

Internet of medical things, policies and geriatrics: An analysis of the *national digital health strategy for South Africa 2019–2024* from the policy triangle framework perspective



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ABSTRACT

Policies are a cornerstone for the effective implementation of a strategy. In the healthcare context, policies should not only highlight a country's vision towards the provision of healthcare but also identify the mechanisms through which such provision will be dispensed and the target beneficiaries. In addition, information technologies have been acknowledged as important media for healthcare delivery. Moreover, as the world's population is ageing, there is a need for a renewed focus on elderly healthcare. It is in this context that this paper investigated the *National Digital Health Strategy for South Africa (2019–2024)* concerning the provision of healthcare to the elderly and the use of the Internet of Medical Things in healthcare provision using the Policy Triangle Framework as the theoretical lens. Findings revealed that the country's digital health strategy is comprehensive and, therefore, could be used as a gauge for the formulation of electronic health strategies that make provision for the use of emerging technologies in developing countries.

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Introduction

Electronic health (eHealth) is defined as the use of technologies such as mobile phones or the Internet to provide or enhance health services. The Internet of Medical Things (IoMT) is a component of eHealth [2], which is the provision of health services using Internet services and tools. As such, an IoMT service works as an interconnected system of things and people to deliver healthcare services such as diagnosis and supervision of remote surgeries through the Internet. Thus, the IoMT can, amongst other benefits, help the elderly (geriatrics) avoid long and painful trips from one health centre to another [4] by performing, for example, remote diagnosis, monitoring and medical surgeries over the Internet [1]. Hence, we can argue that the IoMT is part of eHealth (digital health) and its benefits are numerous for the elderly.

Recent developments in digital health have led to a renewed interest in the enhancement of healthcare delivery to elderly people using the IoMT. A review of the literature suggests that the IoMT has received much attention from researchers for many reasons [1]. These include the increase of chronic diseases amongst elderly people; challenges within current healthcare systems; the need to provide better healthcare services to elderly people; and the shortage of healthcare professionals.

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It has been argued that the IoMT has the potential to alleviate healthcare systems' challenges in developing countries and hence help strengthen the provision of healthcare to elderly people in those countries [2,3].

However, the use of the IoMT to provide healthcare to elderly people should be guided by clear strategies and policies. For instance, Kante & Ndayizigamiye [2] reported that an enabling environment is essential for the effective implementation and use of the IoMT to provide enhanced healthcare delivery to elderly people. Similarly, Khoja et al. [5] reported that proper policies and strategies are crucial for the appropriate implementation of and compliance with a digital health strategy.

An eHealth or digital health policy refers to "a set of statements, directives, regulations, laws, and judicial interpretations that direct and manage the life cycle of eHealth" [6]. The absence of a clear and comprehensive digital health strategy may have adverse effects on the planning, implementation and use of IoMT services in developing countries [2]. Such negative effects may lead to the IoMT not achieving its anticipated outcome. This could then expand the gaps in access to healthcare and use of health information in low resource countries [5], reinforce health inequality, and widen the digital divide [7]. Digital health policies, therefore, are essential for the successful implementation of the IoMT in developing countries to improve the provision of healthcare to elderly people.

Digital health policies have been adopted by many developing countries. For instance, the World Health Organization (WHO) [8] noted that half of its member states reported having a digital health strategy at least. Studies have analysed digital health strategies in developing countries concerning their implementation [6,9], challenges and scope [5], the IoMT [2] and geriatrics [1]. These studies highlighted some of the gaps that need to be filled for the IoMT to enhance the provision of healthcare to elderly people. Amongst the gaps related to the IoMT and elderly people, Kante [1] pointed to Mali's digital health strategy not catering for the IoMT and geriatrics. A similar observation was made about the eHealth strategies of Myanmar, Rwanda, Ethiopia and Bangladesh [2,10]. These studies made recommendations to address the identified gaps and incorporate the IoMT in the provision of quality healthcare to elderly people. There is thus a need to look at the case of other countries, such as South Africa, to gain more insight into the issues that need to be dealt with to ensure the implementation of the IoMT that caters for the elderly.

The main purpose of this paper is to investigate the *National Digital Health Strategy for South Africa (2019–2024)* [22] in the context of the provision of healthcare to the elderly through the IoMT. The study is anchored on the Policy Triangle Framework. It aims to achieve its purpose by analysing the context, content, actors and process within South Africa's digital health strategy.

