



# Digitalising Nepal's health sector

A country's journey towards an interoperable digital health ecosystem

A publication in the German Health Practice Collection

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## GERMAN HEALTH PRACTICE COLLECTION

### ***Working together to generate and share learning***

The German Health Practice Collection (GHPC) is a joint initiative of the German Federal Ministry for Economic Cooperation and Development (BMZ) and its implementing agencies, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and KfW Development Bank (KfW), which are known collectively as German Development Cooperation. Since 2004 the Collection has involved experts working in German-supported health and social protection programmes in a collaborative knowledge management process, seeking to identify, document and share knowledge generated during the implementation of programmes around the globe.

### ***From 'good practice' to learning from implementation***

In 2015 the Collection shifted its emphasis from trying to capture 'good practice' towards generating new knowledge about the delivery of development interventions. Guided by 2-3 key questions, each case study in the Collection analyses how German programmes and their partner institutions have approached a specific development challenge, how they dealt with difficulties and adapted their approaches accordingly, and what they learned in the process about effective implementation.

### ***Creating ownership through a collaborative process***

Since its establishment more than a decade ago, the Collection has helped to catalyse a vibrant community of practice among health and social protection experts through its inclusive and participatory selection and production process.

Every one or two years GIZ and KfW staff from around the world are invited to submit and jointly discuss proposals for experiences they believe should be documented in detail. Through their active participation in the selection process, they help to turn the Collection into a co-creation whose case studies reflect issues and themes which the community regards as worthwhile.

Guided by this assessment of the proposals' merits, BMZ decides which proposals will be documented. Professional writers are contracted to develop the case studies in cooperation with programme staff and their partner institutions. Prior to publication, independent peer reviewers who are international experts in their fields review the case studies and comment upon the new insights which have been generated.

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## Acronyms and abbreviations

ADB	Asian Development Bank
AeHIN	Asia eHealth Information Network
API	Application Programme Interface
BMZ	Federal Ministry for Economic Cooperation and Development, Germany
DFID	Department for International Development
DHIS2	District Health Information Systems Software
EHR	Electronic Health Records
EWARS	Early Warning and Reporting System
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GPS	Global Positioning System
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (now GIZ)
HISP	Health Information Systems Program
HMIS	Health Management Information System
ICT	Information and Communication Technology
IT	Information Technology
KfW	KfW Development Bank
KOICA	Korea International Cooperation Agency
LMIS	Logistics Management Information System
MoHP	Ministry of Health and Population
OpenELIS	Open Enterprise Laboratory Information System
OpenERP	Open Enterprise Resource Planning
OpenHIE	Open Health Information Exchange
OpenIMIS	Open Insurance Management Information System
OpenMRS	Open Medical Records System
PHAMED	Public Health Administration, Monitoring and Evaluation Division
PLAMAHS	Planning and Management Assets in Health Services
S2HSP	Support to the Health Sector Programme
SDC	Swiss Development Cooperation
SDG	Sustainable Development Goal
SMS	Short Message Service (or text)
UBR	Unified Beneficiary Registry
UHC	Universal Health Coverage
WHO	World Health Organization

# Executive Summary



## BOX 1. KEY LEARNINGS

The Government of Nepal has made remarkable progress on its journey towards the creation of an interoperable digital health ecosystem, and is at a pivotal moment in its digital health development. The Nepali-German Health Programme acts as an effective catalyst in several important ways: bringing together the many digital health processes and initiatives into a coherent and integrated programme; building consensus among Nepal's digital health stakeholders; and working towards the delivery of a more harmonised and aligned digital approach in the health sector.

Analysis of key learnings from bilateral cooperation on digital health in Nepal has highlighted the following as drivers of progress and national ownership in digital health development:

**An overarching vision for a digital health ecosystem.** Such a vision is essential for developing a national digital health strategy and guiding its implementation. In Nepal, the introduction of the OpenHIE framework has helped to articulate this vision, which is set out in key policy and strategy documents such as Nepal's National e-Health Strategy (2017).

**The development of digital capacities, knowledge and understanding among key health sector stakeholders.** A combination of high-level and timely advocacy, strategic and technical advice, mentoring and coaching, and the facilitation of peer-to-peer learning have proved effective at enabling government stakeholders to take the lead in Nepal's digital health development, becoming strong advocates for the potential of digitalisation to empower decision-makers and to drive health reform.

**Taking a systems approach to digitalisation in the health sector.** The Nepali-German Health Programme works with partners to identify health system challenges that can be addressed through the intelligent adoption of open-source digital technologies, and supports their introduction and scale-up. The systems approach is iterative and places a high value on reflection, ensuring learning is continually incorporated into strategies and plans.

This case study documents Nepal's journey towards the achievement of an interoperable digital health ecosystem. It aims to highlight how digitalisation is strengthening Nepal's health system and enabling health sector reform, and to provide insights based on Germany's support for digitalisation in Nepal that are relevant for health sector

managers and decision-makers, as well as development partners supporting digital health in other low- and lower middle-income countries.

## THE CHALLENGE

Rising IT literacy and digital capacities, digital infrastructure investments, and the prioritisation of digital solutions by the government and its partners have combined to create a dynamic digital environment in Nepal. Digital health initiatives have proliferated over the past decade and now support multiple aspects of health system functioning and service delivery, from health service data and human resources for health to health financing and quality of care. However, many of these applications were developed without considering the need, or indeed the potential, for exchanging data. The resulting difficulties in aggregating data, and in creating synergies between different digital systems, pose a barrier to realising the potential of digital technologies to strengthen health systems and provide better health care.

## THE RESPONSE

The German Development Cooperation approach to digitalisation in Nepal's health sector builds on long experience of supporting policy development and health systems strengthening in Nepal, and insights gained from supporting the development of digital health systems in other countries. The Nepali-German Health Programme demonstrates how digitalisation can strengthen health systems and accelerate health sector reform in Nepal, through:

- optimising and strengthening existing digital systems and supporting the introduction of better digital techniques. For example, through support for the roll-out of electronic reporting using the DHIS2 platform and the introduction of Electronic Health Records (EHR).
- working with government partners to demonstrate that open-source, interoperable digital solutions can operate at scale. For example, through support to the national scale-up of the digital social health protection management system OpenIMIS, and the Planning and Management Assets in Health Services (PLAHMAS) software for managing the maintenance and repair of hospital equipment.
- developing digital capacities among key health sector stakeholders at all levels of the health system, while using expert judgment as to when and how to provide this support based on long experience of health systems strengthening and digital capacity building across many countries. This is enabling a sustainable approach to digital health development in Nepal that is government-owned and -led.

## WHAT HAS BEEN ACHIEVED

With support from Germany and other development partners, strong foundations have been laid for the continuous adoption of digital technologies in Nepal's health sector, with the Government of Nepal firmly in the driving seat.

The National e-Health Strategy (2017) sets out an **overarching vision for an interoperable digital health ecosystem**, and investments in the digital infrastructure are facilitating the scale-up of interoperable digital solutions, and underpinning a steep rise in IT literacy. Ministry of Health and Population officials are now talking the **'language of interoperability'** and are actively participating in broader government initiatives to strengthen 'digital Nepal', including the formulation of digital governance and regulatory frameworks.

Digitalisation in Nepal's health sector is leading to **greater transparency and accountability** and **empowering decision-makers**. The provision of reliable, timely data and development of digital capacities is enabling new insights and analytical possibilities, strengthening the role of the government as policy-maker and steward of the health sector. This is particularly important in the context of Nepal's federalisation, where responsibilities for budgeting and planning health service delivery are being devolved to the local level.

The **Government of Nepal is allocating its own budget** to the national scale-up of several interoperable digital health initiatives, including the digital health information management system DHIS2 (electronic or e-reporting), and the IMIS digital software platform for managing Nepal's social health insurance. In the context of limited resources, this is an important indicator of success. Furthermore, Nepal is unique in implementing an open-source software for managing national social health protection programmes (OpenIMIS): The country's contributions to the development of this software through the OpenIMIS global community will benefit social protection programme implementers everywhere.

The Nepali-German Health Programme is **continuously pushing the boundaries of interoperability**. The introduction and linking of interoperable digital health initiatives at Trishuli Hospital is demonstrating how digital solutions can strengthen hospital management, and has led directly to a commitment by the Ministry of Health and Population to introduce a new post of (non-clinical) hospital manager in all public hospitals with a capacity of 50 or more beds, aptly showing how interoperable digital solutions can drive health system reforms. With financing from the Global Fund, the Nepali-German programme team is setting up an Interoperability Lab, which will demonstrate how digital technologies can be deployed to solve larger and more complex health challenges, bringing data from different systems seamlessly together to help decision-makers see the bigger picture.

These milestones are critical to development of a sustainable approach to digital health and have helped to place interoperability centre-stage in Nepal.

