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Enablers and Barriers of digitalisation impacting the innovation life cycle of primary health organisations specifically General Practices Medical Centres during a pandemic: A New Zealand study

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RESEARCH

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ABSTRACT

Aim

Technological innovation in General Practice (GP) medical centres in New Zealand (NZ) is proven to be the most important factor needed for the sustainability of primary care during the Covid-19 pandemic. However, GP Medical centres faced many barriers that eventually impacted the dynamic sustainability of the primary care system, specifically GP in NZ. This paper focuses on using the identified barriers and enablers to the innovation life cycle to develop a System Dynamic (SD) framework that would provide the required direction towards the sustainability of the GP Medical Centres.

Method

The barrier and enabler factors that influenced the GP medical centres' innovation life cycle are identified as themes from qualitative research conducted in personal interviews with 86 participants in 16 GP medical from February 28th to August 30th, 2020, in urban, rural, and suburban practices from different decile areas of NZ. A dynamic system methodology is used to develop the causal loop and stock and flow diagrams for the four phases: (Opportunity, refine, establish, decide) of the innovation dynamic framework developed for the paper, assists in putting into context the development feedback loops for the driver's cycle framework creates a research gap that should allow for further research into the development of a system dynamic model that can be executed within a simulation environment.

Results

The result presents the innovation life cycle process for digitalising the GP medical centres during the Covid-19 pandemic in NZ. The most influential drivers are 1) Telehealth capability with existing hardware and 2) Readiness to respond to pandemic demand with a weight of 3.51 per cent each, followed by 3) Accessibility, integration and ease of use, 4) Gain of income and revenue from new services and subsidy with each weighting 3.37 per cent.

Conclusion

The decision to adopt digitalisation had a significant impact on GP centres, disrupting the norm but also allowing continued access to health services to patients who were the most vulnerable during the pandemic. The pandemic forced to change to digitalisation, leading to significant changes in the GP business model and the adoption of innovative solutions. In the four phases of the innovation life cycle frame, a more significant effort had to be placed on establishing tools (Phase 3) due to the weight of influence of the many identified barrier drivers. Deciding to permanently keep the digitalised healthcare services (Phase 4) of the innovation life cycle framework has higher enabler's driver by number and weight influences. This means phase 3 of digitisation is the most critical phase of life cycle innovation. The GP medical centre must be more focused on changing its operation process to switch its service model from doctor-centric to patient-centric.

Key Words

General Practice medical centres, General practitioner, Digitalisation, Covid-19, Ministry of Health (MoH), Primary Health Organisation, Royal New Zealand College of General Practitioners, Primary care, New Zealand, Small-Medium-Business (SMBs), Small Medium Enterprises (SMEs), District Health Board (DHBs).