Health system in South Africa

The population of South Africa is estimated to be 54 956 900, the majority of whom access health services using government-run public healthcare services [11]. The country's health system comprises the public sector (run by the government) and the private sector. The public healthcare sector comprises primary, secondary and tertiary health facilities. These are handled by the provincial health departments which function as the immediate employers of the health workforce [11]. At the national level, the Ministry of Health is responsible for policy development and coordination. The private sector dispenses health services through private health practitioners. These practitioners run private health facilities that are mostly based in cities. In the 2012 financial year, South Africa's healthcare system contributed 8.8% of the country's gross domestic product [12].

The elderly in South Africa represents 5.31% of the general population [13] and it was estimated that they will represent 14.8% of the South African population in 2050 [14]. Elderly people face several health conditions such as heart diseases, strokes, diabetes, falls as well as psychosomatic conditions (stress and loneliness) and hence need specialised care from healthcare professionals [15]. The provision of specialised care is challenging as the ratio of patients to nurses in South Africa is 552:1 [16]. In addition, the elderly require long-term healthcare. Hence, there is a need to pay more attention to this category of the population. South Africa's National Development Plan [17] also points to the need to provide high-quality healthcare to elderly people.

The literature [18,19] suggests that elderly people play a vital role in African societies as their health status affects those around them [1]. Consequently, many countries explicitly highlight the need to protect, promote and support the needs and aspirations of elderly people. For instance, in 2017, Senegal adopted a national policy on healthy ageing through the Office of Health of the Elderly [20]. However, we could not find any specific national policy or strategy dealing with elderly people in South Africa.

Method and framework

A qualitative method in the form of content analysis (CA) was used to conduct the study. Qualitative methods have been recognised as valuable in many fields of research such as applied social policy research [21] and the IoMT policy research [2]. A CA of the *National Digital Health Strategy for South Africa (2019–2024)* [22] was conducted. Many similar studies have used the CA technique [23–26], hence its use in this study. CA necessitates replicating and validating inferences from data to their context to provide new knowledge, a representation of facts and a practical guide to action [27]. Deductive CA can be used when research intends to retest existing data in a new context [28]. It could also entail testing of categories, concepts, models or hypotheses [27]. In this study, the deductive CA process was followed.

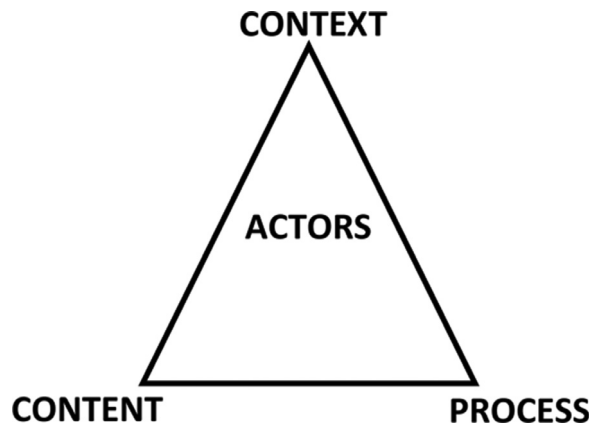


Fig. 1. Policy Triangle Framework
Source: Adopted from Benneke et al. [29].

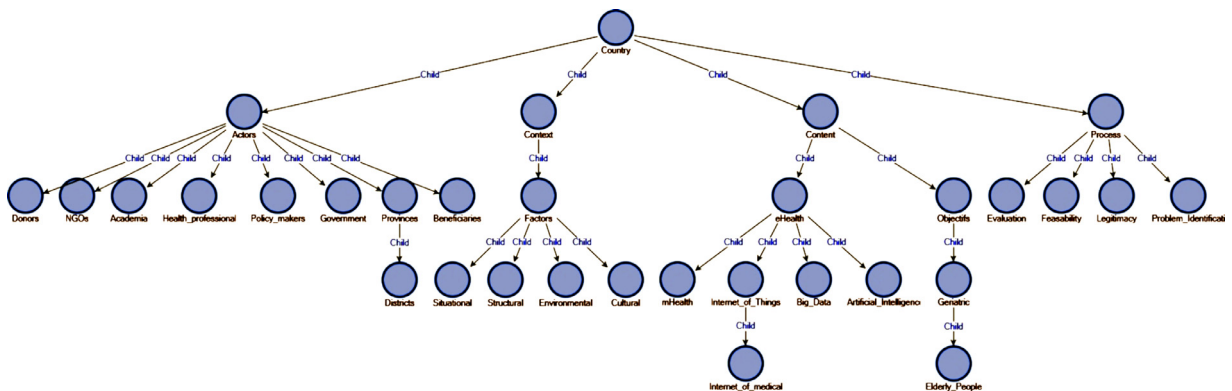


Fig. 2. Coding and categorisation.