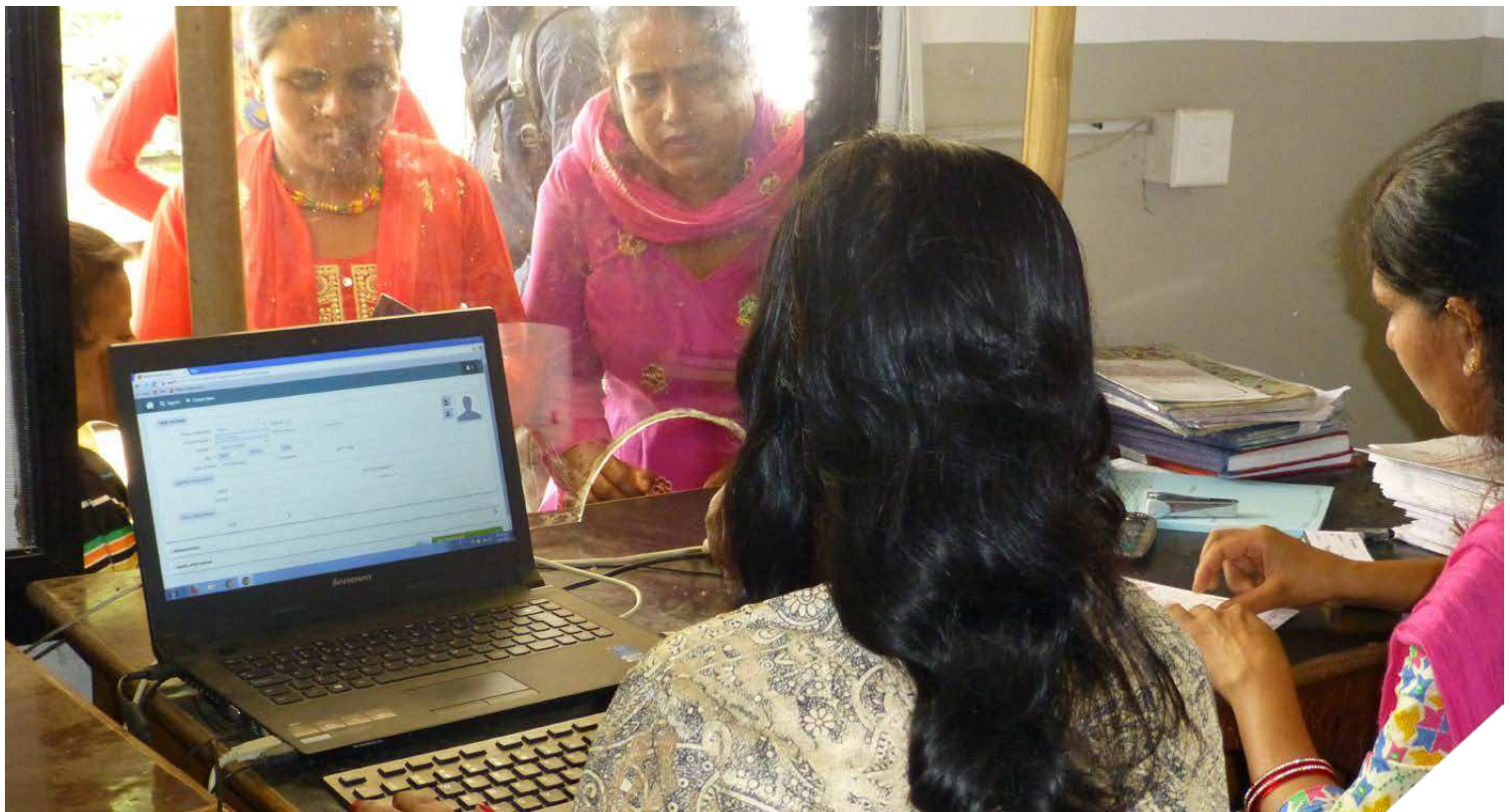
# Why focus on digital health?

It is mid-morning on a hot and humid day in Bidur Municipality, some 60 km north-west of Kathmandu. Trishuli Hospital consists of several buildings in various states of repair, including a single-story prefabricated structure financed by the German government which houses the essential hospital departments of patient registration, emergency care, maternity and in-patients. This building provides a temporary solution while the hospital, which was badly damaged in the earthquake of 2015, is being rebuilt.

Outside a busy municipal hospital, you would expect to see a queue of people waiting during the morning consultation period. But at Trishuli, where a hospital-wide Electronic Health Records (EHR) system is being progressively rolled out, only a few people are waiting to register. Inside, instead of the large registration books where patients' details are painstakingly entered by hand – a common feature of

hospital departments across low- and lower middle-income countries – two registration clerks are quietly and efficiently registering patients with the aid of a laptop and a digital label printer. In a matter of minutes, each client is registered in the electronic system, pays a small fee of 20 Nepali Rupees (less than USD 0,20) and receives his or her hospital card. Once registered, a patient's details can be retrieved by different hospital departments at any time.

EHR systems drive improvements in the effectiveness and quality of care provided to patients. They provide real-time data on almost any aspect of hospital care, be it the number and type of consultations, the fees billed by departments, or the drugs coming into and out of the pharmacy. This not only ensures that individual patients receive more integrated care, it also helps hospital managers to plan and budget more effectively, for instance by



→ Patients are registered into the EHR at Trishuli Hospital, Bidur Municipality, using a laptop and label printer.

predicting seasonal outbreaks of disease, which in turn informs staffing schedules and the demand for specific drugs and commodities. In addition to improving the quality and availability of data, EHR systems enhance transparency and accountability, both internally between particular departments and responsible staff members, and externally between the hospitals, the agencies which finance them and the ministries of health which govern them.

Establishing the new electronic health records system at Trishuli Hospital is an initiative of the Nepali-German 'Support to the Health Sector Programme' (S2HSP). The programme is financed by the German government, with co-financing from the Korea International Cooperation Agency (KOICA) and the Global Fund to Fight AIDS, Tuberculosis and Malaria (the Global Fund), and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of Germany's Federal Ministry for Economic Cooperation and Development (BMZ). The EHR is just one element of a broad programme of GIZ's technical assistance to strengthen the Nepali health system through the creation of an interoperable digital health ecosystem (see Box 2), and the development of the digital capacities of the individuals working within it.

## DIGITAL HEALTH AND THE SDGs

Digital technologies are transformative and empowering – they are a means to an end rather than an end in themselves. As affirmed by BMZ's *Digital Agenda* (BMZ 2017), digitalisation has the potential to accelerate the attainment of all 17 of the Sustainable Development Goals (SDGs) by providing more and more people with access to information, knowledge and education, and with the technical means to engage in political processes and decision-making. It also fuels innovation.

The availability of high-quality, timely and reliable data is essential for strengthening the management of complex health systems, for the effective and efficient delivery of health services, and for identifying those in need of healthcare and social protection. As formalised by SDG 17, good quality data are crucial for making, as well as measuring, progress across the SDGs, both strengthening the means of implementation and revitalising global partnerships for sustainable development.

Investing in digital health and enhancing the use of enabling digital technologies in the health and social protection sectors strongly support efforts to achieve Universal Health Coverage (UHC), helping to ensure healthy lives and promote well-being for all (SDG 3). Yet, when it comes to helping countries to realise this potential, what are the challenges and opportunities for international development cooperation?

## DIGITALISATION CHALLENGES AND OPPORTUNITIES FOR LOW-INCOME COUNTRIES

Despite limited success to date in sustaining and scaling up digital health interventions in low-resource settings, some experts now see digitalisation as an opportunity for countries such as Nepal to 'leap-frog' many of the development steps that more established health systems have undergone (e.g. Clifford, 2016; Free et al., 2013).

However, this opportunity carries with it a considerable risk of fragmentation when – as is often the case – multiple projects and development partners promote the use of separate information systems that cannot share or exchange data. High levels of fragmentation lead to duplication of efforts and pose a barrier to evidence-based decision-making, and ultimately to better healthcare.

### BOX 2. KEY TERMS

**Digital or e-health** is the cost-effective and secure use of information and communication technologies (ICT), including mobile technologies, that makes the flow of information and process management more effective, thereby strengthening the delivery of health services and the management of health systems in support of health sector goals.

e-Health applies digital technologies in support of health and health-related fields (including healthcare services, health financing, health surveillance, health literature, and health education, knowledge and research) and can be used to demonstrate what has been achieved and at what cost (WHO, 2016; WHO, 2006; WHO-ITU, 2012).

**Interoperability** describes the extent to which different information technology systems and software applications are able to communicate, exchange data, and use the information that has been exchanged (<https://www.himms.org>). This is particularly important in digital health, given the inherent complexity of health systems.

The term **digital health ecosystem** refers to the holistic application of information and communications technologies to support and improve healthcare delivery, coordination and integration across providers in a given domain (local, district, national, regional) (BMZ/Stroetmann, 2018).

The experience of introducing digitalisation into the management systems at Trishuli Hospital shows that things can be done differently. From the outset, the EHR was conceived as part of Nepal's emerging digital health ecosystem, ensuring its interoperability and integration with other digital initiatives as they come on stream such as, for example, the digital social health insurance platform and the Health Management Information System (HMIS) (see chapter 'The Approach: Towards a digital health ecosystem in Nepal'). And the example of Trishuli is not an exception: In line with the strategic guidance provided by GIZ and KfW<sup>1</sup> advisors, Nepal's government has made a strong commitment to developing an interoperable digital health architecture and is successfully working towards its realisation.

Having initiated support to digital health in 2011, German Development Cooperation has rapidly become one of the Government of Nepal's principal 'digital' partners, contributing extensive experience in health systems strengthening and capacity development for the emergence of an integrated and interoperable digital health ecosystem for Nepal.

## ABOUT THIS STUDY

In accordance with this Collection's focus on learning from implementation, this case study was prepared through a process of critical reflection together with the technical advisors and Nepali partners collaborating on the Nepali-German Health Programme. Two questions guided the study:

- How can digitalisation contribute to strengthening a country's overall health system?
- And how can German Development Cooperation support its partners in digitalising their health management and information systems in an integrated and sustainable fashion?

Starting in April 2018, a GHPC researcher-writer studied the relevant literature on digitalisation and digital health and then travelled to Nepal to get a first-hand impression of the range of digital developments being supported by German Development Cooperation in the health and social sectors. She interviewed a range of key informants, including current and former programme staff and consultants, development partners, representatives of the MoHP, and front-line healthcare providers.

Based on the findings from this research, the following two chapters look at Germany's contribution to digitalisation in global health and at the context for digitalisation in Nepal's health sector. The fourth chapter describes in detail how Germany is supporting Nepal in the development of a more interoperable and integrated digital health ecosystem, and the fifth presents insights generated from this work which could be relevant for stakeholders in other countries. The study wraps up with a peer review by two independent experts in the domain of digital health.

<sup>1</sup> KfW Entwicklungsbank is the implementing agency for German Financial Cooperation.



# Digitalisation and global health: Germany's contribution

Wherever we are, information and communication technologies influence almost every aspect of our lives, having a profound impact on our well-being and on the economies in which we live and work. In the health sector, information technologies are changing the ways in which care is both delivered and accessed, and are at the heart of responsive and resilient health systems.

In order to situate the learnings from Nepal within the global context for digital health, this chapter traces the history of digital health interventions, exploring uneven utilisation of digital technologies and the opportunities they provide among countries with different socio-economic profiles. It describes relevant global and regional collaborative efforts that enable learning and sharing of digital best practices, highlighting the participation and support of German Development Cooperation.