Introduction

Primary Health Organisations (PHOs) are funded by the District Health Boards (DHBs), and they are essential healthcare services provided to the public, mostly through general practice medical centres[1]. General Practice (GP) medical centres function as Small-Medium-Enterprises (SMEs) and Small-Medium-Business (SMBs) and are often managed by a small group of healthcare providers. Mostly, GP medical centres in New Zealand are less than 20 staff members and are run privately or partially funded by DHBs[2]. New Zealand's Ministry of Economic Development defines SMEs as those with less than 50 employees, maintaining their revenues and assets below certain thresholds. While the New Zealand Ministry of Health (MoH) provides GP medical centres with subsidies and partial funding is allocated by the DHBs, GP medical centres are still considerably underfunded while under pressure to meet their targeted yearly revenues and higher demands of health services. Due to their size and number of employees, characteristics and operational processes, GP medical centres are considered the SMEs of the healthcare organisation[3]. There are many studies on the digitalisation of SMEs in other industries involving critical changes in their business process, operational routines and organisational capabilities, including creating and entering new markets[4-8]. Digitalisation is becoming an obligatory step for SMEs rather than an opportunity[9]. The healthcare industry, specifically primary care and within primary care, specifically GP medical centres, is historically known as a slow adopter of digitalisation solutions and innovation[10]. There are several reasons for this, including separated hierarchies, management structures, different IT systems for different professional groups, and bureaucracy often set against new ways of doing things[11]. Before the Covid-19 pandemic, there were new digitalisation solutions available for adoption in GP medical centres in the form of new patient administration systems, e.g. patient clinical information management systems and electronic medication prescription systems. However, there is reluctance the adoption of digitalised solutions in remote work environments[12]. The remote work environment means a General Practitioner who provides general medical services to patients may not need to physically be in the same room as the patient they are consulting. At a general practice level, remote working mostly consists of telephone consultations, with some practices using video consults. An example of a national-level General Practice advisory organisation that works exclusively remotely is Healthline[13]. Health line provides support to patients over the telephone with basic advice from a trained nurse and aims to reduce demand on Primary care and Secondary care services while triaging and appropriately streaming serious cases. During the Covid-19 pandemic, early data from Italy suggested that a major transmission point for the virus was the waiting room of GP medical centres[14]. On Saturday 21st of March 2020, in response to the emerging Covid-19 pandemic in New Zealand and restrictions announced by the government, the Royal New Zealand College of General Practitioners (RNZCGP) requested all GP medical centres in the country to adopt virtual triage for all patient contacts immediately and aim to provide most (70 per cent) consultations by virtual means, starting on Monday 23rd of March 2020. Sub sequentially, GP medical providers had to reorganise their medical centres overnight to accommodate separation between everyday patients and potential Covid-19 patients, remove chairs from waiting rooms, put up Plexiglas screens at the reception and follow physical distancing rules set by the Ministry of Health[15]. Aside from the shortage of PPE, General Practitioners also had to deal with the emotional problems associated with the Covid-19 crisis. Many of their patients suffered from stress due to uncertainty, insecurity, loneliness, and fear for their loved ones and lack of support[16]. Home visits and face-to-face consultations were significantly reduced, while GP medical centres' administrative staffs were off work as a precaution. GPs were extremely busy and worried about managing patients face to face whilst having minimum Personal Protection Equipment (PPE), stocks of which were not adequate[17]. GP medical centres and hospitals increasingly faced resource constraints and rising service delivery demand in a new remote setting under significant time pressure to adopt new digitalised solutions[18,19]. The Covid-19 crisis has put GP medical services at the centre of the healthcare system as gatekeepers to control the influx of patients and the spread of Covid-19 among visiting patients and healthcare workers. Consequently, GP medical centres had to adopt newly developed procedures and protocols, set guidelines for using Personal Protective Equipment (PPE), install Covid-19 test centres and implement protective digital information measures, which included privacy-proof video calls systems, triage of respiratory symptoms, shared decision-making for patient hospitalisation or referral to an intensive care unit, palliative care guidance and end of life decisions for frail patients with Covid-19 symptoms. There have been many challenges that healthcare organisations struggled to contend with in the past, but Covid-19 developed into the greatest healthcare system challenge since the Spanish Influenza of 1918. The Covid-19 pandemic created uncertainty in many areas, including health, finance, job security and transport in society[20,21]. These challenges increasingly drove GP medical services providers to seek further opportunities through healthcare adopting new digitalised solutions and remote clinical administration frameworks to meet patient service demand. While digitalising is critical for medical service providers during a pandemic, also argue that adopting digitalisation solutions during the Covid-19 pandemic caused industry disruption and the emergence of new business models in the healthcare industry. There are many well-researched adoptions of innovation theories, such as the Diffusion of Innovation (DOI) theory which is structured around a process that establishes a consistent pattern of adoption of new ideas over time by people in an organisation or social group, Disruptive Innovation theory, and Radical Innovation[22-24]. Most theories indicate that adopting digitalisation ideas and innovation follows a predictable pattern as most technologies follow a generalised version of Moore's Law[26], meaning digitalisation and technological changes follow a similar process except for their rates of improvement and volatility. There is a slow start phase, followed by acceleration (known as take-off) which allows a high number of people to adopt the specific innovation(s), then a corresponding deceleration with the tail end of the process, including the last individuals to adopt the innovations. This study results are an in-depth investigation into the digitalisation process of GP medical centres and its outcomes during the Covid-19 pandemic. The initial approach started by the researcher first developing an innovation life cycle framework for the GP medical centre digitalisation process that guided the understanding of how the innovation drivers impacted the innovation life cycle and then using the framework developed to seek to maximise the overall positive influence of GP medical centre business performance[25,26]. The investigation involves looking into how the GP surgeries adopted technological solutions (i.e., digitalisation processes/phases), which could be applicable in other pandemic events. The research investigated how the digitalisation adoption process in GP medical centres behaved under extreme time pressure in an external and potentially existential threat to primary care. The enablers of the digitalisation innovation from GP medical centres are at the centre of this qualitative research from 16 General Practices with 86 participants. The research objective was to identify the enablers and barriers that influenced the innovation life cycle for GP medical centres. The primary focus is to identify the innovation life cycle drivers by minimising the impacts of the barrier factors and maximising the effects of the enabler factors within an innovation life cycle framework. The outcome aims to develop a framework to put the research into context. The framework will have a theoretical contribution to the current innovation model literature and a practical contribution to the GP medical centres digitalisation process in time of the pandemic.

The barriers faced by the GP medical centres during the Covid-19 pandemic are summarised into the themes shown in Figure 1. During the first six months of the Covid-19 pandemic, GP medical centres faced organisational leadership and financial support barriers mainly due to a lack of management and collaboration between staff and Information Communication Technology (ICT) systems. The dissociation within ICT and the lack of knowledge required to support a digital platform across primary care caused significant barriers to the GP medical centres.

Method

The research includes data gathered from a qualitative approach with an embedded multiple case study design and a phenomenological approach as a starting point. The case study research involved the examination of the Covid-19 enabled digitalisation innovation phenomenon in GP medical centres. This research aimed to investigate digitalisation in GP medical services during a pandemic. The aim was to understand and add new knowledge to both academic and practitioner understanding of digitalisation and innovation theories by capturing some of the adoption processes used during the time of Covid-19. The method developed for the research is described in Figure 2.

Step 1

The step involved interviewing 86 participants in 16 General Practice medical centres across New Zealand. A mix of GP medical centres was selected based on their performance in maintaining patient service levels during the Covid-19 pandemic and maintenance of revenue stream. They were selected using purposeful sampling and snowballing methods to identify suitable cases. Each GP practice was treated as an individual case. The GP medical centres list encompassed urban, rural, and suburban practices from different decile areas of New Zealand.

