



**Strategies, Approaches
and Experiences:**
Towards building a South African
Digital Health Innovation Ecosystem

M. Herselman
A. Botha

2016

Strategies, Approaches and Experiences: Towards building a South African Digital Health Innovation Ecosystem

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Strategies, Approaches and Experiences: Towards building a South African Digital Health Innovation Ecosystem

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Foreword

The **digitalisation** of Healthcare Information Systems in South Africa could have an impact beyond mere access to and delivery of health services. The health landscape of South Africa offers unique challenges and for digital health to work, it has to address several major challenges pertaining to infrastructure and interoperability of all health systems. South African **investments in digital health, when conceived and managed as socially, technologically and economically sustainable innovation**, can have **implications beyond economic policy**, and may require new approaches in public management. Therefore, the **planning and building of a national infrastructure for digital health** should take stock of international experiences of building integrated systems. **Yet, substantial effort is required to plan and build a distinctly South African digital health culture that accommodates the country's diverse needs appropriately.** Success will require innovative solutions that are **sensitive to local economic, social, cultural and organisational factors**, and that are adapted to augment the broader **South African capabilities** in digital health. The **adoption and acceptance of digital health infrastructure and solutions by healthcare professionals, organisations and patients is challenging and critical for success.** A clear evaluation framework to monitor unsuccessful and successful adoption and acceptance of digital health solutions, as well as to trigger adaptive and corrective measures, must be designed from early on.

The **Digital Health Innovation Ecosystem (DHIE)** involves three interactive, complementary modules: **context**, the **innovation lifecycle** and the **users/stakeholders**. The context builds on the typology of Social, Technological, Economic, Environmental, Political and Value-based issues (STEPEV). **Stakeholders** should include, for example, patients, user communities, technology providers, payers, regulators and policymakers. **Technology** should cover **systemic views on elements** of interoperability, standards and integration of infrastructure. It should include privacy elements and big data, as well as focus on analytics and storage, and control of access. In a digital ecosystem, **users must sense or experience trust**. They must feel that they can control and increase their own access to a system. Their uptake and use are essential for such an ecosystem to work or to be regarded as a sustainable solution. For sustainability to work, the **value of a system has to be shared across groups** where there are partnerships, capacity building, good leadership and governance. **Reaching, engagement and empowerment** of low-income populations in urban and rural areas to deliver novel digital health services require **highly targeted measures**, which will require careful consideration of relatively **idiosyncratic conditions**.

The **build-up of digital health in South Africa** is not only about improving the availability, access and delivery of healthcare services, but essentially about **enhancing a**

country's strategic capabilities to create, adapt and implement novel digital health solutions within and by the **public and private** sectors. Platforms, technologies and solutions implemented must also be flexible enough to adjust to **future needs**. **Foresight methodologies** may propose a useful approach to construct a shared understanding of emerging possibilities. Including often-facilitated social processes, foresight methodologies propose a reforming platform for a **self-directed innovation ecosystem to emerge**. Innovation is considered to occur in an organic manner based on the **common interests of various stakeholders** and, consequently, it allows novel outcomes. In a local form these creative platforms can support the rise of an innovation-favourable culture, and help lower the barriers of local entrepreneurship.

Preface

The purpose of the book is to provide an overview of how a Digital Health Innovation Ecosystem (DHIE) was developed based on different strategies, approaches and experiences over a period of time, and based on collaborations between the Council for Scientific and Industrial Research (CSIR) and VTT, known as the Technical Research Centre of Finland.

The book provides a realistic overview of the current South African health situation in which ICT systems are involved and related issues have to be addressed if digital health systems are to be implemented to strengthen the health system in South Africa. Digitalisation of healthcare processes is one of the key requirements in global health, and as such constitutes an obvious central issue for every government concerned with the health and well-being of its citizens. National strategies, initiatives, funding, projects, as well as consultant briefs and academic literature on the topic are increasing rapidly. Practically no serious health policymaker or professional would have missed the call to digital health action due to “social and demographic changes, the rise of chronic diseases, and the need to improve efficiency and quality of healthcare delivery” (OECD 2013).

The Finnish Ministry for Foreign Affairs played a key role in making this collaboration a reality through its financial support. The collaboration focused on two key issues: Firstly, it broadened the Finnish and South African capabilities for strategic planning of digital health innovation ecosystems, and secondly, it undertook practical and targeted work to analyse, conceptualise and build a South African Digital Health Innovation Ecosystem (DHIE), in which foresight and road mapping were applied. The dialogue between South African and Finnish research experts in innovation and community work has been important for our ability to learn how technologies can be deployed to address society-wide challenges. It is also a testimony to the importance of two-way learning between Finland and South Africa.

The context and challenges experienced in health in South Africa are outlined in **Section A**, coupled with an analysis of what elements constitute the DHIE in general. **Section B** presents the methodology that was applied, as well as the underlying philosophy and methods that contributed to the development of this high-level ecosystem. The different phases of conceptualising and developing the DHIE for South Africa, together with a graphical representation that illustrates how the concepts relate to and support one another, are also provided in the final DHIE. **Section C** presents the next steps in implementing a Mobile Health and Wellness Innovation Ecosystem in South Africa with the lessons learnt, reflections and discussions.

All the chapters were reviewed by peers and the feedback from these reviewers has been incorporated.

Section C: Implementation Instance

Chapter 8: mHealth & Wellness Innovation Ecosystem

Adele Botha, Marlien Herselman & Derrick Kotze

8.1 Introduction

Against the background of the conceptualisation of a Digital Health Innovation Ecosystem within the South African context, this chapter will present a localised mHealth & Wellness Innovation Ecosystem.

As outlined in the previous chapter, a sustainable Digital Health System necessitates a system that is adaptable, teachable and capable of reacting to changes and new challenges. This would oblige the inclusion of strong competencies for local innovation and problem analysis as credible localised innovation capabilities. The development and facilitation of such a local talent pool cannot be a theoretical exercise and would need to be crafted as a practical endeavour within a suitable domain.

Unlocking and stimulating an *mHealth Innovation Ecosystem* is aligned with the ICT Research, Development and Innovation (RDI) Implementation Roadmap for South Africa (Mjawara, 2012) as it leverages advances in ICT to create a digital advantage at individual, industrial and societal level. This will support the National Development Plan's (National Planning Commission, 2011) vision for

- an economy that will create more jobs through increasing “the size and effectiveness of the innovation system, and ensur[ing] closer alignment with companies that operate in sectors consistent with the growth strategy” (p. 12);
- improving the quality of education, training and innovation through “a wider system of innovation that links key public institutions (universities and science councils) with areas of the economy consistent with our economic priorities” (p. 17); and
- quality health care for all through “better patient information systems supporting more decentralised and home-based care models” (p. 20).

The rest of this chapter is structured as follows. Section 8.2 builds on the narrative from Section A, Chapter 1 and 2, to highlight the mHealth implementation landscape and give an overview of the strategic innovation opportunities in mHealth in South Africa. Section 8.3 builds on Section B and looks at the implementation environment. Section 8.4 presents the specific intervention and highlights some of the lessons learnt. Section 8.5 concludes the chapter by presenting a way forward.

