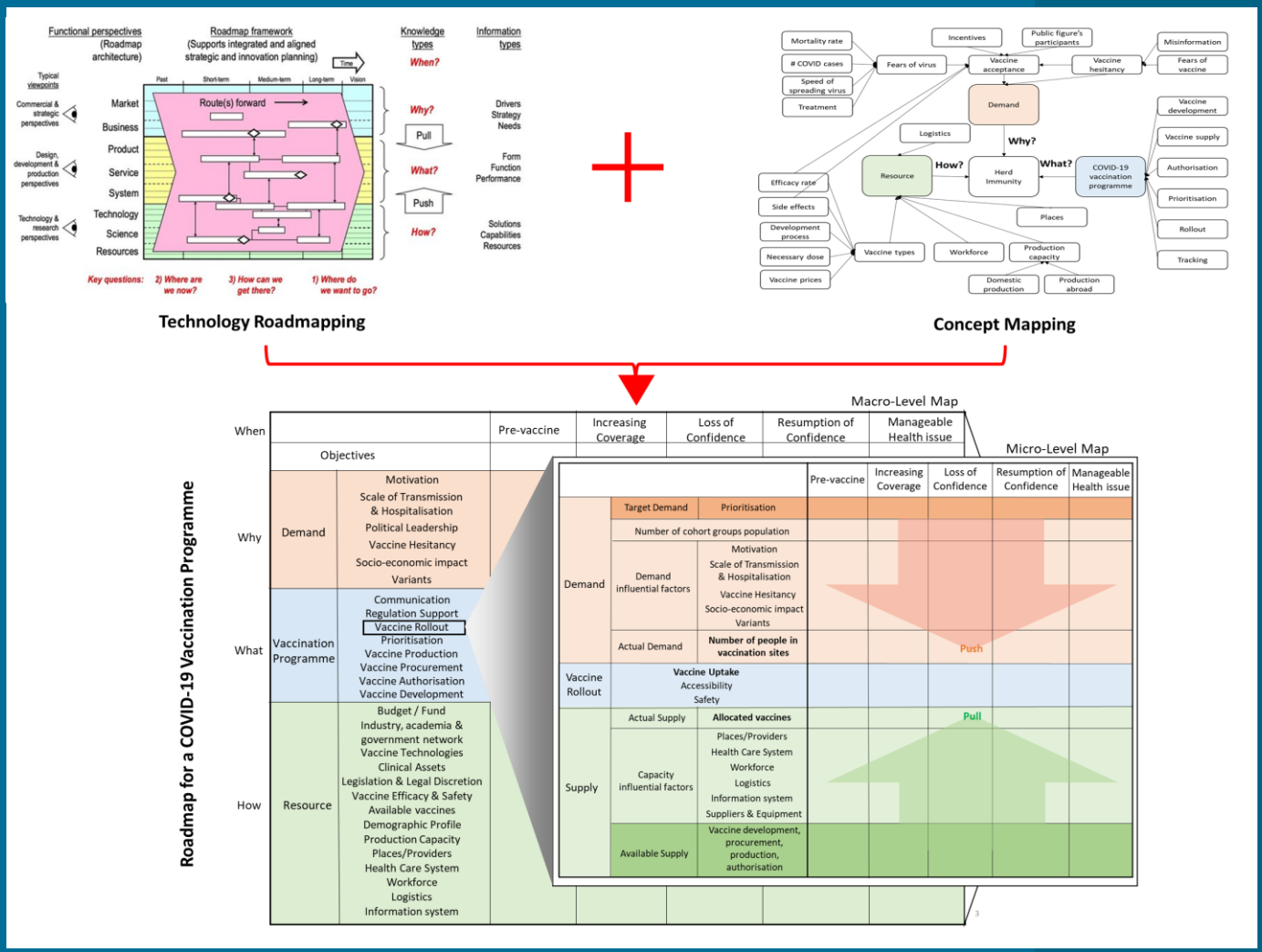

Figure2. Strategic Roadmap for a COVID-19 Vaccination Programme

Research Design and Limitation

Primary data were collected through interviews conducted with the UK participants, working at NHS (National Health Service) and related groups, and four South Korean policymakers from relevant ministries, a local government agency and a public health centre (Table 1). In addition, the UK and South Korean cases were retrospectively reviewed through analysis of multiple documents, including academic journals, press releases and websites.

#	Name	Role	System	Level
1	UK 1	Director	Vaccine rollout	Regional
2	UK 2	Visitor researcher	-	University
3	UK 3	System architect	Vaccine rollout	Local
4	UK 4	Co-Director & Clinical Lead	Vaccine rollout	Regional
5	UK 5	Director of Strategy	Vaccine rollout	Local
6	UK 6	Chief	Vaccine rollout	National
7	UK 7	Director	Vaccine rollout	Local
8	UK 8	PMO and Strategic Lead	Vaccine rollout	Local
9	UK 9	National Operations Lead	Vaccine rollout	National
10	UK 10	Director	Vaccine rollout	Regional
11	KOR 1	Head	Vaccine rollout	Local
12	KOR 2	Director	Vaccine development	National
13	KOR 3	Director	Vaccine rollout	Regional
14	KOR 4	Deputy Director	Vaccine development, authorisation	National

Table 1. Interviewee Profile

This briefing note highlights lessons from the existing vaccination programmes and proposes a strategic roadmap for future vaccination programmes. The next step is to apply the roadmap in the real world and customise to specific context based on feedback. For better preparation for the COVID-19 pandemic or other future pandemics, further research should develop other micro-level frameworks such as vaccine development and production.