Step 2

The researcher completed the analysis and generated themes from the data collected during interviews (qualitative process). The researcher then grouped the identified main pieces into the enabler and barrier sub-themes (drivers). The enablers are the positive factors that supported the digitalisation innovation life cycle during the Covid-19 pandemic, and the barriers are the negative factors that limited the implementation digitalisation innovation life cycle.

Step 3

In this step, the number of times the identified drivers, as discussed in the interview by the participants, are counted.

The method here is to note the number of participants that talk about a particular driver as the main sub-theme, and the combined numbers of interviews where a driver is discussed are indicated.

Step 4

The researcher assigned weight ranking to the individual enabler and barrier sub-theme (driver). The ratio of the number of times the driver was talked as a primary driver to the sum of the total number of times all the participants mentioned the identified drivers were used to calculate a normalised weight for each enabler and barrier driver.

Step 5

The normalised weights for the enabler and barrier drivers developed from all themes combined with the generic four phases of a product development life cycle are used to create an innovation life cycle framework during the Covid-19 pandemic.

Step 6

Using the developed innovation life cycle framework, the researcher used a system dynamic method to establish a Causal Look Diagram (CLD). The CLD has been used to show the influences of drivers on each other through a casual-and-effect feedback loop considered as dynamic in behaviour.

Step 7

With the causal look diagram, the researcher used the Vensim PLE software and visual and hand-coding to link the causal loop influences of the drivers to the innovation life cycle. The combination of qualitative analysis software (Vensim PLE) visual and hand-coding were chosen because of the software's capability to represent the data analysis.

Step 8

Within this research context, the outcome of the steps above will be a new innovation life cycle framework which will be considered as an evaluation to the l for the digitalisation of GP medical centres during a pandemic.

Drivers' weighting

In step 4 of Figure 2 researcher used the total number of sub-themes of the drivers mentioned during the interviews to make a normalised weighting for each driver to rank the driver's influence on the innovation life cycle framework for the GP medical centres in time of the pandemic. The specific formula was adopted from statical Aggregate-Weighted Scoring Systems, mostly used in general hospital wards to detect early warning systems of patients' clinical state deterioration and safety issues[27]. The weight calculation formula is shown in equation (1).

$$\text{Normalised weight (i)\%} = \frac{(\textit{Number of participants mentioned a driver,n})}{(\textit{Total number of times participants addressed all the drivers,N})} x\ 100\%$$

The weight calculation system is also used by many other scholars in finding the total frequency of a factor in research, including prioritising genetic variations and predicting the modified health assessment scores in rheumatoid arthritis patients[28,29]. The weighted factors are used to develop the system's dynamic structure. Used the weight calculation system to align their findings with the approach of using frequency to percentage weights to value labels (drivers), which are not considered static but dynamic with time[30].

Innovation life cycle framework for GP medical centre development

To explain the process of digitalisation adoption while putting the drivers in context, the researchers developed an innovation life cycle framework using a generic four-phase product development innovation framework. The researchers used Vensim PLE software to draw the feedback look influences of the enablers and barriers drivers in each phase of the digitalisation process. The innovation life cycle framework for the GP medical centres is used to understand better the driver's influences in each phase[31].

System dynamic methodology

The System Dynamics (SD) methodology was first created in 1997 by Jay Forrester to identify the dynamic behaviour in complex systems[32]. The model has since been used by researchers as a tool to explore causal relationships and form feedback loops in various disciplines[33]. After assigning a weight to each driver, the researcher used the SD and created a map of complex feedback loops among the drivers to identify the system's behaviour. The participants identified 23 enablers and 17 barrier drivers during the interviews. The barriers are coded as B_n and enablers are nowhere represents the positional weight numbering. The researcher then developed a causal Loop Diagram (CLD) to analyse and create a graph representation of interrelationships among 40 identified drivers. The CLD analysis and innovation life cycle framework will be used to form a Stock and Flow Diagram (SFD). The SFD will highlight the input and output through the four phases allowing an overall transformation into digitalisation of the GP medical practices.

The researchers used Vensim PLE and word document insert tools to develop drivers' interactive digitalisation process as the input, stock, flow, and output, combined with feedback casual links, which was used to build the innovation life cycle framework. The SFD that came out of the built is a framework for analysing the innovation life cycle for digitalisation of the GP medical centres in times of a pandemic.

Results

In Total, the researcher interviewed 86 participants from 16 GP medical centres. A total of eight themes and 40 sub-themes (drivers) were developed after analysis of the data gathered during the interviews. The drivers are used for the assigning of weights in this paper. The total number of drivers mentioned combined is 2164 (Table 1). Table 1 shows the driver's code, the number of participants mentioned the driver, the number of times the driver was mentioned in all interviews, and the weights in equation 1. The most influential drivers are oneE_1 and E_15 with a weight of 3.51 per cent each where N=2164 and n=76. All drivers' weights are calculated using the same equation.

From Table1, the top 12 most influential drivers represent (37.06 per cent) of the overall influences for all the drivers, whereas the remaining 28 have a combined shared of 62.94 per cent.

The paper's innovation life cycle, which consists primarily of four phases, is anchored on the work discusse[34-36]. The researcher used the innovation life cycle with references to the enablers and barriers per each phase to develop the innovation life cycle framework for the GP medical centres.

Innovation life cycle framework

The researcher used the four phases of innovation life framework, as show in Figure 3. The phases show GP medical centres' steps for a novel idea development. The recognised drivers are important in phasing the innovation life cycle as the different drivers impact the phases differently.