8.2 mHealth in South Africa

Mobile health or mHealth has firmly established itself within Health Informatics. mHealth as term is broadly assigned to the use of mobile cellular communication devices, multimedia devices and sensor devices, as they are integrated within increasingly mobile and wireless health care monitoring and delivery systems (Istepanian & Lacal, 2003).

mHealth is perceived to have huge potential for benefiting the health service delivery processes, especially in resource-constrained environments (mHealth Alliance, 2010; Vital Wave Consulting, 2009). Over the past years, mHealth implementations have spread to incorporate a wide range of mHealth applications to service the Health System's information and end-user needs. This Section of the chapter aims to

- summarise the current state of mHealth applications and implementation in South Africa by a review of reported mHealth Implementations and the stakeholders that collaborate in the space (Botha & Booii, 2016) (See Section 8.2.1); and
- outline strategic innovation opportunities within the South African mHealth environment (Botha, 2016) (See Section 8.2.2)

8.2.1 South African mHealth Implementation Landscape

South Africa, with its significant mobile penetration of over 120% (ITU, 2014), has benefited from numerous mobile health implementations (Cargo, 2013) with multiple attempts to create a consolidated overview as an ongoing effort (GSMA mHealth, 2014; HealthEnabled, 2015; USAID, 2015b). The following outlines the relevant data sources that are currently available in the South African mHealth Landscape:

- The mHealth Evidence project of K4Health at Johns Hopkins University contains a listing of mHealth projects and papers (K4Health).
- The mRegistry is an initiative of WHO, JHU and others to produce a registry of all mHealth projects. Launched in 2014, it has not yet collected many projects but is significant as it is supported by WHO (WHO & JHU, 2014).
- USAID produces a compendium of mHealth activity, collated almost annually. It is the fourth edition with around 100 exemplar projects from around the world (USAID, 2015a).
- The mHealth Working Group has an ongoing role of bringing together international efforts in the sector (mHealth Working Group, 2016).
- The GSMA (Global System for Mobile Communications, originally the *Groupe SpécialMobile*) has gathered a wide but not deep collection of initiatives in their mHealth Tracker (GSMA, 2015).

Fragmentation in the Health Information Systems that are currently used in South African public health facilities is unmistakable, as was documented during a 2013 assessment of Hospital Information Systems (NDoH & CSIR, 2014). The study found that many different systems from different vendors were implemented and up to 31% of these systems were unable to exchange patient information.

In attempting to describe the current state of mHealth applications and implementation in South Africa, one firstly needs to accept the fact, that it is a very dynamic environment, with sustainable initiatives being few and far between. Secondly, the reflections here should be seen as a snapshot in time. The data used in this narrative emanates from secondary or tertiary sources, as no direct accounts were sourced from stakeholders. A limitation is then that not all of the information could be verified from the sources. As such, the data presented here is only as reliable as the reported (and in some cases) re-reported data. However, this narrative suggests that the *trends* identified are relevant and applicable within the mHealth Implementation domain in South Africa. These trends have been reviewed and verified by independent practitioners (Botha & Booie, 2016).

With there being such a great variety and number of mHealth applications, it is convenient to use an *mHealth application* lens to describe them. To this end, the mHealth application outline proposed by Labrique, Vasudevan, Kochi, Fabricant and Mehl (2013) has been used. These authors built on efforts from the WHO global survey on eHealth (Kay, Santos, & Takane, 2011) and the mHealth Alliance's mHealth services review for maternal and newborn health (mHealth Alliance, 2010) and they proposed 12 common mHealth applications as (Labrique et al., 2013, p. 164):

- Client education and behaviour change communication
- Sensors and point-of-care diagnostics
- Registries and vital events tracking
- Data collection and reporting
- Electronic health records
- Electronic decision support (information, protocols, algorithms, checklists)
- Provider-to-provider communication (user groups, consultation)
- Provider work planning and scheduling
- Provider training and education
- Human resource management
- Supply chain management
- Financial transactions and incentives

The mHealth applications listed above provided a convenient way to examine the diverse uses of mobile technologies within the mHealth environment.

The most common mHealth applications in South Africa at the time of the review were the *registration of users and vital event tracking*, closely followed by *data collection and reporting*, and *the creation and updating of electronic health records*.

8.2.2 Trends within the South African mHealth implementation landscape

The first noticeable trend in the South African mHealth environment is that most of the initiatives are donor funded and *no significant business model* was identified that would ensure sustainability beyond donor involvement.

The services are facilitated through multiple Mobile Network Operators (MNOs). This implies that the services are not *free*, although all of the applications were free to end-users, thus implying the need for a steady capital input. *Free* Wi-Fi mobile access needs infrastructural investment to be provided and is only accessible to higher-end devices. Advertising-related revenues are the predominant proposed business model that has been promoted, but no evidence was found for any sustainable service that was covering its own costs without subsidy from a stakeholder as investor.

The vast majority of mHealth implementations in South Africa are aimed at the general public or at a segment of the public with a specific health-related need. These mHealth implementations mostly provide text- or voice-based communication that is often geared towards a specific community or individual through sequencing and pacing. In general, for the population of South Africa, mobile cellular technology predominantly provides the *ability* to connect, rather than functions of *mobility* and *utility*. As many of the devices used by targeted end-users are low-end basic and feature phones, mHealth applications tend to aim at the lowest barrier of entry, and they frequently use voice or signalling channels. Services for healthcare workers and institutions tend to provide a richer interaction through mobile data services that make use of mobile applications (apps) or on-board applications.

Institutional use of mobile technology through mHealth implementations leans towards towards facilitating mobility, extending the reach of the Institution's health system and mitigating contextual connectivity, electricity and the use of more expensive Desktop Computing devices.

Most of the health-related mobile services target a specific group of individuals. These are mostly *push* services that sequence and pace actions or activities, and alert institutions and healthcare professionals of events or actions. HIV antiretroviral distribution, drug adherence and information regarding pregnancy and prenatal care are some of the major targeted areas. General pull services such as discussion forums host larger numbers of users and are more wide-ranging in focus.

Most of the surveyed Mobile Health Implementations made use of the personal devices of the users, leveraging the existing user base. As the technical barrier to participation for these services needs to be as low as possible to increase reach, most of the applications use mobile channels available on most GSM cellular telephones that make economic sense. The most used channel is Short Message Service (SMS) followed by Unstructured Supplementary Service Data (USSD). The use of Smartphone Applications shows an increase alongside the move to Smartphones (Deloitte, 2016; Pew Research Center, 2015). Voice services and the use of Interactive Voice Response (IVR), possibly due to the cost implications in South Africa, are implemented much less. Sensors may be considered emerging technology and could become increasingly relevant. No credible case of the use of Instant Messaging services, after the demise of MXit, has been recorded.

The large installed-user base associated with mobile cellular technologies in South Africa remains an attractive option, however, richer interaction that necessitates a higher-end Smartphone tends to be limited to institutionally funded users. In these cases, institutions would provide technology as well as pay for data access.

The above discussion highlighted some of the most relevant mHealth application trends and outlines the following:

- The application of mHealth initiatives are mostly financed through donor funding.
- No sustainable business model for mHealth initiatives, targeting a community need, was identified.
- Relevant advertising was identified as the most commonly used business model for community-based mHealth applications.
- Most of the mHealth applications were aimed at the general public or segments of the public (such as pregnant women).
- Most of the mHealth applications were educational information or aimed at some type of behavioural change.
- The health focus of these applications tended to address specific health issues that are aligned with the Millennium Development Goals (MDG).
- The use of basic phone capabilities is targeted to make maximum use of the existing mobile user base.
- South African mHealth applications mostly utilise SMS.

The following sub-subsection looks at some of the major mHealth application implementers.

8.2.3 Stakeholders in the South African mHealth implementation landscape

Out of all the mHealth initiatives identified, only approximately two-thirds were still active at time of this publication. The South African mHealth landscape is characterised by multiple small one-, two- or three-organisation collaborations that exist on donor funding and contribute significantly to the bulk of the mHealth implementation environment. Of significance is that there are six major implementing agencies that dominate the environment and have formed large collaborations. Local and national health departments are frequently involved in the larger implementations.

Some of the most prevalent mHealth stakeholder trends were found to be the following:

- Although there are many stakeholders responsible for mHealth implementations in the South African mHealth domain, there are only six major players that are responsible for the bulk of the implementations.
- Lessons learned and research-focused successes are seldom captured.
- Very little evidence was found of integration among mHealth implementations and most of the documented integration took place within a single collaboration.
- Evidence for community benefits remains anecdotal.

- Little or no information was available on where the data was stored that had been collected from individuals or generated through end-users' participation in initiatives, and what security and access control was facilitated.

The following paragraph looks at Innovation opportunities in mHealth in South Africa.

8.2.4 Strategic Innovation Opportunities in mHealth in South Africa

This section draws on the contextualisation of *mHealth* and *uHealth* as reviewed in Chapter 1 and furthers the continuum of personalisation of healthcare towards personal wellness.