## A BRIEF HISTORY OF DIGITAL HEALTH

The history of the application of modern ICTs to health-care is a relatively recent one, starting at the end of the 20th century (Eysenbach, 2001). Early digital health initiatives digitised simple processes such as those used in accounting and reporting, and introduced efficiencies through improved access to more accurate, complete and timely data.<sup>2</sup> As digital technologies advanced, developers created programmes which could collect, store and link patient data, offering the potential for more effective case management. In the health systems of low-income and lower middle-income countries, digital technologies introduced the possibility of taking health services to remote places which had historically been difficult to reach. An example is the use of telemedicine, where a health worker in a distant facility equipped with internet and video can be guided by an expert located in the capital city.







### → BOX 3. OPEN-SOURCE VERSUS PROPRIETARY SOFTWARE

There are broadly two kinds of software licensing arrangements: proprietary software, which has an owner, and open-source software, which is accessible to be used and adapted by anyone. The major difference between them refers to the availability of the software, including the source code, which is the code computer programmers write. With open-source software, the end user has the right under a licensing arrangement to access and modify the source code, and make this available to all users. This right enables software programmes, such as the Electronic Health Records System at Trishuli Hospital, to be customised to the context in which they will be implemented. With proprietary software, the source code is secret and protected.

Open source software is particularly valuable for resource-poor countries, reducing the time and cost of developing digital healthcare solutions. In Nepal, the NGO 'Possible Health' selected the Bahmni software package (see Box 10) and customised this for implementation in two private hospitals they support. The S2HSP team used this customised version of Bahmni and invested additional resources to further customise it to the needs of a public sector hospital. Both these solutions are now freely available to anyone wishing to implement an EHR. Any future improvements to the software will also be available to Trishuli and other users of this software.

<sup>2</sup> While digitisation is the simple transformation of information into binary code (0s and 1s), which can increase the speed, reliability and accuracy of information flows, digitalisation is the broader application of digital technologies to bring about change, and to better meet the specific needs of both people and systems.

## FIGURE 1. HOW DO DIGITAL TECHNOLOGIES STRENGTHEN HEALTH SYSTEMS?

HEALTH SYSTEM DOMAINS	INEFFICIENCIES	E-HEALTH SOLUTIONS
 Health workforce	Inequitable distribution Inappropriate or costly staff mix	Human resources for health information system Use of geographic information services for targeting services
 Essential medicines	Irrational use of drugs Counterfeit drugs	Logistics management of information services Counterfeit drugs detection systems
 Healthcare delivery service	Inappropriate hospital admissions Overuse of procedures, investigations and equipment	Web-based access to shared electronic health records Clinical decision support tools
 Health system leakages	Corruption Fraud	Hospital and insurance digital payments Financial management information systems Radio-frequency identification-based supply chain and logistics
 Patient monitoring and community health	Drug non-adherence Underserved populations Missed appointments	Shared electronic health records Telemedicine Mobile health-applications, including phone-based reminder systems, integrated patient ID registries, rapid reporting forms and referrals
 Disease surveillance & population health	Delayed and unreliable data for decision-making	Rapid case detection and communication applications Health issues monitoring dashboards

(from Roth, Landry and Parry 2015; reproduced and adapted to GHPC design)

With the advent of more powerful and portable computing devices and the expansion of broadband and satellite services over the last decade, applications have been developed which can facilitate the exchange and analysis of larger and more complex data sets, both between and across institutions and populations. The focus has shifted over time to the broader application of digital technologies to strengthen health systems and to provide more effective care, with the aim of achieving health sector goals and objectives.

Reflecting the inherent complexities of healthcare delivery and organisation, digital technologies are being applied to solve a range of ever more complex issues. Examples include: enabling more standardised and quality-assured care that incorporates the latest evidence, increasing 'digital' involvement of patients in their care, and global disease surveillance and control based on access to real-time data. The potential for digital technologies, to simplify these complexities and to make care more accessible and understandable to the general population, has contributed to an exponential rise in mobile health applications, although this potential has still to be fully realised (Lopez and Blobel, 2015).

However, not all countries have been able to invest in, or benefit from, this fast-paced technological change at the same rate or to the same extent. Low-income and lower middle-income countries have lagged behind due to a combination of resource constraints and structural obstacles in both the IT and health sectors. At the same time, these countries face huge challenges in increasing the quality and coverage of health services.

While digital technologies cannot solve all these challenges, they can help to prevent disease and to deliver healthcare both more effectively (i.e. through enabling standardisation and better continuity and quality of care) and more efficiently by improving resource allocation and maximising benefits from existing resources. Additionally, digital technologies can help to bring those outside a health system – often poor and vulnerable people – into its care (see Figure 1).

These enabling qualities make digital health technologies particularly attractive for resource-poor countries, helping them to move faster and go further towards meeting their health- and poverty-related goals and objectives, such as Universal Health Coverage and Universal Social Protection. Increasing commitment by the digital health community to technologies that are

open-source, interoperable and/or modular (i.e. made up of compatible and standardised component parts) means that low-cost solutions are now available that can have a huge impact (see Box 3).

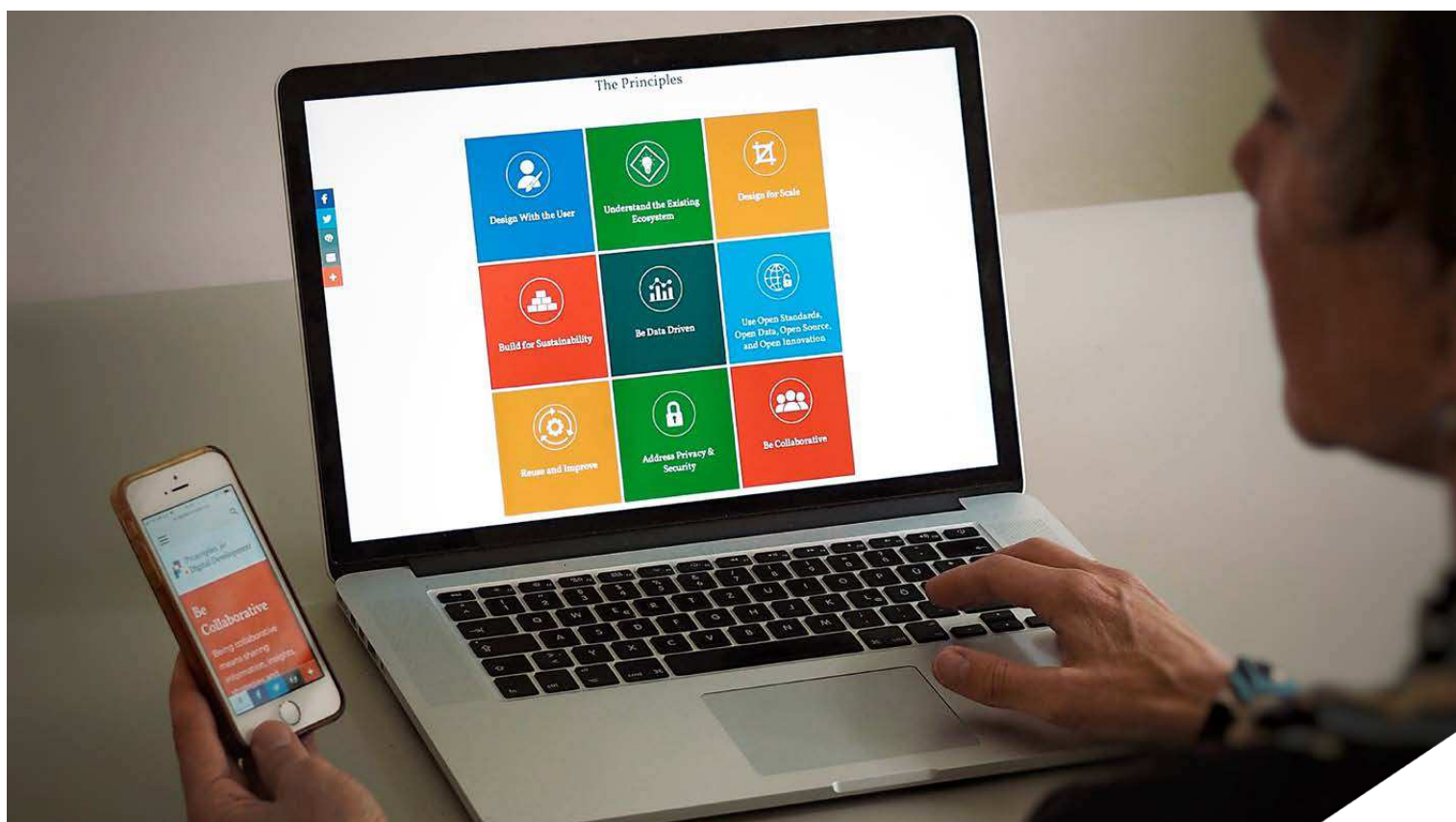
## GERMANY'S CONTRIBUTION TO INTERNATIONAL COLLABORATION ON DIGITAL HEALTH

Digital technology is about improving information flows and data management, so it is perhaps not surprising that discussions on how to share best practices in the application of ICT tools for development cooperation started early on. These discussions culminated in the development of a number of important, internationally endorsed guiding frameworks such as the [Principles for Digital Development](#) and the [Principles of Donor Alignment for Digital Health](#).

The Principles for Digital Development are intended to help development practitioners and agencies, such as GIZ and KfW, integrate established best practices into technology-related programmes (see Figure 2). They call for digital solutions that address local needs and are tailored to local

contexts, while supporting the development of interoperable and digitally integrated systems. Given the fast pace of technological change, the Principles are intended to be 'living' guidelines that will continually change and adapt as new learning and developments take place.

In its recently published '[Digital Agenda, Harnessing the Digital Revolution for Sustainable Development](#)', BMZ commits Germany to these Principles for Digital Development as well as to the use of digital innovation for greater development effectiveness (objective 1.4). BMZ has also played a prominent role in the development of the [Principles of Donor Alignment for Digital Health](#) which were formulated in response to the high degree of fragmentation and duplication of development partner investments, and which bring global aid commitments such as the Paris Declaration (2005), the Accra Agenda for Action (2008) and the Busan Partnership (2011) into the digital arena. The Principles of Donor Alignment were finalised in May 2018 and launched at the World Health Summit in October 2018.



→ The Principles of Digital Development help orient practitioners around the world who work on ICT in development.