System dynamic causal loop diagram (CLD) Discussion

Formulating a CLD is the key to constructing phenomena through instinctive and qualitative analysis that values combined thinking about the complicated relationships between the drivers[37]. The dynamic complex feedback loop interrelationships among the drivers are developed using Vensim PLE software and Microsoft word document. Figure 3 shows the feedback loop relationships that exist among the drivers. The driver's weight is displayed next to the driver code symbol. The CLD diagram shows the reinforcing (R) and the balancing (B) loops of the drivers' impact on one another.

System dynamic Stock and Flow Diagram (SFD)

The innovation life cycle framework developed in Figure 4 is used in Vensim PLE to develop integrated feedback casual links of the drivers to the innovation life cycle framework. Figure 5 shows the flow diagram representing the innovation life cycle system dynamic framework for GP Medical centres in the pandemic.

Discussion

As per the introduction section, the primary focus of this paper is to identify the innovation life cycle drivers by minimising the impacts of the barrier factors and maximising the effects of the enabler factors within an innovation life cycle framework. The outcome aimed at developing a framework to put the research into context. The system dynamic methodology was used to describe the dynamic influences that the drivers have on the four phases of the innovation life cycle discussed using the CLD, SFD and product development life cycle framework. The three most influential drivers per phase are discussed as follows in the descending order of weight influence:

Phase 1

(E3; 3.28 per cent), (E21; 3.37 per cent), (B12; 2.91 per cent). The pandemic lockdown forces influence this phase. This means that normal change resistance does not exist with forced ICT. The GP medical centre receives more financial support and subsidy from the government, and even with doctor-centric systems the enablers are maximised, and the barriers are minimised. Therefore, this makes this a short window of opportunity to digitalise primary care.

Phase 2

(E1; 3.51 per cent), (E2; 3.37 per cent), (B10; 3.28 per cent). While the conflicting and inadequate communication from MoH and PHOs created the most significant barrier in this phase, the existing ICT resources and system capabilities were the drivers that pushed the digitalisation of GP medical centred to the next level, therefore, should be maximised.

Phase 3

(E5; 2.91 per cent), (B3; 2.73 per cent), (B1; 2.73 per cent, (B2; 2.68 per cent), (E9; 2.68 per cent), (E16; 2.68 per cent). This phase has the greatest number of barrier drivers. This phase is, therefore, critical to the innovation life cycle as the total weights of all drivers combine at 31.10 per cent, with the barriers having an influence of 18.07 per cent and the enablers only contributing 13.03 per cent. Maximising the enabler drivers is key to this phase's successful digitalisation of GP medical centres.

Phase 4

(E15; 3.51 per cent), (E17; 2.68 per cent), (E18; 2.68 per cent). This phase has five enablers and only three low-impact barrier drivers. Suppose a digitalisation innovation successfully passes phase three of the process in phase four of the innovation life cycle framework. In that case, the enablers will be even stronger in maximising the successful implementation of digitalisation. The important drivers interesting in this phase are the patient demand and

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interesting telehealth (E18), and readiness for an outbreak (E15).

A theme that emanated from the research work is that driver B10 (Inadequate, conflicting, inaccurate and miss communication) scored the 6th in weight ranking drivers. Overall, as one would have expected, this driver was a critical driver that impacted the digitalisation of GP medical centres during the pandemic; however, the influence of this driver was much lower than expected at the beginning of this research.

The telehealth capability with existing systems and hardware (E1; 3.51 per cent) was shown to be the most critical enabler driver influencing the adoption of technological innovation. The negative feedback loops from the SFD figure 5 shows the influence that the existing telehealth capabilities and technical systems can have on the digitalisation of GP medical centres (primarily in phase 1, 2, and 3) by providing the basic systems and hardware to move from digitisation to digitalisation in a matter of 48 hours. The telehealth capabilities have a positive feedback loop with other enabler drivers, primarily in phases 2 and 3 of the innovation life cycle framework for the digitalisation of GP medical centres in time of the pandemic. The combined enabler drivers' influence weight contribution in the innovation life cycle is 60.72 per cent, and combined barrier drivers have an influence weighting of 39.28 per cent. Table 1. Figure 6 illustrates the percentage distribution of the drivers per phase.

Conclusion

This was the first study that system dynamic methodology was used as an effective methodology in understanding the links between enablers and berries in a newly developed innovation life cycle framework for the digitalisation of GP Medical Centres in time of a pandemic. The SD methodology was used to identify the complex and dynamic behaviour patterns of the main drivers impacting GP medical centres' ability to innovate during a pandemic. In the discussion part of this paper, it is emphasised that a more significant effort had to be placed on Phase 3 due to the weight of influence of the high number of identified barrier drivers. Phase 3 follows phase 4 of the innovation life cycle framework, which has higher enabler's driver by number and weight influences. This means phase 3 of digitisation is the most critical phase of life cycle innovation as it makes the MoH change their policies and process. At the same time, the GP medical centre must be more focused on changing its operation process to accommodate the MoH new policies and procedures and changing its service model from a doctor-centric to a patient-centric model. Using the influence weight from Table 1 and minimising the barriers drivers' influence and the enabling factors' overall influences on the innovation life cycle, the outcome of digitalisation can be significantly more successful using the developed framework for the GP medical centres. This paper's methodology is supported by the research work done by other researchers[38]. The innovation life cycle framework for the report is unique because the available innovation life cycle adopted from other researchers and was developed further by integrating and showing drivers' influence at each phase of the cycle as illustrated in Figure 3.