The application of mobile devices and applications within the health space has extended the reach of government and healthcare institutions to individual and remote communities. The individual user of available healthcare services experiences this as personalised healthcare. The reality of connected devices and its use in health contexts, such as ambient-assisted living (Dohr, Modre-Osprian, Drobits, Hayn, & Schreier, 2010), is further facilitating the trend towards realising what is sometimes termed Ubiquitous Healthcare (uHealth). Brown and Adams (2007) define ubiquitous healthcare as an emerging field of technology that uses a large number of environmental and patient sensors, and actuators to monitor and improve patients' physical and mental condition, thus providing personalisation of health care. As it becomes possible to gather information on many physiological characteristics remotely, new opportunities and challenges arise around remote monitoring, diagnosing and preventative healthcare. Currently there is an exponential development and resultant patent registration of various censoring devices for screening and monitoring.

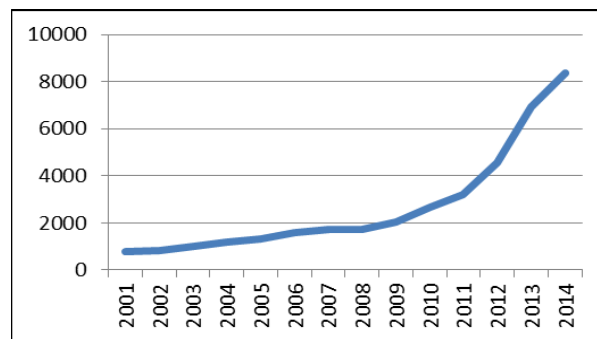


Figure 8-1: Patents filed for wearable computing per year (Koedderitzsch, Botha, & Herselman, 2016)

In addition, in South Africa, the high mobile phone penetration, the increase in the uptake of smartphones and a user base that is already using mobile channels for accessing health-related services and information (Deloitte, 2016; Pew Research Center, 2015), place the country in an ideal position for the adaption and creation of innovative solutions and services for a local market.

The CEO of MLab SA made the following statement in a press release: “Internationally the wearable medical device market, while relatively new, created over \$3billion in market value last year at a compound annual growth rate of 17.8% in the next 4 years. This is just one of the opportunities in mHealth & wellness which also includes data and analytical tools, virtual reality, robotics, apps, fashion and more, and it offers local innovators and start-ups a gap to become market leaders in a new economic sector” (Moyo, 2016).

8.3 Implementation environment of an mHealth & Wellness Innovation Ecosystem

To unlock the potential of mHealth and for it to contribute towards improved health equality in the South African context, specific localised challenges will need to be addressed. Success will require home-grown development of innovative solutions that are sensitive to the South African economic, social, cultural and organisational factors. It is for this reason we are arguing for the notion of an integrated mHealth & Wellness Innovation Ecosystem as opposed to the development of additional free-standing mobile applications and services. mHealth in South Africa is not only about improving the availability, access and delivery of healthcare services, but is also about enhancing the country’s strategic capabilities to create, adapt and implement novel mHealth solutions within, and by, the public and private sector, towards enhancing the country’s overall innovation capacity.

In this context, it is also about sharing our understanding of future possibilities in a systematic way. Platforms, technologies and solutions implemented today should also be mindful of and open to the needs of tomorrow.

A Digital Health Innovation Ecosystem in South Africa is conceptualised as being constituted of a multi-layered context incorporating the STEEPV (Miles, 2015) dimensions, and an Innovation Life Cycle as an Open Innovation process that provides opportunities for co-creation.

Building on the gained understanding of

- the mHealth landscape,
- the strategic innovation opportunities within the mHealth & Wellness space, and
- the conceptualisation of the Digital Innovation Ecosystem,

the mHealth & Wellness Innovation Ecosystem is an applied instantiation.

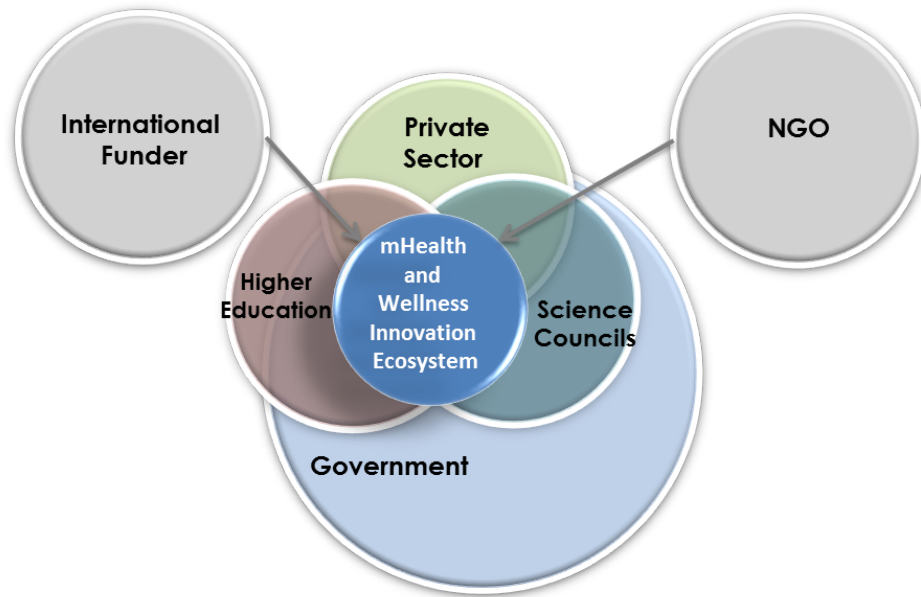


Figure 8-2: Positioning the mHealth and Innovation Ecosystem within the South African National System of Innovation

A successful *mHealth & Wellness Innovation Ecosystem for South Africa* will require (CSIR & VTT, 2015) the following:

- Local, South African development of relevant mHealth & Wellness solutions
- A self-directed innovation ecosystem
- An innovation ecosystem based on the common interest of all actors in a quadruple helix (government, industry, users or community and universities or research entities) (Salmelin, 2015)
- mHealth & Wellness solutions that are sensitive to local economic, social, cultural, and organisational factors
- mHealth & Wellness solutions that are adapted to augment the broader South African capabilities in mHealth & Wellness as part of digital health.

8.3.1 Context

The context builds on the typology of Social, Technological, Economic, Environmental, Political and Value-based issues (STEEPV) (Miles, 2015). For consideration are the political, legal, economic (monetary values of affordability), social, ethical and environmental components of the DHIE for South Africa.