Retrospective Roadmaps

As a validation process of the roadmap, notable events in the UK and South Korea COVID-19 vaccination programmes were placed on the roadmap from January 2020, when COVID-19 was first detected as a global threat. This 'retrospective roadmapping' is an analytical framework for qualitative research, capturing key events, milestones, dynamics, and processes chronologically (Phaal et al., 2011). Figure 3 represents the UK retrospective roadmapping. The detailed information about this retrospective roadmap and the South Korean one can be found in the dissertation.

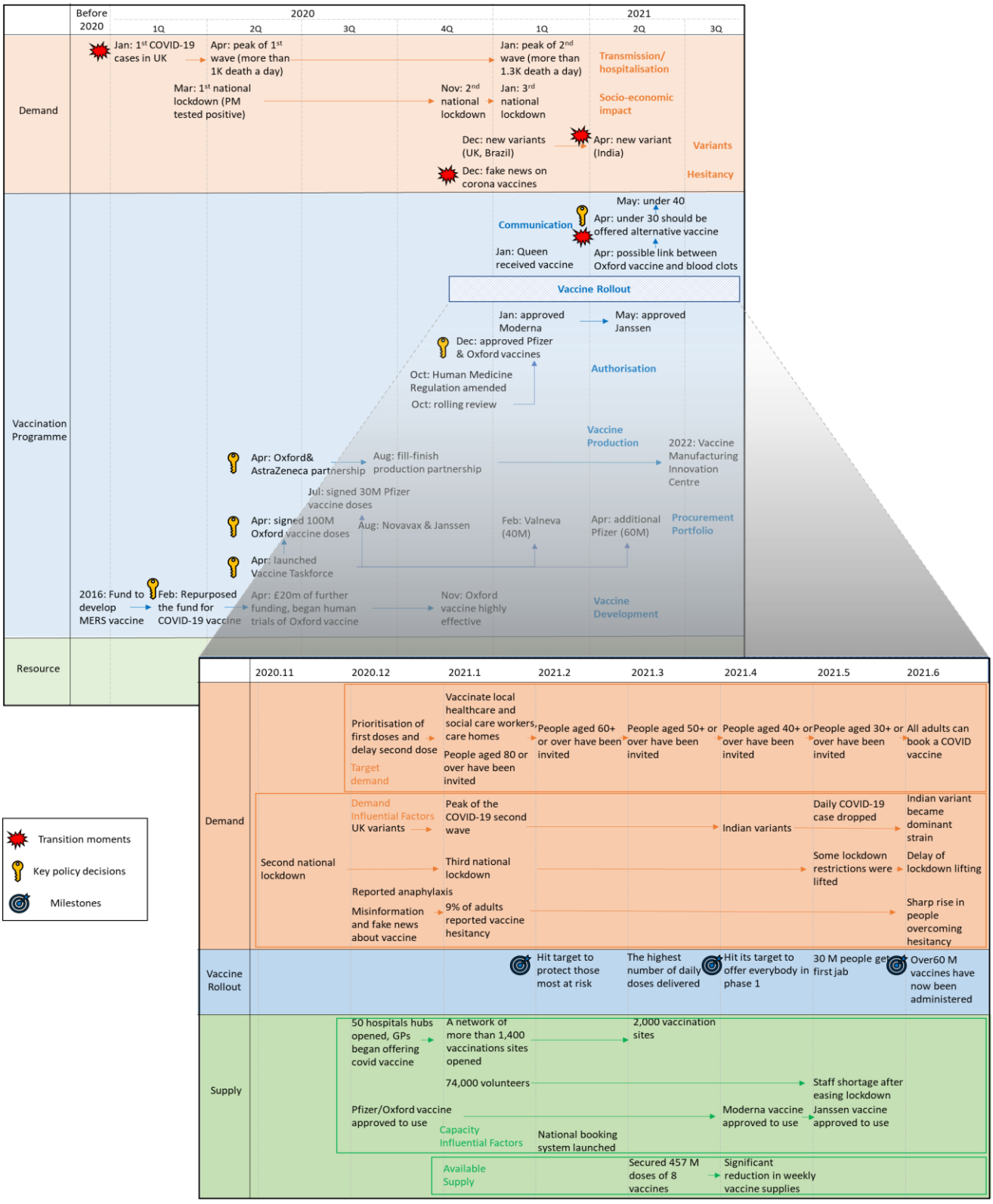

Figure3. Retrospective Roadmapping of the UK COVID-19 Vaccination Programme

Please find more details in attached file (Full copy of the dissertation)

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About Author

Yuna Yang is a research student at ISMM. She is a Deputy Director of Ministry of Science and ICT in South Korea. She is in the early stages of her career as a science and technology policymaker working to support technology development and diffusion.

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