Further research can be done around the extension of the driver's pandemic with the effect of digitalisation achieved and obtained during and after the pandemic.

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None

Competing interest

Nil.

ETHICS COMMITTEE APPROVAL

This study was approved by the University of Canterbury Human Ethics Review Board and Research Ethics Committee. The reference number for ethics approval is #09032021.

Tables and Figures

Table 1: ***Enablers of digitalisation in time of Covid-19 pandemic at GP medical Centres 86 participants interviewed***

Sub-themes (drivers)	*Driver (E; B)*	*#Participants Identified driver*	*Normalise Weight%*	*Ranking*
Telehealth capability with existing hardware and systems	E1	76	3.51%	1
Readiness to respond to a pandemic demand	E15	76	3.51%	2
Accessibility, integration, and ease of use	E2	73	3.37%	3
Gain of income and revenue from new services and subsidy	E21	71	3.37%	4
Forced ICT transition	E3	58	3.28%	5
Inadequate/incorrect/conflicting/failed communication	B10	58	3.28%	6
Incorporating digital administration processes	E5	59	2.91%	7
Doctor-centric systems, not patient-centric	B12	59	2.91%	8
Lack of ideal design, systems connectivity, compatibility, and ease of use	B3	55	2.73%	9
Health organisation support (PHOs, MoH, IT providers)	E8	58	2.73%	10
Good communication and support from the community	E19	63	2.73%	11
Utilisation of existing practices examples outside NZ & pilot schemes	E23	57	2.73%	12
Lack of knowledge, awareness, and interest	B1	54	2.68%	13
Loss of time, revenue, and resources	B2	51	2.68%	14
Patient-centric systems and operation processes	E9	50	2.68%	15
Patient attitudes and preferences thought towards telemedicine	E16	49	2.68%	16
Reduction in workload due to adoption of technology	E17	40	2.68%	17
Patient demand for and interest in telehealth	E18	46	2.68%	18
Changed operational processes, guidelines for collaboration	E6	45	2.63%	19
Doubs regarding ability to provide services or data quality	B13	41	2.63%	20
Prefer face to face over Telehealth	B4	36	2.54%	21
Lack of readiness to respond to a pandemic	B11	42	2.54%	22
Understanding of local needs and priority setting	E11	41	2.50%	23
Introduction of a new legal framework for telehealth & telemedicine	E20	38	2.50%	24
Work flexibility, time efficiency and remote work	E7	76	2.36%	25
In house knowledge, fast appropriate training, and adaptability	E22	73	2.36%	26
Risk awareness and risk-averse	E4	71	2.31%	27
Cost of equipment, system membership and remote work limitation	B14	58	2.31%	28
Perceived risk, un-usefulness, and lack of physical contact with patient	B6	58	2.26%	29
Out-dated legal framework and requirements from MoH	B16	59	2.26%	30
Willingness to adopt and retain new technology	E10	59	2.13%	31
Privacy, confidentiality, and security-related concerns	B15	55	2.13%	32
Social interaction over digital interaction	B7	58	2.08%	33
Disruption of existing practices, routines, and culture	B9	63	1.94%	34
Open to telehealth or face to face consults	E12	57	1.89%	35
Well-designed digitalised innovative systems	E13	54	1.89%	36
Old, out of date PMS unable to accommodate telehealth requirements	B8	51	1.76%	37
Poor quality devices and equipment, phone, and internet services	B17	50	1.39%	38
Expectations towards managing a pandemic amongst the public	E14	49	1.29%	39
Lack of digital administration processes and resources	B5	40	1.16%	40

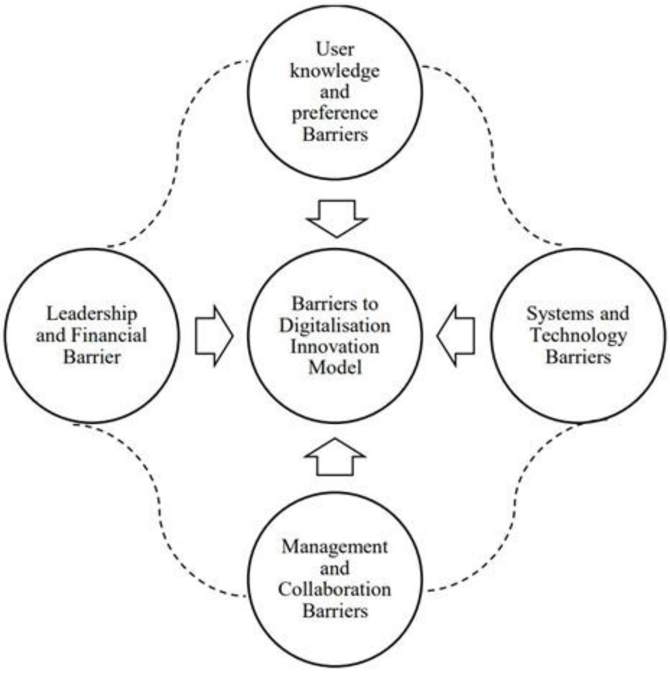

Figure 1: Innovation barrier model: Author's illustration.