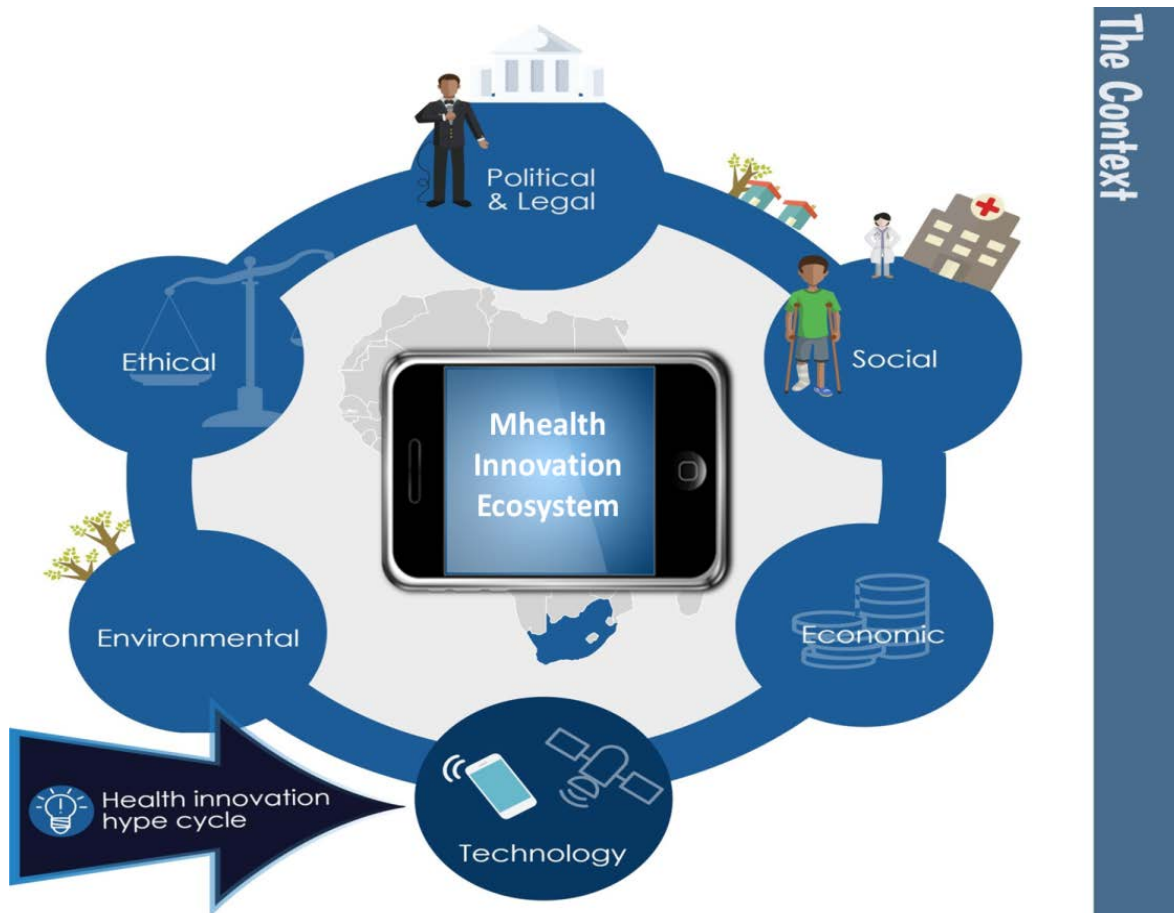


Figure 8-3: Context

These considerations were examined by means of a foresighting exercise to which industry, academia and practitioners were invited. The full findings are beyond the scope of this study and interested readers may contact the authors for more details.

8.3.2 *Innovation Life Cycle*

Various innovation models and innovation strategies exist which can support the creation of innovation ecosystems where academia, industry, students and other stakeholders are facilitated to co-create around new ideas and concepts that can stimulate socio-economic development. The Demola model (Demola, 2015) was evaluated and chosen to enable the mHealth & Wellness Innovation Ecosystem, as it has a proven track record of IPR generation and would link to a larger international innovation network. The Demola innovation model has, as an international network and through local Demola Centres, extended to 12 locations in nine countries with 50 local facilitators. The Demola Centres are integrated with 40 universities and over 250 degree programmes. Their network incorporates over 600 companies and has delivered a 70% global licencing rate (Demola, 2015; Demola Network,

2016). As such, the learning and implementing through local adaption would be an invaluable asset in the local innovation system.

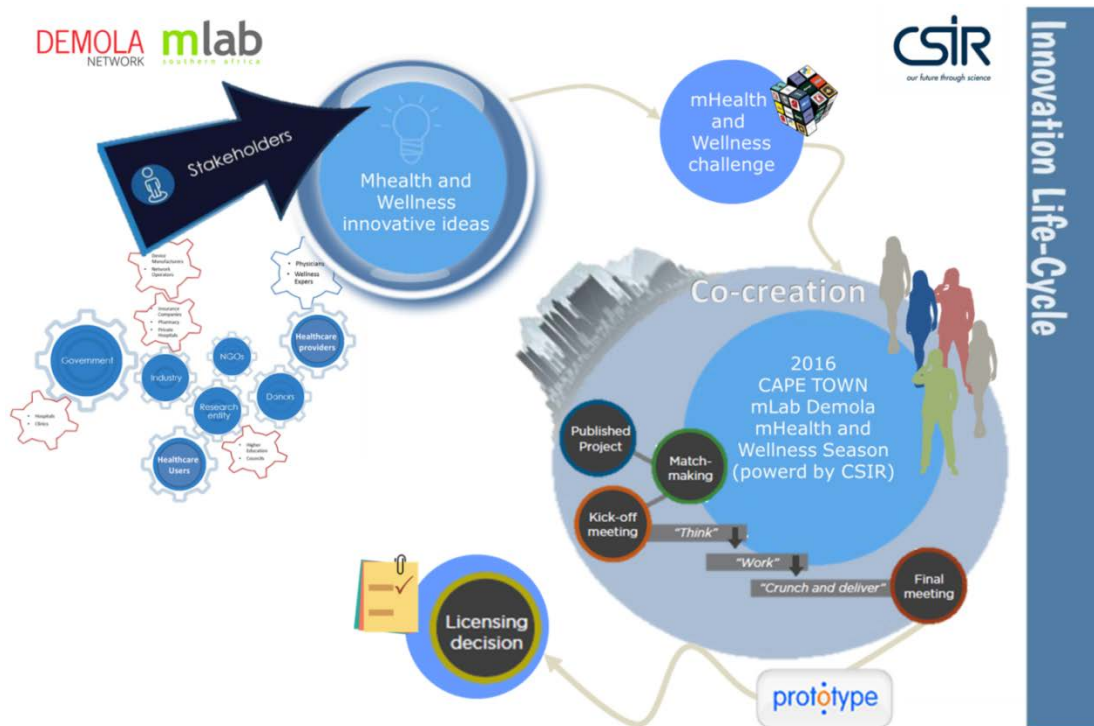


Figure 8-4: Innovation Life-Cycle based on the Demola Innovation Model

mLab South Africa was identified as an implementation partner as it had a substantial footprint in the mobile application development space. As a mobile solutions laboratory and start-up accelerator, mLabSA can provide entrepreneurs and mobile developers with the support they need to develop innovative mobile applications and services in this domain. Although mLabSA is based at the Innovation Hub in Tshwane, South Africa, they run virtual programs throughout southern Africa and have the capabilities and vision to expand to most major hubs in the region. The Demola innovation model would, once adapted to the local context, constitute an integral part of mLabSA’s offerings (Kotze, 2016).

The Demola innovation model originated in Finland and is underpinned by the idea of innovation as a process rather than an event. It provides an innovation mechanism where students from Higher Education Institutions (HEIs) are given opportunities to co-create with industry participants towards developing a real and relevant solution to an industry challenge. The Demola Innovation Models methodology (Einarson & Lundblad, 2014; Huhtamäki, Luotonen, Kairamo, Still, & Russell, 2013) would be implemented as an mHealth & Wellness Innovation season in Cape Town, South Africa, and it would be the start of an introduction and scaling of this model to the rest of South Africa and Africa.

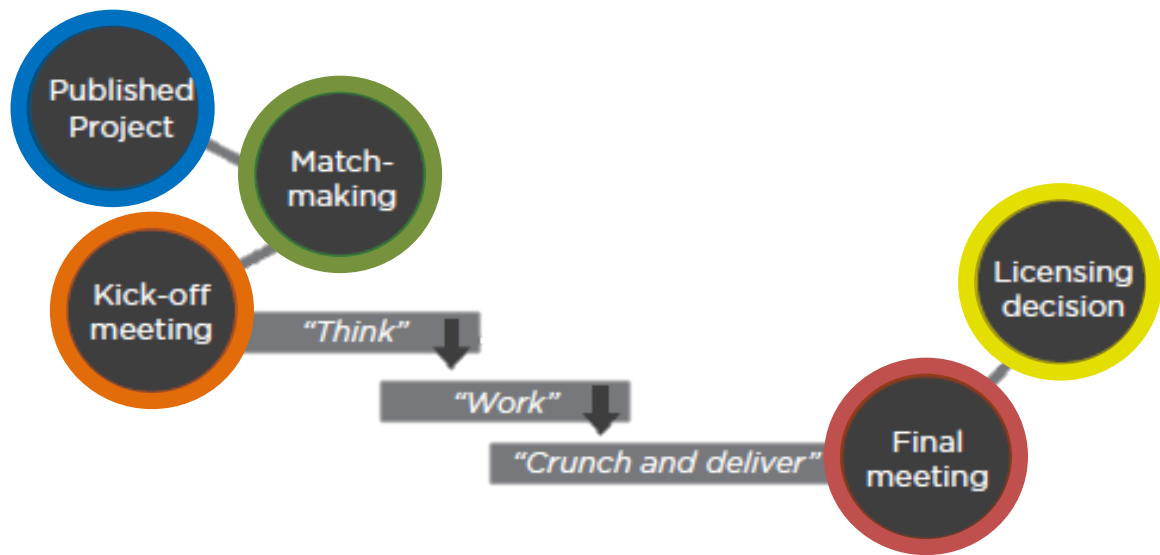


Figure 8-5: Demola Innovation Model envisaged to be applied in the Cape Town 2016 season (Adapted from Pippola, Poranen, Vuori, Kairamo, & Tuominiemi, 2012)