Through the participation of BMZ, GIZ and KfW, Germany is an active member in several global digital health partnerships and collaborative efforts, including the [Health Data Collaborative](#), which works with countries to improve the quality and use of health data for decision-making. Germany recognises and builds on the catalytic role played by regional organisations and networks in stimulating progress and building national capacities for digital health by facilitating networking, peer-to-peer learning and the exchange of experiences between countries. For example, both the Asian Development Bank (ADB)<sup>3</sup> and the [Asia eHealth Information Network \(AeHIN\)](#), provide support to countries in the region to develop national e-health strategies and implementation plans, with the aim of supporting the rapid scale-up of solutions that work on the ground (see Box 4). The Nepali-German Health Programme works extensively with AeHIN to build digital capacities in Nepal (see also p. 19).

BMZ and the Swiss Agency for Development Cooperation (SDC) fund the Open Insurance Management Information System ([OpenIMIS](#)) Initiative (see Box 11 on p. 25) with the aim of reducing duplication and supporting increased collaboration on digital social health protection. This Initiative aims to form a global community of practice focused on the open-source OpenIMIS software as a digital global good that supports the achievement of universal health coverage and universal social protection. The chapter ‘The approach: Towards a digital health ecosystem in Nepal’ looks at how the introduction of OpenIMIS has transformed social health protection in Nepal.

## DIGITAL HEALTH IN GERMANY’S BILATERAL COOPERATION

A cornerstone of [German development policy in the health sector](#) is the integrated and systemic nature of Germany’s development assistance. Digital health plays a crucial role in an increasing number of German-supported health and social protection programmes, introducing greater efficiencies through optimising management processes, supporting communication and networking, and providing information quickly and at low cost.

As shown in Figure 3, Germany is supporting a broad and diverse range of digital health and social protection initiatives throughout the world. The Nepali-German Health Programme presents a uniquely diversified and therefore interesting example of German support for the development of interoperable digital health ecosystems, which can provide useful learning for programmes in other countries. The following chapters give a brief overview of Nepal’s health and ICT context, and go on to describe in detail how the German approach to strengthening systems and developing digital capacities is contributing to the success of this programme.

### BOX 4. THE ASIA eHEALTH INFORMATION NETWORK (AeHIN)

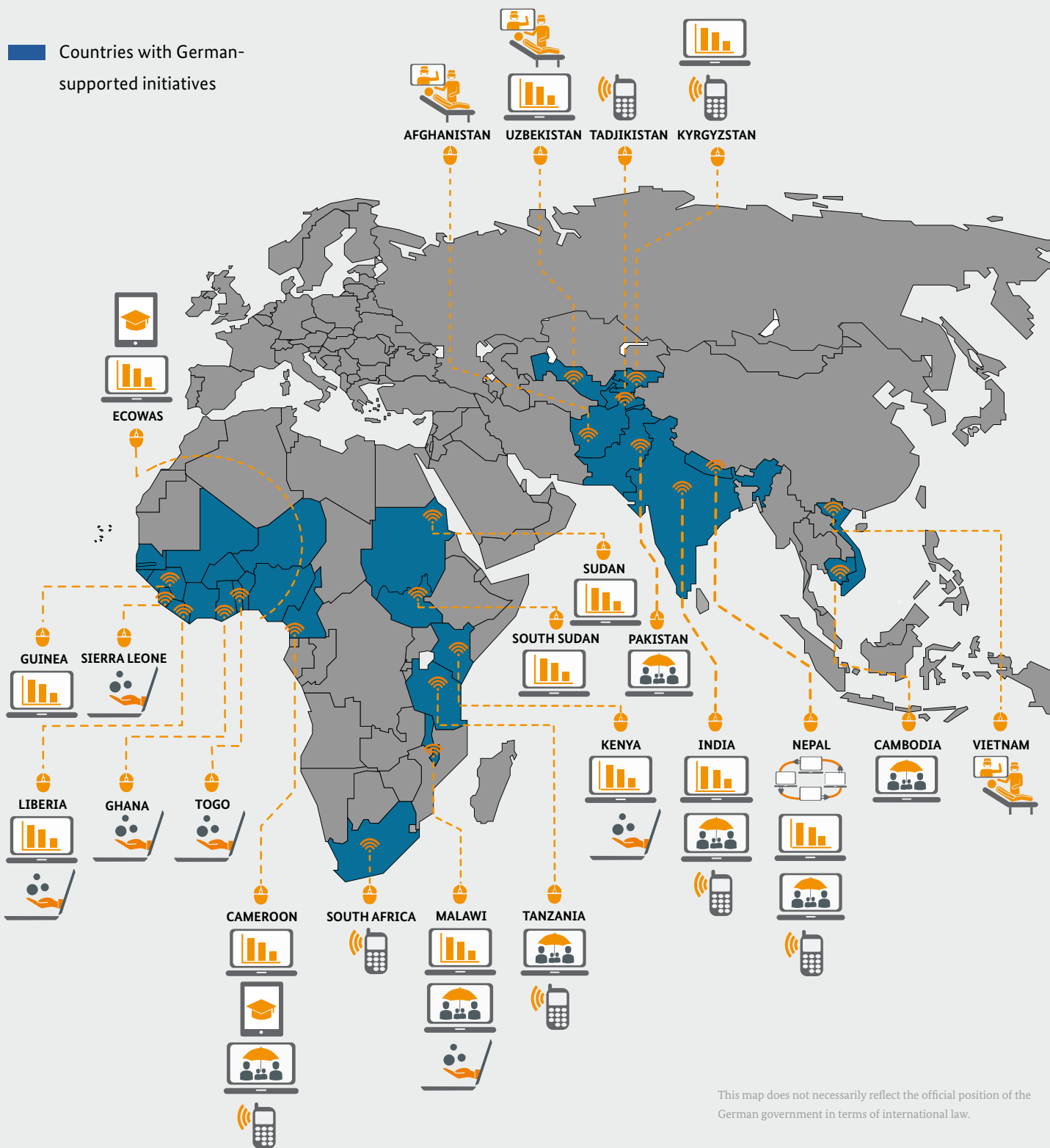
The Asia eHealth Information Network (AeHIN) is a regional network specialising in peer-to-peer learning approaches to strengthen the use of ICT to achieve better health across South and Southeast Asia. It has a fast-growing membership in Bangladesh, Cambodia, India, Indonesia, Mongolia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam. The aims of the organisation are to:


- Enhance leadership, sustainable governance, and monitoring and evaluation.
- Increase peer assistance and knowledge exchange and sharing through effective networking.
- Promote standards and interoperability within and across countries.
- Build capacity for e-Health, Health Information Systems, and Civil Registration and Vital Statistics.


AeHIN’s guiding principles are country ownership and leadership, the strategic use and reuse of e-health and health information systems investments, and commitment to open standards to promote interoperability.


<sup>3</sup> For example, see Drury et al. (2018) for recent guidance from ADB on investing in digital health.

**FIGURE 3. GERMAN-SUPPORTED INITIATIVES IN DIGITAL HEALTH AND SOCIAL HEALTH PROTECTION**





 National digital ecosystems and digitalisation strategies


 Health information and management systems

 Social protection management systems

 Telemedicine

 e-Learning platforms

 Digital grant management platform

 m-Health (SMS, mobi-sites, apps and web-apps) for prevention, information, patient follow-up

# Health and ICT in Nepal

Nepal lies along the southern slopes of the Himalayan mountains between India and the Tibet Autonomous Region of China to the north. The small, landlocked country is home to nearly 30 million people from more than 100 ethnic groups, most of whom share the official Nepali language. Most Nepalis live either on the country's fertile plains or in the hills, while migration has left less than 7% of the population living in the remote mountainous regions.

Until the late 1950s, Nepal was all but closed to the outside world. Since then, the country has undergone a checkered transformation from Hindu monarchy to federal republic,

culminating with a new constitution in 2015 and local elections in 2017. The new federal structure, comprising 753 municipalities of varying sizes, is a legacy of the peace process that followed the decade-long Maoist insurgency (1996-2006). In 2015, a series of devastating earthquakes caused some 9,000 deaths and injured more than 22,000 people, damaging and destroying buildings and roads across the central and north-eastern parts of the country. The closure of the border with India in September 2015 for a 5-month period due to conflict between the two countries caused near-total economic seizure in Nepal, further destabilising the country's development.

 **FIGURE 4. MAP OF NEPAL**



Despite these considerable challenges and with limited resources, Nepal has made remarkable progress in reducing poverty, increasing access to education and improving the health status of its people, and achieved many of the Millennium Development Goals (MDGs) by 2015 (National Planning Commission, 2016). However, it remains one of the poorest countries in Asia, with poverty concentrated in remote areas and increasingly in towns and cities, as the country experiences rapid urbanisation (ADB, 2017; adb.org, 2018). Nepali people continue to suffer from high levels of inequality and social discrimination related to gender, caste and ethnicity (World Bank & UKAID, undated).

## HEALTH STATUS

Nearly all of Nepal's key health indicators are moving in the right direction. Between 1996 and 2016, deaths among children under five were reduced by nearly 70% and maternal mortality by over half from 539 to 239 per 100,000 live births (MOHP, New ERA, and ICF, 2017). Vaccination coverage is high, and considerable efforts have been made to halt and reverse the incidence of HIV, TB and malaria.

However, the country still faces serious health-related challenges, many of them aggravated by poverty and natural disasters as well as underlying weaknesses in the health system. Multi-Drug Resistant Tuberculosis is a growing public health concern and persistent high levels of undernutrition and anaemia in women and children threaten many of the health gains of recent years (Ghosh et al., 2009). At the same time, non-communicable diseases such as cardiovascular disease, diabetes and cancer are on the rise, and mental health illnesses and road injuries are growing challenges (MOHP, New ERA, and ICF, 2017; Sharma et al., 2017).

The National Health Policy (2014) and the National Health Sector Strategy (2015-2020) guide activities in the sector. The health sector strategy recognises that health cannot be improved without strengthening the country's health system and highlights the critical role of information systems and modern ICT in enabling evidence-based policy and planning. A series of five-year plans provide a framework for development partner support to the health sector. Germany, through GIZ and KfW, and development partners including DFID, UNICEF, USAID, WHO and the World Bank, are supporting a comprehensive health sector reform programme, currently in its third implementation phase (2016-2021).