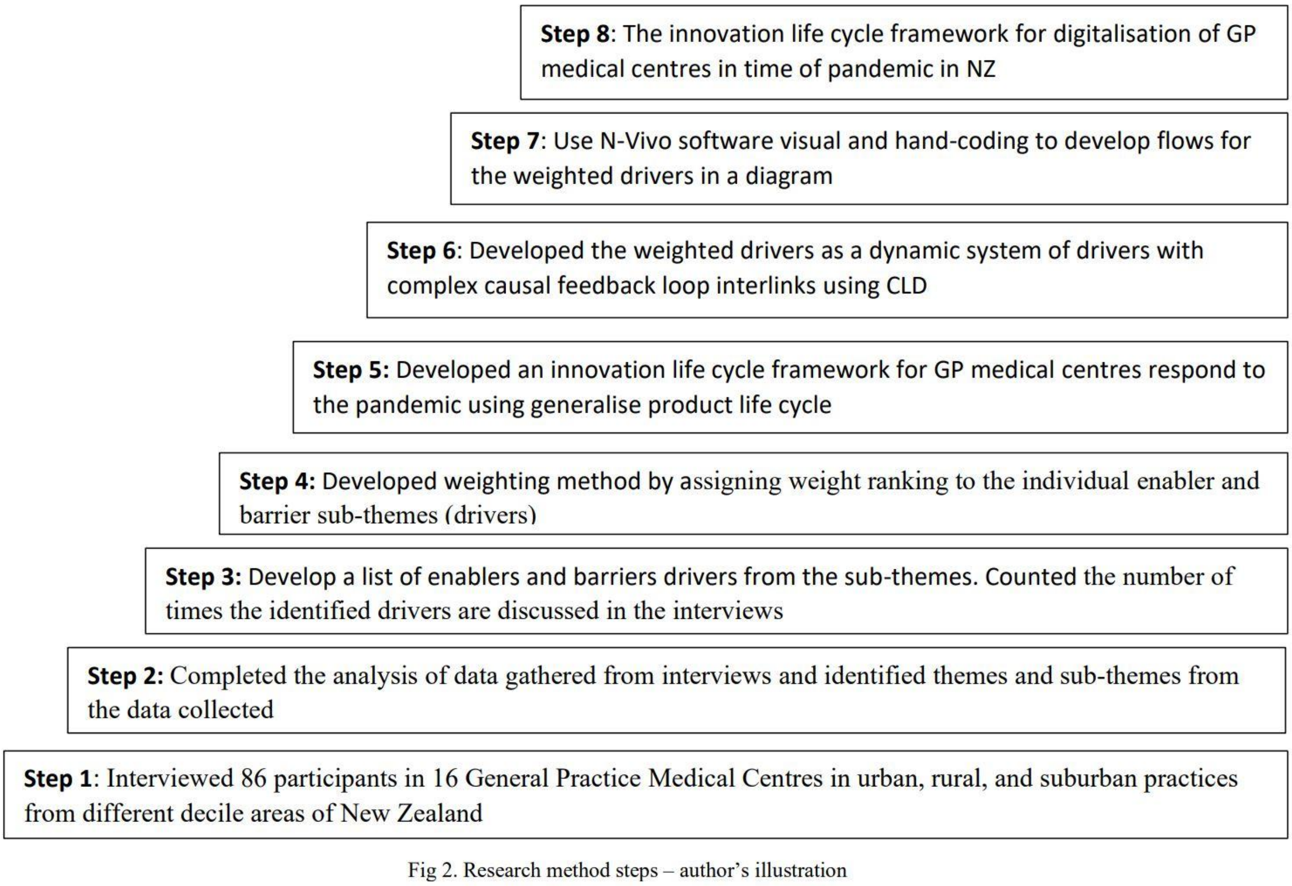

Figure 2: Research method steps – author's illustration.