The first season reached out to all the Higher Education Institutions in the Western Cape, inviting them to participate. As illustrated in Figure 8-5, the Demola Innovation Model can be seen as an intentionally structured innovation methodology consisting of a number of interventions. These are outlined briefly below (Demola, 2015; Demola Network, 2016; Einarson & Lundblad, 2014; Huhtamäki et al., 2013; Pippola et al., 2012; Silven, 2016):

- *Publish Project*: Local and international organisations were identified and sourced to submit specific industry challenges or opportunities. These challenges were guided to optimise the innovation opportunities within the mHealth & Wellness space. The Demola Model can offer participating industry partners a number of benefits such as a cost-effective external validation of internally generated innovation, mutually beneficial collaboration with participating Higher Education Institutions and Innovation Spaces, a better visibility in local, regional and international Innovation Ecosystems and a pipeline for recruitment (Pippola et al., 2012)
- *Match Making*: Students applied to a specific challenge that they were interested in.
- *Kick-off meeting*: Participating organisations would agree upfront, as a condition of participation, to mentor and collaborate with students in their specific challenge. The interaction agreement is negotiated by the students and the industry partner, and it forms the basis of their future co-creation endeavours. The co-creation activities that follow are part of a structured innovation process that is facilitated by the Demola Innovation model.

- *Final Meeting:* After four months, students were expected to present and demonstrate the solutions to their challenge.
- *Licensing Decision:* If the participating industry collaborators consider the outcome meaningful and decide that it possibly warrants further development, they have the option to compensate the student team to secure either a shared licence or full licence to the intellectual created property. Should they decide that they are not interested in taking the concept outcome further, the students retain full IPR rights to their innovation and have the option to be absorbed within the next level of innovation support structures such as incubators and accelerators. As they already have a refined and validated IPR artefact, they could additionally apply for different streams of funding through mLabSA.

8.3.3 Users and Stakeholders

mHealth & Wellness users were considered to include the government, industry, NGOs, communities with specific needs, healthcare providers, healthcare users and individual users.



Figure 8-6: mHealth & Wellness users

These users were facilitated in the mHealth & Wellness innovation season through specific challenges that were posed and would focus on selected users relevant to the challenge.

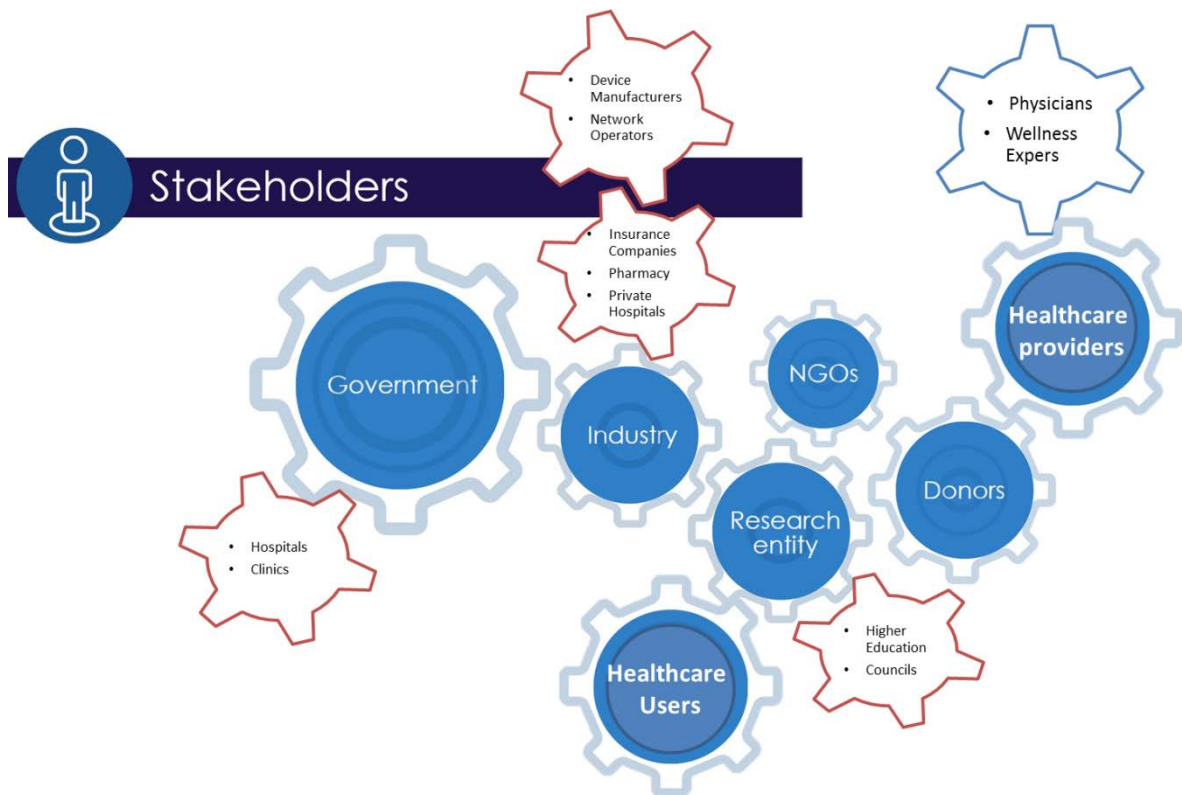


Figure 8-7: mHealth & Wellness stakeholders

8.4 mHealth & Wellness Innovation Ecosystem

A local mHealth & Wellness Innovation ecosystem was envisaged as promoting and developing efficient co-creation by applying the Demola innovation model’s methodology. The ecosystem is seen as instrumental in driving a culture change towards an open innovation culture and enhancing innovation competences both on individual and organisational level towards creating a digital advantage within specifically the Health Technology vertical and within the National System of Innovation in general.

This mHealth & Wellness ecosystem and innovation culture development would be facilitated through a hosted innovation season as an instantiation. The mHealth & Wellness ecosystem and innovation culture development programme, a collaboration between DST, CSIR and mLab Southern, was implemented during the first half of 2016 and identified the following objectives:

- Connecting Higher Education (HE), industry and innovation
- Stimulating collaboration and knowledge sharing among mHealth stakeholders
- Stimulating research opportunities with HEIs
- Stimulating innovation opportunities among HE students and staff, youth and start-up SMEs

- Initiating a change in the South African mHealth and innovation landscape to facilitate alternative pathways to value creation
- Exploring alternative innovation models to stimulate the National System of Innovation in South Africa
- Exploring innovative ways to co-create with SMEs, industry, NGOs, HEIs and entrepreneurs



Figure 8-8: mHealth & Wellness Innovation Ecosystem Initiative

Towards this end the *mHealth & Wellness Innovation Ecosystem Programme* embarked on the following **actions, activities and events to stimulate a resilient ecosystem** as outlined in Table 8-1.

Table 8-1: Actions, activities and events: *mHealth & Wellness Innovation Ecosystem Programme*

Action	Activity	Event	Description	Value	Output	Audience
Investing in local Human Capital Development	Knowledge transfer aimed at upskilling stakeholders on issues pertinent to the innovation and mHealth and Wellness space	Workshops	A workshop hosted to explore the existing provincial innovation and start-up ecosystem, its stakeholders, existing health initiatives and presenting on the CSIR and mLab strategy.	Unlocking the mHealth & Wellness Ecosystem in the Western Cape entailed an outreach to various stakeholders. This was done through a workshop that enabled networking opportunities. In addition, the stakeholders had the opportunity to declare their interest in participation.	Knowledge-sharing workshop conducted to advance Human Capital Development	Industry (Practitioner, SME, Start-ups, Entrepreneurs) Academia (HE) Innovators Participants included all local universities, WESGRO, Silicon Cape, Investors, Startups and representatives from Demola Networks
		Presentation	Presentation by Global Health Innovation Accelerator representing Path and MRC	Knowledge transfer with regard to innovation and innovation trends within the health context.	As part of the student preparation for DEMOLA, the mLab hosted a lecture on the innovation in health by the MRC.	Students, MRC and GHIA
		Presentation	Presentation on landscape overview and strategic innovation opportunities in the mHealth & Wellness space in SA	Knowledge transfer of stakeholder opportunities and strategic innovation opportunities in SA in the mHealth & Wellness domain	Peer-reviewed publication (Botha & Boo, 2016)	Academia, students and practitioners.