Under the new federal government system, the decentralisation of the health sector will entail a complex process of devolving and redistributing responsibilities for health planning, budgeting and service provision to the 753 new municipalities. Since 2017, the municipalities took on responsibility for over 4,000 health facilities, together

with large networks of community health workers and volunteers. This process underlines the need for smooth, accurate flows of quality real-time information.

## HEALTHCARE FINANCING

The Government of Nepal has increased spending on healthcare to around 6% of GDP (2015), which is high in the South Asian context. However, the small size of the economy and highly erratic growth over recent years mean that the government spends only about USD 44 per person each year on health (worldbank.org, 2018). External spending on healthcare, including contributions by development partners, fell sharply from just over a quarter to around 10% of total government expenditure between 2005 and 2015 (Ibid.).

Basic healthcare is nominally free of charge, although the rapid introduction and roll-out of free services since 2007 has led to widespread stock-outs of medicines at all levels of the system. Patients routinely have to purchase drugs and pay for tests. Furthermore, around half of all services are provided through the fast-growing, fee-paying private sector, contributing to high levels of out-of-pocket expenditure of around 60% (Ibid.).

As part of its commitment to universal health coverage, the Nepali government began designing a national social health insurance scheme in 2013 with the aim of protecting people from the high and often catastrophic costs of healthcare. It is designed as a mandatory scheme under the 2017 Insurance Act with the government subsidising the contributions of poor people and senior citizens.

## INFORMATION AND COMMUNICATION TECHNOLOGIES

The ICT industry and services in Nepal are a fast-growing sector for the economy as well as important enablers for the country's overall development – the government wants to see this sector contribute 7.5% of GDP by 2020. Digital technologies are now applied to multiple aspects of everyday life including electronic (mobile) payments and the outsourcing of IT services for foreign companies, as well as enabling access to health and education in remote areas.

Nepal's National Information and Communication Technology Policy (2015) states, 'ICTs are increasingly at the core of strategies aimed at securing the goals of sustainable development and stimulating economic growth.' The policy provides an overarching vision of 'digital Nepal' and has proved to be a major milestone for digital development, highlighting the role of information technologies for increasing efficiency and strengthening systems across all sectors.

The policy articulates the government's commitment to open-source software and conformity with national and international standards, as well as the need to build inter-institutional and intersectoral linkages for the development of a coherent and interoperable ICT sector. The Nepali government and its partners are moving in the right direction by facilitating data linkages across the different health, governance and social protection initiatives. For example, the World Bank is providing support for the establishment of an electronic platform for Civil Registration and Vital Statistics and the government is in early discussions about a new national ID system.

Cognisant of the many challenges which accompany a fast-expanding and dynamic technology sector, the Government of Nepal has begun to address the need for institutional and regulatory coherence. In August 2018, the Ministry of Information and Communication Technology published an online draft of its new [2018 Digital Nepal Framework: unlocking Nepal's growth potential](#), inviting comments from public, private and civil society organisations. In the years ahead, the nascent IT governance structures will need to be adapted to the new federal administrative and political systems being rolled out.

Nepal is well on the way to developing its digital infrastructure. Kathmandu now boasts a modern, publicly owned and managed Government Integrated Data Center (GIDC), built with financial support from KOICA. The centre hosts databases and provides free internet services and an uninterrupted power supply to government institutions, including the Health Insurance Board (HIB) and the Health Management Information System (HMIS). A second data centre to the south of Kathmandu has recently been completed, and will provide back-up services in case of disaster, such as an earthquake or fire.

Saurav Bhattarai, the S2HSP team's Deputy Chief Technical Advisor and digital health expert, welcomes this development:

→ *'This was a really big step in terms of developing the digital infrastructure for Nepal. Before the GIDC, every government agency had its own server in a small back room. This system was highly resource-intensive and inefficient.'*

The Ministry of Information and Communication Technology has committed to rolling out the necessary infrastructure to enable internet and mobile phone access, including in remote areas. The expansion of internet coverage to health facilities and schools across the 753 new municipalities is to be financed through the Rural Development Telecommunications Fund (see Box 5). However, financial and human resource constraints are likely to act as a barrier for future investment, as well as to slow the expansion and use of the new digital infrastructure.

Rapidly increasing IT literacy over recent years has facilitated the spread of digital technologies in Nepal, particularly among young people and professionals, and social media are a critical driver for internet adoption. The Nepal Telecommunications Authority estimates that an additional 2.25 million people began to use the internet in 2017 alone. The government has committed to increasing digital literacy skills for three quarters of the population by 2020, and a minimum level of computer literacy is now a requirement for entering the Nepali civil service. Maintaining the growth in digital infrastructure and digital literacy will require concerted efforts to grow the pool of technical and engineering specialists in both the public and private sectors. German Development Cooperation is unique among development partners in the health sector to have brought in IT engineers to support the development of digital health initiatives.

## → BOX 5. NEPAL'S MOBILE AND INTERNET COVERAGE – A FEW FACTS AND FIGURES

Mobile and internet coverage are expanding fast in Nepal, albeit from a low base:

- The proportion of people with access to the internet at home (through any device) rose from around 1% in 2006 to an estimated 17% in 2016, with large disparities between urban and rural areas ([Internetstatslive.com](#)).
- Total internet users are estimated to be around 16.2 million (55% penetration) with 9.3 million active social media users (Government of Nepal, Ministry of Communication and Information Technology and Frost & Sullivan, 2018).
- In its national ICT policy, the government has committed to increasing broadband access to more than 90% of the population by 2020.
- Mobile phone penetration is now thought to be well in excess of 90%, having increased from 66% (85% in urban and 61% in rural areas) in 2011.



## DIGITALISATION IN THE HEALTH SECTOR

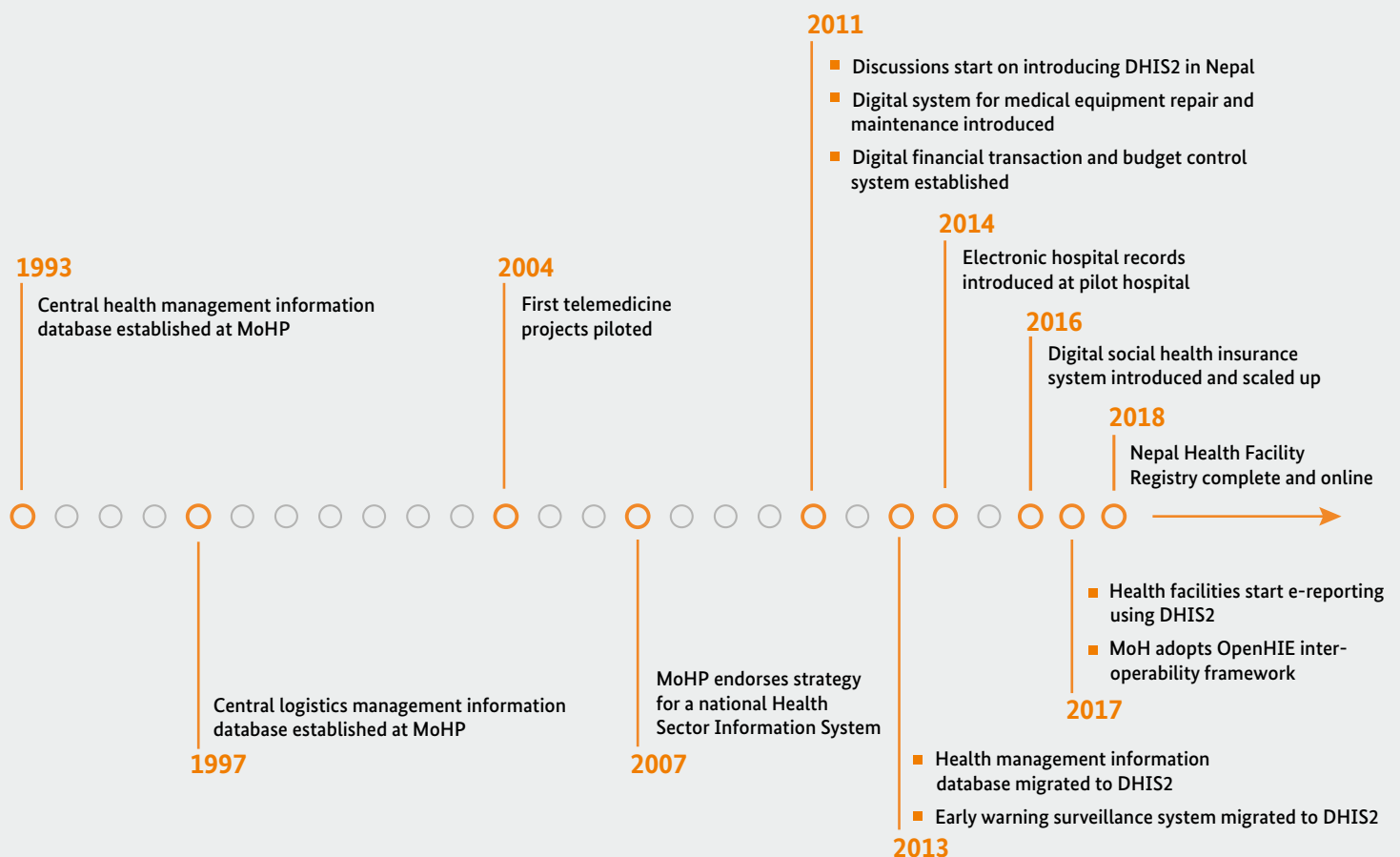
As shown in Figure 5, the digitalisation of Nepal's health sector began during the 1990s with the integration of parallel reporting structures for both the national Health Management Information System (HMIS) and the Logistics Management Information System (LMIS), for which centrally managed databases were established at the Ministry of Health and Population. Recognising the need for a more integrated and coordinated approach to the management of health information, the Ministry of Health and Population published a strategy paper for an overarching 'National Health Sector Information System' in 2007. But despite good intentions, this strategy was never implemented: The idea of a single, huge integrated information system was soon overtaken by the realisation that modular and interoperable information systems present a better solution.