The Policy Triangle Framework (Fig. 1) was used to analyse South Africa’s digital health strategy with the help of NVIVO (version 12) software. In doing the analysis, we assigned distinctive codes to data, grouped these codes into categories, and then arranged the categories according to themes. These themes were content, actors or stakeholders, process, and context. They comprise the four components of the Policy Triangle Framework.

Results and discussion

The results are presented and discussed in this section. To begin with, the results of the coding and categorisation are provided and these are followed by those results relating to the depiction of certain terms in the digital health strategy document.

Coding and categorisation

As outlined above, the results of the analysis were coded and categorised into four main themes as drawn from the Policy Triangle Framework. They are depicted in Fig. 2 below.

Terminology: geriatrics or elderly and internet of things (IoT) or IoMT

Our first examination was to determine if South Africa’s digital health strategy [22] contains the terms “geriatrics” or “elderly” and “IoT” or “IoMT”. While the term “geriatrics” is not used, the term “elderly” is – it is used in the context of the elderly being one of the “vulnerable groups”. Reference is also made (0.04% coverage) to the phrase “a life expectancy rate of at least 70 years for men and women”.

Similarly, while the term “IoMT” is not mentioned the term “IoT” is (0.01% coverage), in the form “Internet of Things (IOTs)”.

This latter finding from the South African eHealth strategy is similar to Kante & Ndayizigamiye’s [2] finding that the digital health strategy of Senegal also mentions the “Internet of Things”. The Senegalese policy also mentions the term

Table 1

Contextual factors.

Situational factors	An event that can be qualified as non-lasting, which can affect or impact the policy. The event could include a change of government, a natural catastrophe and a workers' strike.
Structural factors	These are factors that hardly change in society. They include the political system, demographic structure and the economy. These factors are more predictable.
Cultural factors	These are cultural, moral, ethical and religious values of the society or a part of it (a minority).
International/Environmental factors	These are events, values and criteria which have an existence outside of the political system of the country. In other words, in our case, it is the eHealth agenda of the WHO or other international bodies such as the European Union.

Source: adapted from [29].

Table 2

Context of South Africa's digital health strategy.

Situational factors	<ol style="list-style-type: none"> 1. Ameliorate the quality and coverage of healthcare services delivery. 2. Prevent the onset of acute and chronic diseases by promoting healthy behaviour. 3. Improve and promote healthcare delivery to vulnerable groups such as children and the elderly. 4. Strengthen the health information systems in terms of coordination, interoperability, internet connectivity and technological infrastructure and architecture 5. Increase the healthcare workforce.
Structural factors	<ol style="list-style-type: none"> 1. High expenditure on healthcare and social services. 2. Need for effective collaboration between health stakeholders, namely, the public and private sector. 3. Capacity building and skills transfer, and optimising data and business intelligence.
Cultural factors	A large portion of the South African population prefers to consult with traditional healers or to do so in conjunction with "Western" medicine.
International/Environmental factors	<ol style="list-style-type: none"> 1. Influenced by the Global Observatory for eHealth of the WHO. 2. Driven by the Sustainable Development Goals (SDGs) of the United Nation's (UN) General Assembly [30]. Goal 3 is to "Ensure healthy lives and promote well-being for all at all ages" and Goal 8 is to "achieve universal health coverage" and to increase access to quality healthcare at an affordable cost [8].

"geriatric" as reported by Kante [1]. However, the digital health strategies of some other countries mention geriatrics but not the IoT. For instance, the eHealth strategy of Myanmar states: "Coalition will be built with mass media for providing health education to the population continually regarding methods of preventing communicable and non-communicable diseases, caring practices for the old aged, and creating awareness on nutrition and proper sanitation" [1]. In the South African context, it can be argued that while the country's digital health strategy caters for the IoT to provide healthcare for its citizens in general including elderly, it barely mentions these elderly. Hence, this could be seen as a gap in South Africa's digital health strategy that needs to be addressed, that is, for the strategy to specifically point to the use of the IoMT in the provision of healthcare to elderly people.

Results relating to the components of the Policy Triangle Framework, namely, context, actors or stakeholders, content, and process are discussed below.

Context

The situational, structural, cultural and international factors constitute the contextual factors [29]. These factors are explained and summarised in Table 1 below. These contextual factors were then extracted from South Africa's digital health strategy document and are presented in Table 2.