Action	Activity	Event	Description	Value	Output	Audience
		Presentation	Presentations to the HEI in Western Cape on collaboration and innovation opportunities	Knowledge sharing on how each HEI can participate, presenting the alternative innovation model and highlighting other opportunities within the Health Technology vertical	Participation of 3 HEI.	HEI innovation, researchers, academia and HEI management.
		Presentation and Discussion Panel	Unlocking the mHealth & Wellness Economy in South Africa – GovTech Presentation and Panel Discussion	Knowledge sharing on opportunities and challenges in the mHealth & Wellness Economy in South Africa. Value acknowledgement and validation of the potential for the ecosystem within the South African context	Participation in GovTech, presentation and panel discussion.	GovTech participants and stakeholders.
		Presentation	DEMOLA presentation to the Finnish Ministry Delegation on Innovation	Visit by the Ambassador of Finland, The Deputy Minister, Ministry counsellors, Tekes (Finnish Funding Agency)	Increased visibility of the innovation potential in South Africa	Ambassador of Finland, the Deputy Minister, Ministry counsellors, Tekes (Finnish Funding Agency)
		Workshop	Workshop on the landscape and strategic innovation opportunities	Knowledge sharing on how each HEI can participate,	Increased research interest in areas related to mHealth	Students and Staff of Rhodes University.

Action	Activity	Event	Description	Value	Output	Audience
			within the Health Technology vertical	presenting the alternative innovation model and highlighting other opportunities within the Health Technology vertical	& Wellness with two students publishing papers and one potential PhD.	
		Hackathon as innovation strategy	Youth driven mHealth & Wellness Challenge 1 - codeX Developer Graduation Hackathon	Expose participants to the domain Challenge them to innovate within the theme	Human Capital Development through the practical skills development of youths, their trainers and facilitators An opportunity to experiment and grow competencies in the mHealth & Wellness domain Report published	codeX Academy youth, trainers and facilitators. (CodeX is a youth skills development programme supported by mLab.)
		Hackathon as innovation strategy	Youth driven mHealth & Wellness Challenge 2 - Geekulcha Vacation Work Programme	Expose participants to the domain Challenge them to innovate within the theme	Human Capital Development through the practical skills development of youths, their trainers and facilitators An opportunity to experiment and grow	Geekulcha youth, trainers and facilitators (Geekulcha is an mLab-hosted youth engagement platform with the aim of increasing awareness and interest in ICT and

Action	Activity	Event	Description	Value	Output	Audience
					competencies in the mHealth & Wellness domain Report published	Science)
	Local capacity building and skills transfer	DEMOLA innovation methodology implementation in the mHealth & Wellness as training through the DEMOLA network	Training of facilitators (local SA youth)	Upskilling of local SA trainers to enable growth and scaling within the region	Trained youth for sustainability and future iterations	mLab, Youth participants
		DEMOLA innovation methodology implementation in the mHealth & Wellness space as training by previously trained facilitators.	Train-the-trainer	Upskilling of local SA trainers to enable growth and scaling within the region	Second generation of trained facilitators	mLab, Youth participants
		Industry Challenge Creation Workshops	mLab hosted a number of industry challenge-creation workshops	Knowledge transfer of opportunities in the health technology	MTN, Powerhouse, Innogy & Virgin Active challenges	Industry
		Campus Activations	Engaged with students on campus to promote the opportunities within the ecosystem and participation in the DEMOLA programme	Knowledge transfer of opportunities in the health technology	Students registering for participation	Youth, HEI

Action	Activity	Event	Description	Value	Output	Audience
		University Faculty Engagements	As part of the ecosystem stakeholder exploration the CSIR and mLab met with a number of university faculties.	While the intention is to institutionalise a culture of innovation within the Universities and have them participate actively, promote and contribute to the DEMOLA programme, the first season's focus was to share the programme goals and remove potential impediments for students wanting to participate	University Participation	HEI, Academia
		DEMOLA demo day	The finale presentation and demonstration of the 3-month innovation process	Opportunity for the student participants and partners to showcase their innovation demonstrations	Student and industry showcase co-created innovation	Internal and external stakeholders
Conducting research and development	Research dissemination	Conference Journal	Peer-reviewed evaluation and dissemination	HCD, knowledge contribution, creating a local conversation in South Africa	Journal articles, 4 conference papers and book	Academia
		Reporting to DST	Report	Reflection, knowledge dissemination	Report document	DST, MLab, CSIR
	Network building towards future	Finland Research visit	Visit DEMOLA Finland and make	Difference and similarities between the two countries'	Possible future collaboration	Academia, mLab

Action	Activity	Event	Description	Value	Output	Audience
	collaboration		comparisons with SA season	innovation spaces and processes	opportunities and economic participation	
	Knowledge creation	Experiences gained from first iteration	Reflecting on the experiences and lived realities of the first mHealth & Wellness innovation season in Cape Town	Towards adapting the Demola Methodology for a local context.	Revised season 2 implementation	DEMOLA Networks, MLab, HEI
	Adapt and design	Demola season in Cape Town	Adaptation of the DEMOLA methodology to South African and African conditions	Adoption, exploration and communication of the DEMOLA innovation methodology to local challenges and opportunities	Research report	DEMOLA networks into Africa The DEMOLA network stretches across 9 countries and 13 locations linking together over 40 universities and 600 company partners.
Stimulating the National System of Innovation	Implementation	Demola season in Cape Town	Implementation of mHealth and Wellness ecosystem and innovation culture development programme	Exaptation of the DEMOLA innovation process as a specific innovation initiative aimed at products and services in the mHealth & Wellness space, operationalised as the mHealth & Wellness	Five cases with HEI and Industry collaborating Two IP registrations	Industry: MTN Group, Innogy and Powerhouse

Action	Activity	Event	Description	Value	Output	Audience
				ecosystem and innovation culture development programme		
	Licensing and deployment of solutions	Industry partner evaluations are currently under way and will determine the licensing rate of the first season	The mHealth & Wellness project team that completed the season and demonstrated their solution is now being assisted with establishing a new enterprise that will allow them to further develop and commercialise their IP	mHealth & Wellness project team will be joining the mLab accelerator programme and be offered additional support	Startup, Licencing	HEI, NSI, mLab, CSIR
	reHealthAfrica launch	The official launch of the reHealthAfrica brand coincided with the DEMOLA demo day	The official launch of the reHealthAfrica brand coincided with the DEMOLA demo day	Official switch from the programme messaging to an independent, multi-partner brand and community.	ReHealthAfrica as a brand	Stakeholders
Industry and HEI co-creation	Collaboration and network building	Industry network building	Link with national and international industries to establish relevant mHealth challenges	Innovation culture development	Established links with industry and inclusion in ecosystem as open innovation partner	National and International industry
		HEI network building	Institutionalising innovation at local tertiary institutions	Innovation culture development	Established links with HEI and inclusion in ecosystem as open innovation partner	HEI in South Africa

Action	Activity	Event	Description	Value	Output	Audience
		Formation of multidisciplinary teams that will collaborate and co-create with industry	Link university students and other youth innovators to form Multidisciplinary teams that will collaborate and co-create with industry	Innovation culture development	Network formation and inclusion in ecosystem as open innovation participants	HEI, Youth, Industry
		Co-creation endeavours with industry partners around mHealth innovation challenges	Manage the co-creation endeavours with industry partners around mHealth innovation challenges	During the challenge creation workshops, two distinct groups were identified: i) Technology Industry Partners who, while interested in expanding services and products to this sector, do not have the disciplines internally to identify the opportunities and challenges ii) Health and Wellness Industry Partners who, while identifying many challenges that require solving, could not understand or struggled to accept that mobile technologies could resolve	mLab challenges and upskilling	Industry, HEI, mLab