In the early 2000s, the government began working with partners in the private and non-government sectors to introduce telemedicine pilots with the aim of addressing challenges for accessing health services posed by Nepal's mountainous terrain and poor infrastructure. These early

pilots, which provided medical staff in remote and rural health facilities with access to professional support and specialist knowledge for diagnosing and treating patients, rarely continued beyond their project-defined timeframes, although the government remains committed to this approach as an effective way of strengthening capacity for service delivery.

Over the last decade, there has been an exponential rise in digital initiatives across the health sector, largely financed by development partners, including German Development Cooperation. While these digital initiatives have contributed to strengthening aspects of Nepal's health system, many of the earlier initiatives were unable to share or exchange data (i.e. they lacked interoperability), and were introduced using imported proprietary technologies that are inflexible and expensive to change. Since 2013, S2HSP advisors have been working with the ministry to address the high levels of fragmentation and resulting inefficiencies, and to support Nepal's journey towards an interoperable digital health ecosystem. Key components of Germany's support to digital health in Nepal, including the development in 2017 of the National e-Health Strategy, are set out in more detail in the next chapter.

**FIGURE 5. NEPAL'S e-HEALTH TIMELINE**



# The approach: Towards a digital health ecosystem in Nepal

Rising IT literacy and technical capacities, digital infrastructure investments, and prioritisation of digital solutions by government combine to create a dynamic and exciting digital environment in Nepal. Digital initiatives support multiple aspects of health system functioning and service delivery, including management of human resources for health, logistics management, health service data including commodity tracking, infrastructure, annual work plans, finance and budgeting, and managing processes related to health insurance. However, many of these applications were developed without considering the need, or indeed the potential, for exchanging data, and this has contributed to fragmentation in the health sector, with different crucial components evolving in 'silo' mode.

German Development Cooperation is supporting the delivery of a coherent, harmonised and aligned digital approach, working with the Government of Nepal to develop a more conducive digital health policy environment, to build digital capacities across the health sector, and to use digital technologies to strengthen health systems. Support for digital health has expanded rapidly in response to the needs of government partners and today is both a thematic area in its own right and an enabling component that cuts across the whole Nepali-German programme (see Box 6).

## A PIVOTAL MOMENT FOR NEPAL'S DIGITALISATION IN HEALTH

Nepal's ICT Policy (2015) commits the government for the first time to develop a more interoperable digital architecture for the country, and provides an entry point for the development of sectoral digital strategies. For the health sector, WHO and the [Asia eHealth Information Network \(AeHIN\)](#) have developed approaches to help countries develop national digital health strategies: The [WHO-ITU National eHealth Strategy Toolkit](#)<sup>4</sup> and the AeHIN 'Mind The Gaps-Fill The Gaps' framework assist countries to systematically assess the situation on the ground, and to define and plan the changes needed to move to a more integrated and interoperable digital health system.



→ S2HSP's digital health team.

In 2016, with the support of the S2HSP team, WHO, UNICEF and other partners, the Ministry of Health and Population took the foundational step of developing a national e-Health Strategy. The strategy, which was approved in 2017, explicitly supports the achievement of the goals set by the National Health Policy (2014) and directly contributes to 7 of the 9 outcomes of the Nepal Health Sector Strategy (2016 -2020). The same strong commitments that are evident in the National ICT Policy are reflected in the new e-Health Strategy, whose guiding principles call for 'cost-effective, standardized, efficient, interoperable and user-friendly e-health solutions and applications'.

In 2017, an e-Health Unit was established in the Public Health Administration Monitoring and Evaluation Division (PHAMED) of the Ministry of Health and Population. Together with the Health Management Information Systems unit of the Department of Health Services, the e-Health Unit has provided a much-needed focus for digital health capacity development and decision-making.

The S2SHP team has been able to play a key role in forging a more coherent, harmonised and aligned approach to digitalisation in Nepal's health sector by building on its long experience supporting policy development and

<sup>4</sup> This toolkit is a joint initiative of the World Health Organization and the International Telecommunications Union (ITU) (WHO-ITU 2012).

health systems strengthening in Nepal, and by bringing in relevant experience from support to digital health systems development in other countries. When Nepal was at a pivotal juncture in the development of its digital health systems, S2HSP was ready with support for developing the necessary digital capacities and to help government partners establish the required governance and management systems. Crucial components of the S2HSP approach have included high-level, timely advocacy and technical advice, on the job coaching and mentoring, and the facilitation of peer-to-peer learning. Selected initiatives are explored below.

## FACILITATING PEER-TO-PEER LEARNING

In early 2017, S2HSP provided an important opportunity for the Nepali government to exchange with colleagues from other countries at different stages of their digital development. A group from the Ministry of Health and Population were sponsored to attend the AeHIN General Conference in Myanmar, where they were introduced to the concepts and language of interoperability, and in particular the open Health Information Exchange (OpenHIE) framework for the development of an interoperable digital health architecture (see Figure 6).

Inspired by the visit and motivated to bring these ideas back to Nepal, the government hosted a [Convergence and Planning Workshop](#) in Kathmandu in July 2017 with support from AeHIN and other partners. Stakeholders from the health and social protection sectors, telecommunications, the police, and the private sector, joined together to discuss the concepts of interoperability in relation to Nepal's digital development and to agree on next steps.

The learning process continued with a study tour to the Philippines in March 2018, where Nepali delegates were able to discover first-hand the progress made in developing a robust e-health architecture and interoperable digital health applications, and the approach used. According to Dr Tinkari, former Chief of PHAMED and head of the Nepali delegation,

→ *'Discussing the challenges we face in Nepal with colleagues who understood what we were talking about because they had struggled – and managed to overcome – similar obstacles made all the difference for me. In Manila, we saw in practice what interoperability is really about.'*

These study visits and networking events have provided valuable opportunities for open and honest discussion of challenges and bottlenecks, and how they were overcome in different contexts. The active and successful participation of Nepali stakeholders in peer-to-peer learning events has been fostered by the S2HSP team as an important component of their support to capacity development. This has contributed to the close working relationship and mutual trust between the S2HSP team and government partners and has been a crucial factor for building consensus around the importance of investing in interoperable digital health systems.

As Dr Paul Rueckert, Programme Manager of the S2HSP, states,

→ *'It is not only the event itself that is important but the preparation and follow-up that make the real difference. Bringing together the right people at the right time – this requires trust and a good assessment of when is the right moment to deploy such an approach. This is what strategic technical advice is all about.'*

## → BOX 6. GERMAN DEVELOPMENT COOPERATION IN NEPAL

Nepal is a priority country for [German Development Cooperation](#) and Germany is an important bilateral donor for Nepal, having established diplomatic relations as far back as 1958. The three key areas of cooperation between the two countries are health, renewable energy and energy efficiency, and sustainable economic development. In the aftermath of the devastating 2015 earthquake, additional support has been provided for the reconstruction of health facilities amongst others.

Under the German Development Cooperation health programme, the Federal Ministry for Economic Cooperation and Development (BMZ) provides both financial and technical support, on the one hand through the Support to Health Systems Strengthening Programme (S2HSP) implemented by GIZ, and on the other hand through a series of financial cooperation projects including the District Health Project, the Sector Programme for Health and Family Planning, the National Health Sector Programme III, Programme Improvement of Maternal and Child Care in Remote Areas and the Financial Cooperation Recovery Programme - Health Component.

The S2HSP works in five main thematic areas, all of which incorporate digital technology: Implementation of a social health insurance system, including hospital management; strengthening human resources for health, including capacity development of health informatics experts; strengthening governance in health (and e-health) with a focus on the transition to a federal system and urban health systems; digitising and harmonising health information and management systems (IT solutions and e-governance); promoting adolescent health and development, including through the use of mobile health.



→ The Nepal delegation's reception in Manila.

## PUTTING INTEROPERABILITY CENTRE-STAGE WITH OpenHIE

Building consensus among different stakeholders – including government, development partners and the private sector – around the importance of interoperability is one of the most important steps on Nepal's journey towards the development of a coherent digital health ecosystem. The OpenHIE framework provides a means to easily visualise and think about interoperability: It has been adopted as the overarching structure for Nepal's digital health sector and as a guiding framework for implementing the National e-Health Strategy. Supported by a global community of practice, it enables countries to understand how health data can be shared across the different digital initiatives and how these initiatives can interact with each other ([opengroup.org](http://opengroup.org), 2018).

Instead of striving to create one enormous integrated digital health system – difficult if not impossible to manage in the changing context of Nepal – OpenHIE facilitates the development of a flexible, modular digital health system with interoperable component parts that can be scaled up as new investments come on stream.

As Figure 6 shows, the modular digital health ecosystem comprises multiple operators (e.g. health facilities, laboratories, insurers, the ministry and the municipalities, maintenance experts for medical equipment, and so on) which play important roles in the health system (shown in the outer boxes). In order to fulfill their roles, these actors and institutions all need data, often with overlapping requirements. At the same time, they also produce data, for example, by treating a new patient, providing a service or registering a new member of the social health insurance scheme. To enable these actors, and the digital applications which facilitate and support their work, to communicate with one another (i.e. to be 'interoperable'), they have to 'speak the same language'.

This 'shared language' is contained in the registries, which contain the unique identification codes for a health system's basic constituents, including the staff, facilities and clients, as well as the definitions, standards and terminology to be used by all digital applications (e.g. the ICD 10 codes which provide a list of all possible medical diagnoses). These registries, shown in the inner circle of Figure 6, harmonise and standardise the way in which the different actors and their digital systems collect and store information, so that it can be made available, re-used and shared between a wide range of digital programmes and platforms.

Application Programme Interfaces (APIs) – contained in the orange interoperability layer between the applications and the registries – validate and approve the information that is collected and used to update the registries, and authorise access to and use of the data. Together, the registries and interoperability layer represent the 'control centre' of the digital ecosystem, ensuring its interoperability and efficiency, as well as data protection and security.