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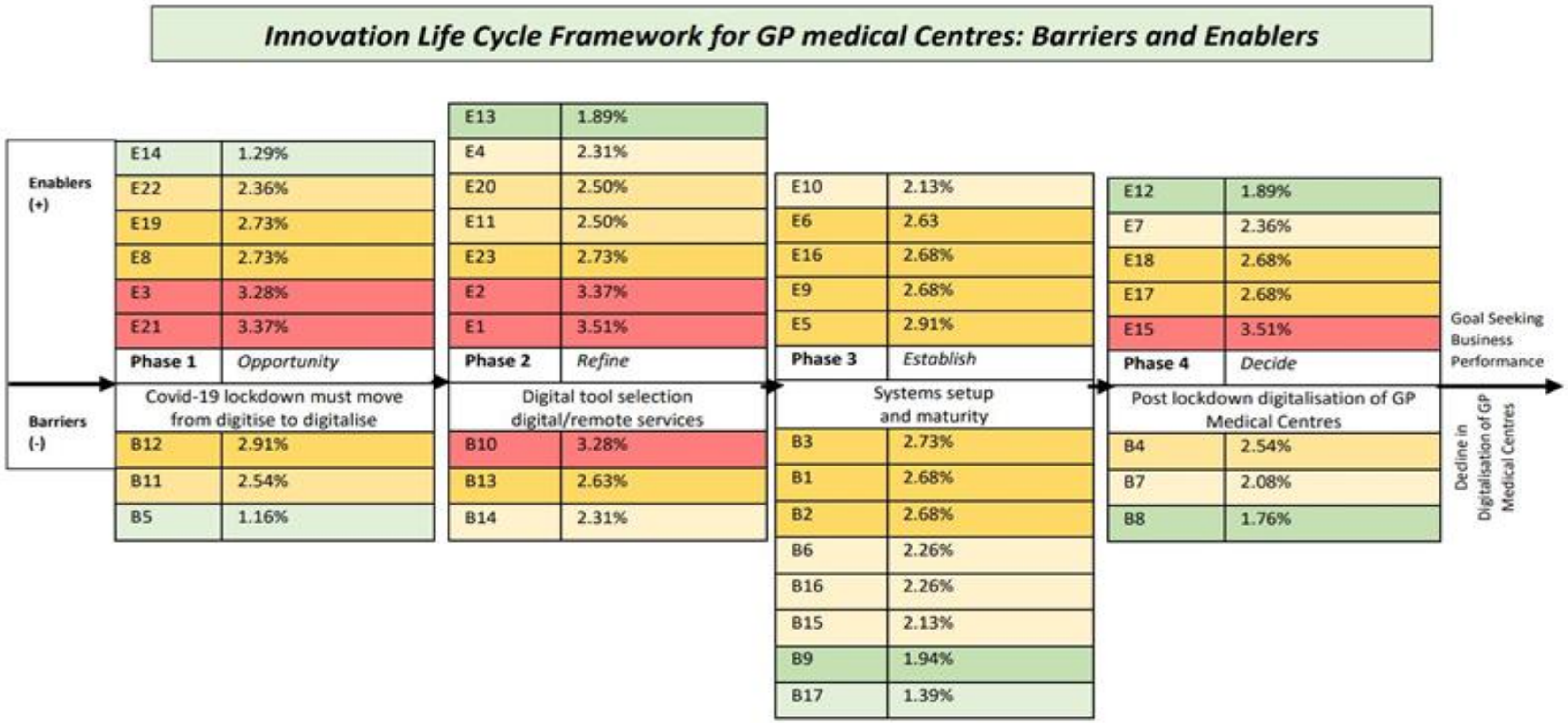

Figure 3: The innovation life cycle framework.

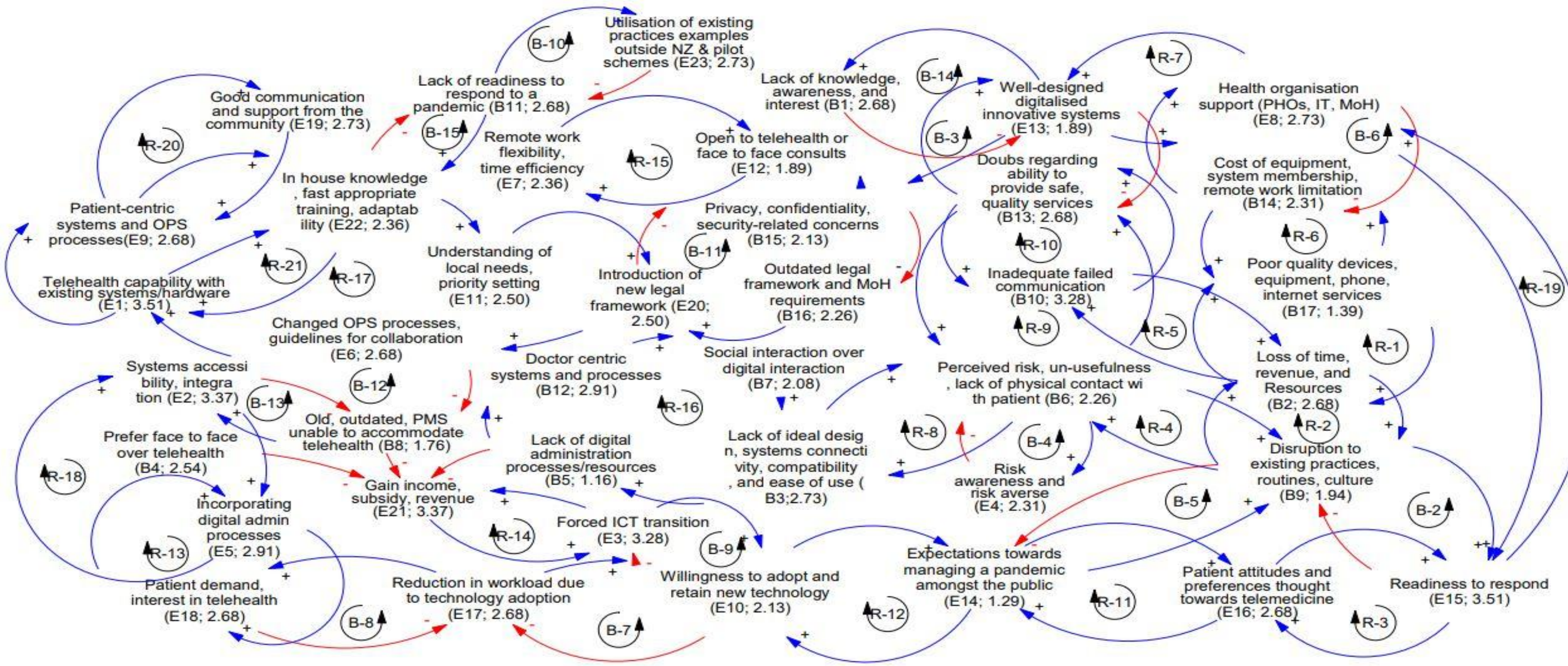

Figure 4: Casual loop diagram.