Action	Activity	Event	Description	Value	Output	Audience
				or contribute to a relevant solution		
		DEMOLA Lean Innovation Season	Co-creation within an innovation initiative	The season was implemented over three months with students participating in a number of facilitated partner engagements and team work activities. These included weekends at the mLab facilities. The sessions were facilitated by mLab and the CSIR was present to assist co-creation teams and evaluate the DEMOLA processes.	Co-creation IP, Networking, positioning for season 2 and scaling	HEI, Industry, Demola Networks

The Mhealth & wellness ecosystem as the implementation instantiation of the South African Digital Health Innovation Ecosystem delivered a theory of action and theory of change (Rogers, 2008) based on the following principles:

Table 8-2: Theory of action and theory of change principles applied (Rogers, 2008)

Theory of change	1. Situation analysis: Identifying the problems, causes, opportunities and consequences.	2. Focusing and scoping, setting the boundaries of the programme.	3. Outcomes chain that links the theory of change and the theory of action.
Theory of action	4. The desired attributes of intended outcomes as well as consideration of unintended outcomes.	5. Programme aspects and external factors that affect outcomes.	6. Programme actions to address the key factors of the programme: internal and external.

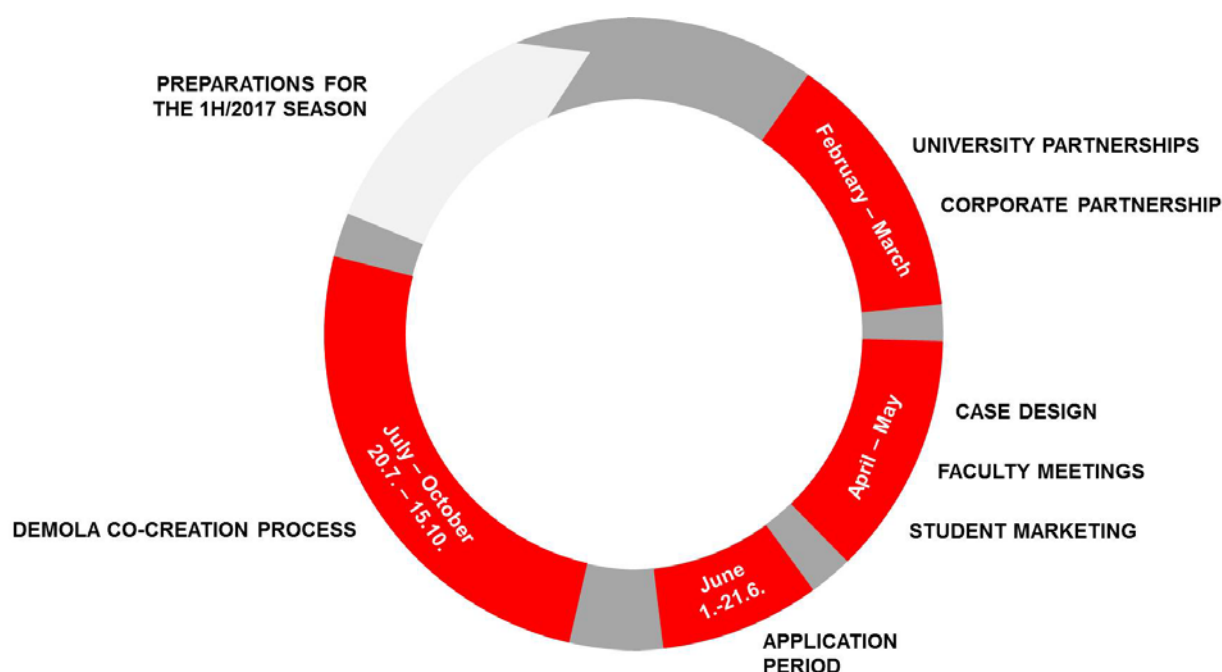


Figure 8-9: Timeline for the mHealth & Wellness Innovation Ecosystem Programme season 1

Table 8-3: Theory of action for the mHealth & Wellness Innovation Ecosystem Programme

Theory of change:	Evidence from this project
Situation analysis: Identify problems, causes, opportunities and consequences	<p>Problem: The MHealth & Wellness innovation space is currently not visibly active in South Africa. Therefore, it is necessary to stimulate, establish and grow a local mHealth & Wellness innovation ecosystem. This ecosystem should enable greater human capital and economic development within South Africa and create a Digital Advantage within the Health Technology vertical.</p> <p>Cause: mHealth is perceived to have a huge potential for benefiting the health service delivery processes, especially in resource-constrained environments. It has developed to incorporate a wide range of mHealth applications to service the health system and end-user information</p>

Theory of change:	Evidence from this project
	<p>needs. An emerging consumer demand is evident when one considers the 700% increase over one year with approximately 6 million smartwatches and fitness trackers reportedly skipped in the first half of 2014. A survey has found that 64% of global internet users reportedly have worn a piece of wearable technology. Amazon, in addition, supports close to 9000 distinct wearable technologies ranging from \$100- \$500 and this number is set to increase as the technology matures and the form function speaks to consumer tastes (Mobiquity, 2014). South Africa’s share in this market, set to expand to \$ 31.27 billion by 2020 with a compound annual growth rate of 17.8% in the next four years, is not established.</p> <p>Consequences: The strategic innovation opportunities within the mHealth & Wellness space, South Africa’s large installed-user base of mobile users, and the dearth of South African innovations in this domain provide a fertile setting towards stimulating a mHealth & Wellness Innovation Ecosystem.</p> <p>Problem: Innovation mechanisms like hackathons, boat camps and code sprints have failed to develop IP and stimulate the NSI, or to produce products beyond the intervention. Most resulting innovations are never registered or patented. Despite the investment, the effect of these innovation mechanisms seldom extends beyond HCD.</p> <p>Cause: The National System of Innovation in SA is not strengthened if investment in innovation fails to deliver new or improved products and services to the market (Department of Science and Technology, 2002, p. 19).</p> <p>Consequences: Evaluating, selecting and validating a specific innovation methodology to support the initial aims were considered essential. An implemented innovation methodology would need to be instrumental in driving a culture change towards an open innovation culture and enhancing innovation competences – both on an individual and organisational level – towards creating a digital advantage within the Health Technology vertical specifically, and within the National System of Innovation in general.</p> <p>Problem: Academia and industry exhibited limited evidence of an Open Innovation culture.</p> <p>Causes: There is a limited understanding of Open Innovation as an alternative innovation culture.</p> <p>Consequences: Getting South African-based industry companies as well as academic institutions involved to commit their students to the innovation season in Cape Town was challenging, as no local success could be showcased. The experience was that academia wanted to own</p>

Theory of change:	Evidence from this project
	the innovation idea and were reluctant to commit though institutional involvement. The fees-must-fall campaign put pressure on student participation and created challenges around participation. The economic reality of many of the students made transport without institutional support a barrier to participation and had to be mitigated.
Scoping Boundaries of project	The development of the <i>mHealth & Wellness Innovation Ecosystem</i> was influenced by innovation through a specific innovation model's methodology (DEMOLA) and only Finnish and Estonian models of successful innovations were applied. The implementation and adaptation of the DEMOLA model allowed SA to contextualise the methodology based on the specific local context and lessons were learnt. Initially two DEMOLA seasons are planned to take place until end March 2017, with the second season scaling to additional provinces.
Outcomes chain	<p>Immediate outcomes:</p> <ul style="list-style-type: none"> • Localising a digital health innovation ecosystem based on contexts • Refining the view of mHealth & Wellness Innovation Ecosystems • Connecting Higher Education in one province with industry and innovation • Stimulating collaboration with mHealth stakeholders • Stimulating localised collaboration with mHealth stakeholders • Stimulating localised interest among higher education students • A number of companies move from consumers to become co-creators • Designing and optimising value addition and various corporate interactions between industries and academia • From corporates owning resources to creating various platforms of collaborations • One mHealth Innovation season in one province of SA where HEIs, industry and students co-create novel mHealth innovations <p>Long-term outcomes:</p> <ul style="list-style-type: none"> • Identifying mHealth implementation for public health and wellness stakeholders • Involving mHealth implementation stakeholders in future strategy planning and decision making • NDoH improved decision-making and policy decisions based on mHealth interventions and success • More sustainable local mHealth & Wellness applications and innovations • Assisting other African countries in developing their own localised digital health innovation ecosystems • Connecting Higher Education Institutions in SA with national and international industries and innovation opportunities • Stimulating the economy of South Africa through mobile innovations • Changing the landscape of value-creation enablers (theway industry and HEI talk to each other with RoI)