## USING OpenHIE TO PRIORITISE INVESTMENTS

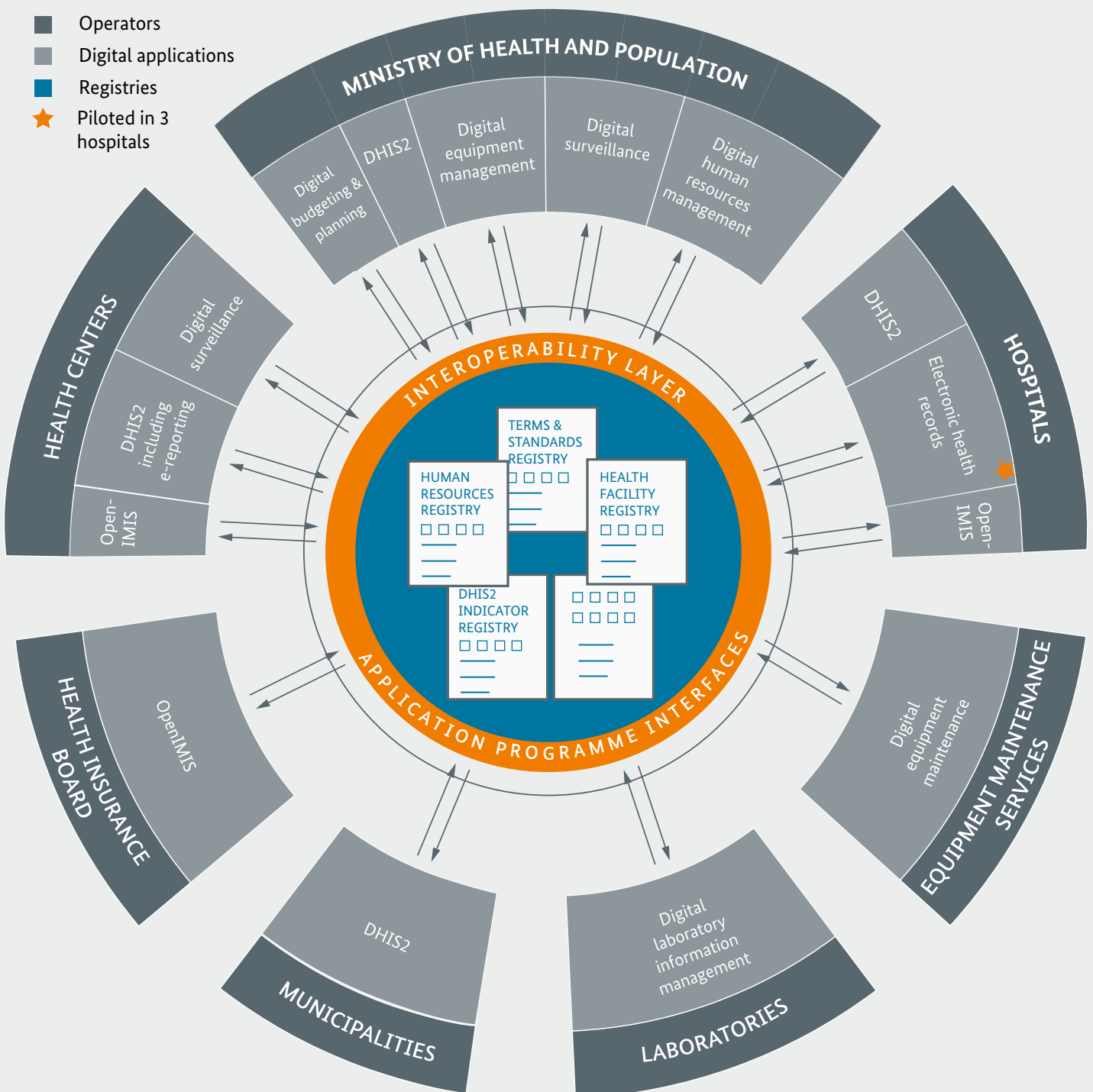
In a country such as Nepal, with so much to do and so few resources, the OpenHIE framework provides a means to prioritise investments. A first priority was to develop the registries. In the immediate aftermath of the 2015 earthquake, German Development Cooperation worked with DFID to send 40 engineers to assess the damage in 800 health facilities in the worst affected areas. The engineers used tablets to store photographs and record details of the health infrastructure. By now, half of Nepal's more than 4,000 public health facilities have been assessed, and the records used to create a health facility registry. WHO is providing support for the creation of a health worker registry, and a patient registry is envisaged. These registries will facilitate the scale-up of the electronic health records systems in public hospitals as well as the national roll-out of OpenIMIS (see p. 25).

To illustrate how OpenHIE works in practice (see Figure 6), the newly completed facility registry has allocated a unique code to each public health facility. This code can be used to link the different digital applications and produce a much richer analysis from national and regional levels down to the health facility level. The logistics information management system (LMIS) and the health management information system (HMIS), based on the District Health Information Systems Software (DHIS2), have been among the first to adopt the new health facility codes, making it possible, for instance, to compare the number of vials of vaccine delivered to a particular health facility with uptake of vaccine services at that facility. Such data can also be used to verify stock levels and stock-outs, and for more effective forecasting for vaccine procurement. This is an important step towards the development of more interoperable digital health systems in Nepal.

Nepal is at a stage where the concepts of interoperability have been embedded at central level, and ownership of the national e-Health Strategy and associated implementation plans is growing stronger. The move to a federal system of government and the decentralisation of decision-making and budgets to the municipalities present unique challenges but also opportunities for the development of a more interoperable digital health architecture in Nepal. In Dr Tinkari's view,

→ 'The reduced role of central government in the federal structures opens up space for us to develop the necessary policy and guidance frameworks for digitalisation and to ensure that the municipalities introduce e-health initiatives that are interoperable with the rest of the system.'

→ **FIGURE 6. NEPAL'S DIGITAL HEALTH ECOSYSTEM**



With support from the S2HSP team, the ministry's e-Health Unit is lobbying information system stakeholders and the different levels of government, encouraging them to make use of the registries and to ensure that new digital applications are interoperable with other applications in Nepal's emerging digital health ecosystem.

## INTRODUCING ELECTRONIC REPORTING

Electronic or e-reporting can significantly improve the timeliness, accuracy and completeness of reporting, making data available to support decision-making by health service providers, managers and policy-makers (Nguyen, Bellucci and Nguyen, 2014). Traditionally in Nepal, data are recorded manually in large registries, and health workers must travel long distances over poor roads to submit the data each month. Paper-based reporting and the repeated manual transfer of data from one template to another give rise to incomplete and often erroneous data. And once received and analysed, the information rarely finds its way back to the facility in the form of useful feedback.

Aware of these drawbacks, the Ministry of Health and Population gave high priority to introducing e-reporting as a means to improve data quality and strengthen the overall health system. Rather than developing a new specialised software from scratch, which would have required a large amount of resources to achieve the flexibility and interoperability that many open-source products already offered, the Ministry opted to adapt the modular open-source software DHIS2 (see Box 7), to its specific needs, on the advice of the S2HSP team and other development partners.

### BOX 7. DISTRICT HEALTH INFORMATION SYSTEMS SOFTWARE (DHIS2)

The open-source and web-based **District Health Information System software** (DHIS2) is designed to facilitate the collection, validation, management, analysis and presentation of health service delivery data. It was initially developed by the University of Oslo (Norway) and continues to be supported by the **Health Information Systems Program** (HISP) global network. A major advantage of DHIS2 is its flexible user interface which allows the software to be tailored to different health information activities without specialist programming expertise. Data can be entered anywhere – at the health facility on a computer, laptop or other device, or in the field by community health workers using mobile phones or tablets.

Advanced data visualisation functions, such as Geographic Information System (GIS) mapping to show where services are being delivered, together with a series of charts and dashboards, enable health managers to explore and better understand their data, leading to more evidence-based decisions. A total of 54 countries are deploying DHIS2 on a national scale, 30 of which are in the early phase of their roll-outs, including Nepal.