The factors listed above are similar to the contextual factors stipulated in the digital health strategy of Senegal [2]. The workforce shortage has been highlighted as part of situational factors in many other digital health strategies including those of Myanmar, Mali, Rwanda and Ethiopia [2,31]. In addition, international/environmental factors in the form of external actors such as the WHO, play an important role in the formulation of the national digital health strategies of these countries [32].

Actors

The principal actor in South Africa's digital health strategy remains the state (government) through the Ministerial Advisory Committee (MAC). Other actors include, amongst others, universities, districts, provinces, the Health Professions Council of South Africa (HPCSA), the United States Agency for International Development (USAID), the Novartis Foundation, the WHO, the International Telecommunication Union (ITU), the African Centre for eHealth Excellence, non-governmental organisations (NGOs) and healthcare professionals (doctors, nurses, etc.). Some actors (the WHO, government, health professionals and NGOs) are similar to those of other countries such as Senegal, Myanmar, Rwanda, Ethiopia [2] and Mali [1]. However, other actors identified in South Africa's digital health strategy did not feature in the digital health strategies of other countries. For example, the districts and provinces were not identified as actors in the eHealth strategy of Mali [1].

Content

The main objective of South Africa's digital health strategy is to provide better health for the people of South Africa using eHealth. This objective can be linked to the SDG 3 of the UN noted above and which aims "to ensure healthy lives and promote well-being for all at all ages" [30]. The country's digital health strategy priorities are:

- ✓ To implement a comprehensive electronic health record, which will improve patient management.
- ✓ To digitise health systems business processes. This will improve the efficiency and quality of human resource management and access to medications at an institutional level.
- ✓ To enact an incorporated platform and architecture for the health sector information system which will lead to the interoperability and linking of existing patient-based health information systems.
- ✓ To scale up high impact eHealth interventions for community health. In the context of the proposed National Health Insurance, this strategy will expand health promotion to vulnerable groups such as children, the elderly, women and others who have been prioritised.
- ✓ To develop digital health knowledge workers for successful eHealth implementation as well as economic development.

These priority areas could be compared to those of Senegal [1]. The digital health strategies of South Africa and Senegal both have SDG 3 as the main objective to be attained. This confirms the finding of Kunyenje & Chigona [32] that external actors play an important role in the adoption of policy. In these two countries, the external actor (as identified above) is the WHO. The specific digital health priorities of these countries include the provision of healthcare to elderly people and also the use of the Io(M)T. However, the specific digital health priorities of South Africa and Senegal differ, for example, from those of Mali [1], as the digital health priorities of the latter do not specifically address the provision of healthcare to elderly people, nor do they mention the prospects of using the IoMT in the provision of healthcare.

Process

The process component of the Policy Triangle Framework is categorised into three phases: problem identification, legitimacy, feasibility and evaluation [29]. The problem identification phase comprises ensuring that the provision of healthcare to the elderly and the use of the IoMT in the provision of healthcare are on the political agenda. This was achieved in South Africa when the government and the other stakeholders began reviewing the previous strategy implementation of 2012 to 2016. This review led to the legitimacy phase, which was driven by the situational and structural factors identified and listed in Table 2. In addition, the review process became the basis for the strategy formulation process and consultations with key stakeholders which, in turn, marked the feasibility phase. From there onwards, the MAC reported that a detailed monitoring and evaluation plan would be developed with clear targets on the activities required to achieve the milestones of strategic interventions.

Conclusion

This paper analysed the current South African digital health strategy in terms of the provision of healthcare to the elderly and the prospects of using the IoMT in the healthcare sector. The analysis used the Policy Triangle Framework which is anchored on content-related, actors-related, process-related, and contextual factors. The findings reveal that South Africa's digital health strategy makes provision for the elderly (geriatrics) and the use of the IoMT in the dispensing of healthcare. The strategy also addresses the situational, structural, cultural and international factors (contextual factors) related to the provision of healthcare in South Africa. Furthermore, the paper identified the actors, content and the process in the digital health strategy. South Africa's digital health strategy is shown to be comprehensive in terms of the four pillars of the Policy Triangle Framework. As many developing countries are aiming to digitise their healthcare information systems, they may perhaps learn from how South Africa's digital health strategy was formulated.

This paper did not assess the implementation of South Africa's digital health strategy. Further studies should, therefore, be conducted to investigate the determinants and challenges related to the implementation of the strategy.

Declaration of Competing Interest

The authors declare no conflict of interest.

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