Theory of change:	Evidence from this project
	<ul style="list-style-type: none"> • Multiple innovation seasons in various domains (apart from mHealth) • Replicating lessons learnt to Africa through identified funding instruments

Table 8-4: Theory of action and theory of change for the mHealth & Wellness Innovation Ecosystem Programme

Theory of action	Evidence from this project
Attributes of intended outcomes	<p>An innovation is only as viable as the Innovation Ecosystem in which it is conceived and developed.</p> <p>Innovation through co-creation can be facilitated through a structured methodology.</p> <p>Involve all mHealth and innovation stakeholders (Quadruple helix – government, industry, academia and community) in the co-creation of innovation to stimulate the SA NSI</p> <p>Use evidence of the first Demola season in Cape Town as marketing tool to market upcoming or later Demola seasons in other provinces in SA.</p> <p>Use a contextualised and adapted SA Demola model</p>
External and internal factors of risk	Risks were identified through the application of a SWOT analysis, brainstorming exercise and a STEEPV analysis. The risk factors are political, economic, social, technological, environment and legal factors
Action to do risk mitigation	For each risk the risk mitigation was done (which is beyond the scope of this chapter)

Parallel to the implementation of the DEMOLA programme, the CSIR and mLab continued with the evolution and analysis of the local mHealth & Wellness ecosystem which led to the creation of the reHealthAfrica brand.



Figure 8-5: reHealthAfrica (2016)

The brand was launched on an integrated digital and social media framework consisting of the www.reHealthAfrica.com domain and content creation extensions on Twitter, Instagram, Facebook, LinkedIn and Stroyfy. This represented the first phase of the brand implementation. reHealthAfrica (2016) is about *reEngineering, reThinking, reImagining* and doubling efforts to unlock the potential of mHealth and medTech. It strives to unlock a future of personalised, participatory and inclusive healthcare for all the citizens of Africa. As a community of innovators, researchers, technologists, entrepreneurs and designers it will endeavour to establish a vibrant mHealth & Wellness Innovation Ecosystem that will be the foundation of and provide the support for fledgling innovatiotive ideas.

8.5 Way Forward

A second season is planned that will scale the mHealth and mHealth & Wellness Ecosystem and Innovation Culture Development Programme to additional locations using the DEMOLA model and adapted DEMOLA methodology. This further implementation will extend beyond the mHealth & Wellness Innovation Ecosystem to explore innovation ecosystems in other domains. The notion of an innovation culture will be further examined by developing a Lean Open Innovation Culture Toolkit which will comprise of the following elements:

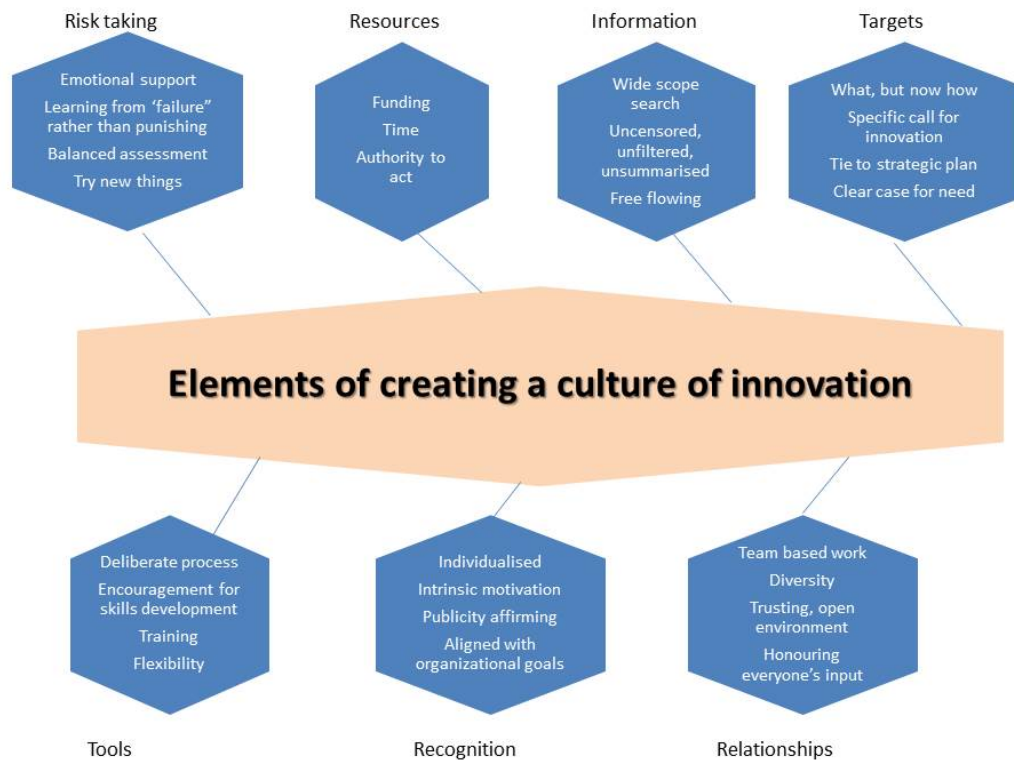


Figure 8-11: Elements of a culture of innovation (Adapted from MedStar Institute for Innovation, 2016)

The elements of the above culture of innovation consist mainly of tools, recognition, relationships, risk taking, resources, information and targets. The detail of each can be found above.

Expanding the partnership base of reHealthAfrica by securing both industry partners and challenges for the second season of DEMOLA will be actioned and a membership programme will be established for the reHealthAfrica community. The digital assets of the reHealthAfrica brand will be optimised by improving the social media and digital framework to better represent and promote the interests of stakeholders. reHealthAfrica envisages to help establish a vibrant community to unlock the potential of mHealth & Wellness in South Africa through innovation and entrepreneurship. The creation of a public lab for innovators that will lower the barrier of access to technology is planned as part of this endeavour. reHealthAfrica will further provide a systemic, localised approach to innovation, using adapted innovation methodologies within the national system of innovation. reHealthAfrica is committed to empowering the African and in particular the South African youth in partnership with local and international industry, and through co-creation opportunities towards building a resilient mHealth & Wellness Innovation Ecosystem in South Africa. It also allows for the opportunity to test the methodology in Africa and to compare results and share best practices.

In conclusion, it is evident that transferring European solutions, methodologies and models to South Africa is not feasible. The experience and knowledge of co-creating with users and of industry identifying the beneficiaries of digital health systems, or the adaptation of the cost structure of solutions, would probably be the traditional focus areas when considering the value of European examples for South Africa. The failure to appreciate the local context and user needs is a typical mistake that is made when solutions are transferred from Europe to Africa. Learning from other countries at the system level requires that attention be paid to how the emerging South African digital health system is adapted to, integrated and coordinated with South Africa's National Innovation System.

Strengthening the South Africa's National Innovation System can only be realised once implementation takes place and lessons are learnt to develop best practices. Hopefully these can be articulated into making policy recommendations that can be incorporated to refine the national eHealth and mHealth strategies. Therefore the development of a new concept known as *Ecovation* is the result of an ecosystem where various stakeholders can co-create new innovations within their own contexts. The end goal of any health-related innovation should always be to support, improve and influence the quality of life of ordinary citizens in this country.

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The background is a gradient of blue, from a lighter shade at the top to a darker shade at the bottom. It features a complex pattern of white and light blue lines and shapes that resemble a circuit board or a network diagram. There are several circular elements, some solid and some outlined, scattered throughout. The overall aesthetic is clean, modern, and technological.

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