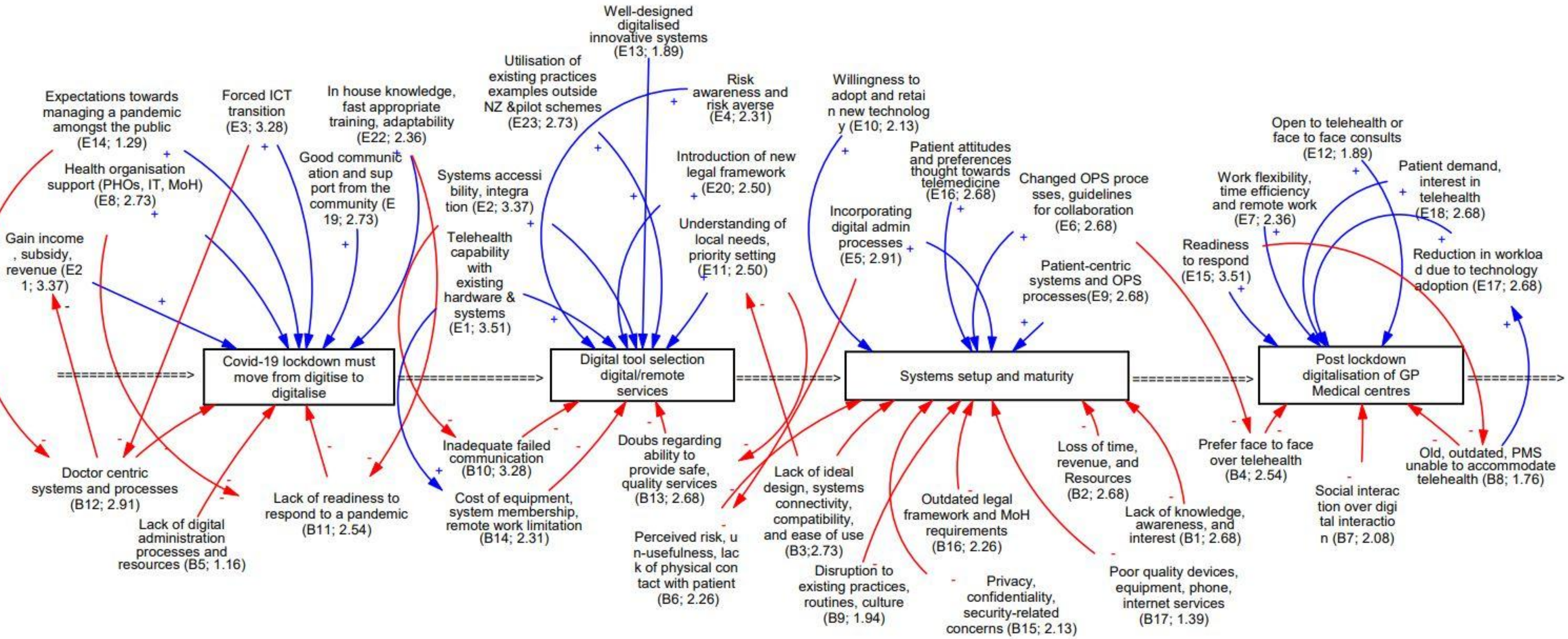

Figure 5: The stock and flow diagram.

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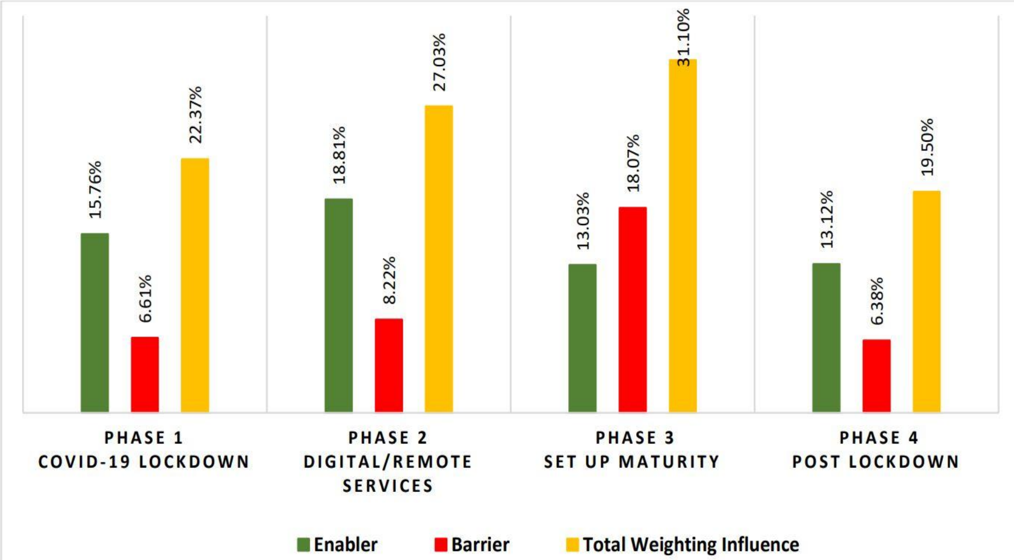

Fig.6. Weights influence each phase of the innovation life cycle framework.

Figure 6: Weights influence each phase of the innovation life cycle framework.

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