### BOX 8. HOW E-REPORTING IS 'OPENING THE GATE' TO GREATER DIGITAL PARTICIPATION

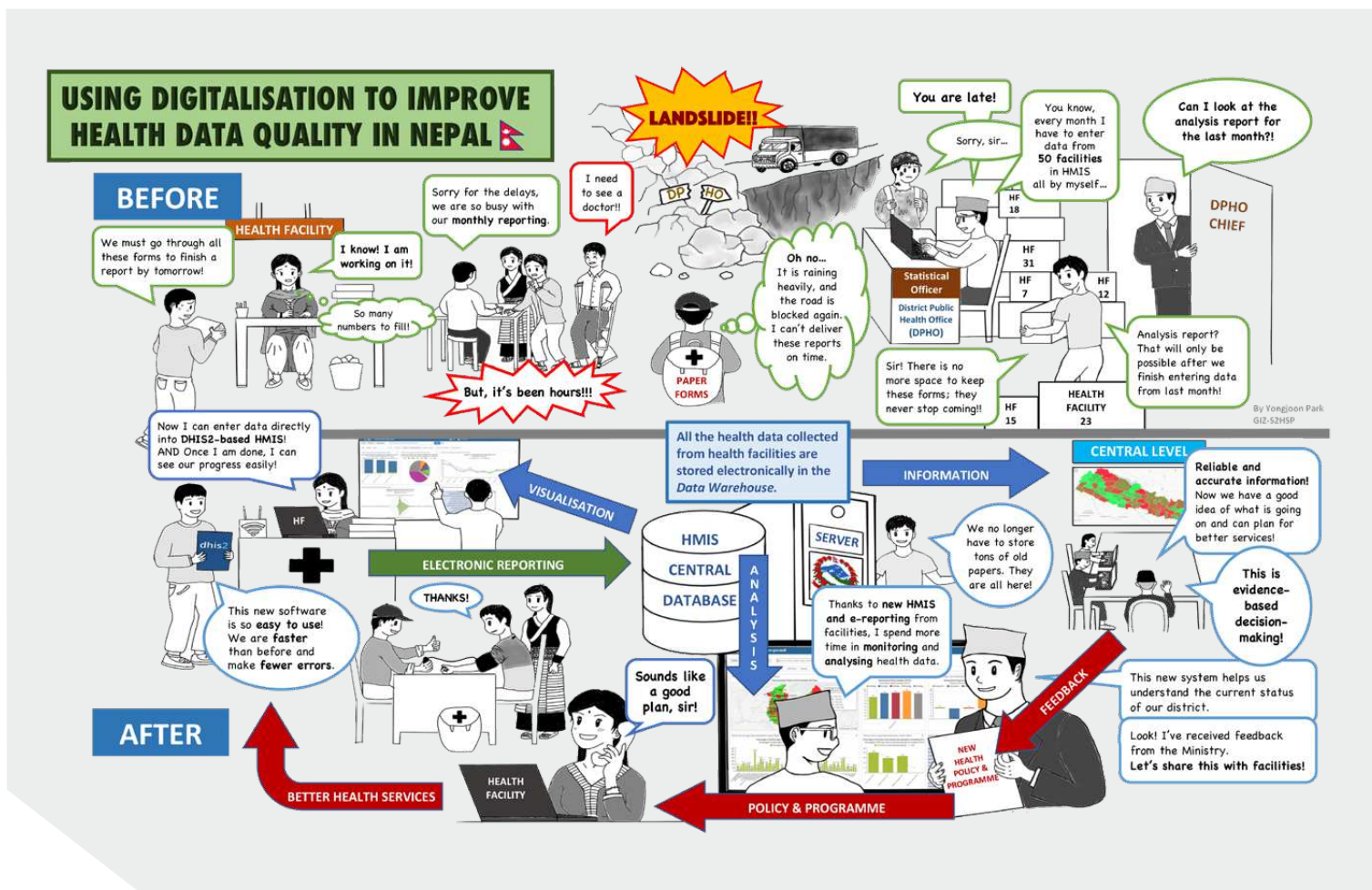


→ Bikash Nepal, Technical Adviser, S2HSP

As the e-reporting training is rolled out to new facilities, Bikash Nepal, Technical Adviser, S2HSP, sees first-hand how the Nepali-German Health Programme is helping to change the information culture in Nepal, supporting the expansion of IT infrastructure and rising IT literacy rates, and laying the foundation for the introduction of future digital technologies. Bikash, who has played a leading role in training health staff in the new system, says that bringing digital technology into a remote health post is like 'opening a big gate'.

When they enter the training programme, many of the health staff have never used a computer before, and a major challenge for the roll-out of e-reporting has been to leverage the resources to provide follow-up support and training. Given the rapidly expanding use of social media, even in Nepal's remotest health posts, Bikash had the idea of setting up a Facebook group where health workers after attending the training can discuss problems and share lessons learned, and the S2HSP team can provide remote technical assistance. The site attracted more than 300 members at launch and membership continues to grow, using technology to provide low-cost, accessible solutions.

[www.facebook.com/groups/hmisnepal](http://www.facebook.com/groups/hmisnepal)



➔ Explaining e-reporting of DHIS data in Nepal. A cartoon by Yongjoon Park, S2HSP.

S2HSP has been able to cover some 300 health facilities with a package of support that includes provision of laptops, internet connection and a 5-day training package covering basic computer skills in addition to the use of the DHIS2 programme. To date, S2HSP has provided more than 200 laptops equipped with Ubuntu ([www.ubuntu.com](http://www.ubuntu.com)), a LINUX operating system, and Libre Office, at a cost of less than USD 500 per laptop. For many health workers, particularly those working in more remote areas of the country, the training and support they receive on the new e-reporting system, as well as their growing computer literacy, is opening new doors (see Box 8).

Based on the success of these activities pioneered with S2HSP, the Government of Nepal is financing the expansion of the e-reporting support package to an additional 500 facilities, representing approximately 20% of all Nepali health facilities. These combined efforts from the government and S2HSP will enable a total of more than 800 health facilities to report directly into DHIS2 on a monthly basis, and the Ministry of Health and Population plans to scale up e-reporting to the whole country by 2020. Meanwhile, German Financial Cooperation through KfW will incorporate learning from this initiative into ongoing programmes in the far west of Nepal and in the earthquake recovery areas.

As Mukti Nath Khamaal, former Section Chief of Nepal's HMIS says,

➔ *'A new generation of computer-literate health workers is coming – all now receiving training in DHIS2 as part of their medical education. The key is to convince policy-makers to take advantage of these improvements and to use the growing body of evidence for decision-making, and we are making good headway.'*

Yongjoon Park, a member of the S2SHP team, developed a cartoon which nicely illustrates the many benefits of electronic reporting for Nepal.

The strong commitment by government to this programme represents an important milestone. As Paul Rueckert, Programme Manager of S2HSP, observes, 'The government quickly became convinced that this is a good approach and are investing their own funds to scale up nationwide – this is always the best indicator of success.'

## ELECTRONIC HOSPITAL RECORDS TRANSFORM A TYPICAL PUBLIC HOSPITAL

A common feature of many hospitals in low-income and lower middle-income countries is a small, windowless room packed to the ceiling with paper records, poorly filed and rarely consulted. In Trishuli Hospital in Bidur Municipality, as in many areas that were badly affected by the 2015 earthquake, these paper records were lost or destroyed when the buildings collapsed. With the new electronic health record system in Trishuli, data are collected electronically and backed up regularly to servers off-site, and lost or damaged hospital cards can be reprinted at the touch of a button.

Electronic recording and management systems perform multiple functions and are designed to go beyond standard clinical data collection by linking a patient's diagnoses, medications and treatment plans, immunisations, radiology images, laboratory and other test results, as well as billing information. Over time, a rich patient history is created, easily accessible by authorised personnel, leading to more efficient, better-quality care for patients.

With co-financing from the Global Fund and KOICA, the S2HSP team is supporting the introduction and phased roll-out of the EHR system at Trishuli Hospital using an open-source hospital management software platform called Bahmni, which has been specially designed for low-resource settings (see Box 9). At the time of its introduction in Trishuli Hospital, Bahmni was already being successfully piloted in two private hospitals managed by the NGO Nyaya Health Nepal as part of a public-private partnership with the Ministry of Health and Population.

The S2SHP team customised this software to the specific requirements of a public hospital, demonstrating to the ministry how electronic records systems could support improved hospital management across the public sector. Trishuli Hospital will be the first fully computerised public hospital in Nepal.

When Dr Rueckert arrived in Nepal to lead the S2HSP programme, he brought with him a colleague, Mohammad Ullah, with whom he had worked on the introduction of a German-supported medical recording system in Bangladesh. This experience had brought home to them the importance of building management skills and digital capacities at all levels, as well as the need for continual, high-level advocacy efforts to build institutional and financial sustainability, and ultimately secure government budget allocations for the scale-up of digital approaches.

In Nepal's new federal system, hospitals will receive their budgets from different sources (i.e. municipality, province, central government as well as their own income) depending on their size and speciality. Part of the e-Health Unit's budget for the fiscal year 2018-19 will be used to support hospitals to lobby for funding to introduce Bahmni or a similar open-source electronic hospital management software. The essential criterion is that, whatever package is selected, it must be interoperable with the rest of the system and draw data from the registries (see Figure 6). This is a significant and positive outcome of the work of the S2HSP team over recent years, and demonstrates the high level of commitment by the ministry to building an interoperable digital health ecosystem.

Importantly, the EHR system used at Trishuli Hospital is designed to be interoperable with the DHIS2 platform. The monthly aggregate service delivery statistics are generated by the EHR system and, once approved, are sent electronically to the HMIS, saving considerable time of the statistician who previously entered huge quantities of data by hand, and improving both the accuracy and timeliness of reporting. Management dashboards that are tailored to the specific needs of hospital managers and senior clinical staff facilitate analysis of the available data and, together with orientation on their use, are helping to introduce and embed a culture of using data for decision-making at Trishuli Hospital.

### BOX 9. THE BAHMNI HOSPITAL MANAGEMENT SYSTEM

The Bahmni software platform provides an integrated, easy-to-use and flexible hospital management system that facilitates management and clinical decision-making by combining several products in an interoperable framework, including OpenMRS for management of patient medical records, OpenERP for inventory, billing and financial accounting, and OpenELIS, which is a laboratory information system software. Critically for low-resource countries such as Nepal, the system is easy to use with basic training and does not require high levels of computer literacy or even a constant internet connection. As with many open-source and interoperable software programmes, an active implementer community has grown up around Bahmni which shares best practices and constantly works to improve the product and make solutions available to product users.



## IMIS: ENABLING THE RAPID SCALE-UP OF SOCIAL HEALTH INSURANCE THROUGH DIGITALISATION

The Government of Nepal is committed to social health insurance as the principal means of reducing high levels of out-of-pocket health spending and achieving progress towards UHC. In support of this important commitment, the S2HSP team has played a catalytic role since 2015 in the introduction and adaptation of the Insurance Management Information System (IMIS) software, which has enabled the launching and rapid scale-up of social health insurance in the country (see Box 10). In customising the IMIS software for the Nepali context, an overriding consideration was ensuring that the software is interoperable with other digital health initiatives being used and/or planned.

Adapting the IMIS for Nepal shaped important decisions on the final design of the insurance scheme such as the contents of the insurance benefit package, illustrating how digital initiatives can accelerate progress in the implementation of major health financing initiatives. IMIS digitally handles multiple aspects of the insurance scheme, including enrolment of beneficiaries and policy renewal, filing and processing claims, and billing and reimbursement of health facilities (see Figure 7). IMIS functions as the backbone of the insurance system, and has enabled a rapid expansion of the programme since 2016 to over 1 million people across 33 (former) districts, representing some 10% of the population in the districts where the insurance scheme has been active for at least 6 months.

Nepal's social health insurance system was initiated as a voluntary scheme and foresees different payment mechanisms for different target groups: voluntary payments for informal sector workers, government subsidies for the poor, and a percentage of salary for those working in the formal sector. For those making voluntary payments, the contribution is a single annual payment per household, equivalent to around USD 25. Once enrolled, the insured do not pay cash at participating health facilities for any services covered by the insurance scheme and the hospitals are directly reimbursed by the Health Insurance Board. This is important for a scheme designed to enable access by the poor.

Subsidies for the registration fee of 100%, 50% and 25% are provided for ultra-poor, poor and marginalised groups respectively, based on a poverty card. The Government of Nepal has committed USD 15 million in the 2018-19 fiscal year for the subsidies, demonstrating strong commitment to universal coverage.

As a next step, S2HSP will support the government to design and introduce a new Unified Beneficiary Registry (UBR), similar to those of Malawi and Turkey.<sup>5</sup> The UBR will help to ensure that time and resources used to identify beneficiaries of the different health and social sector schemes are not duplicated. The UBR could also provide an excellent basis for a new patient registry (see Figure 7 above) which would contribute to the interoperability between these schemes.



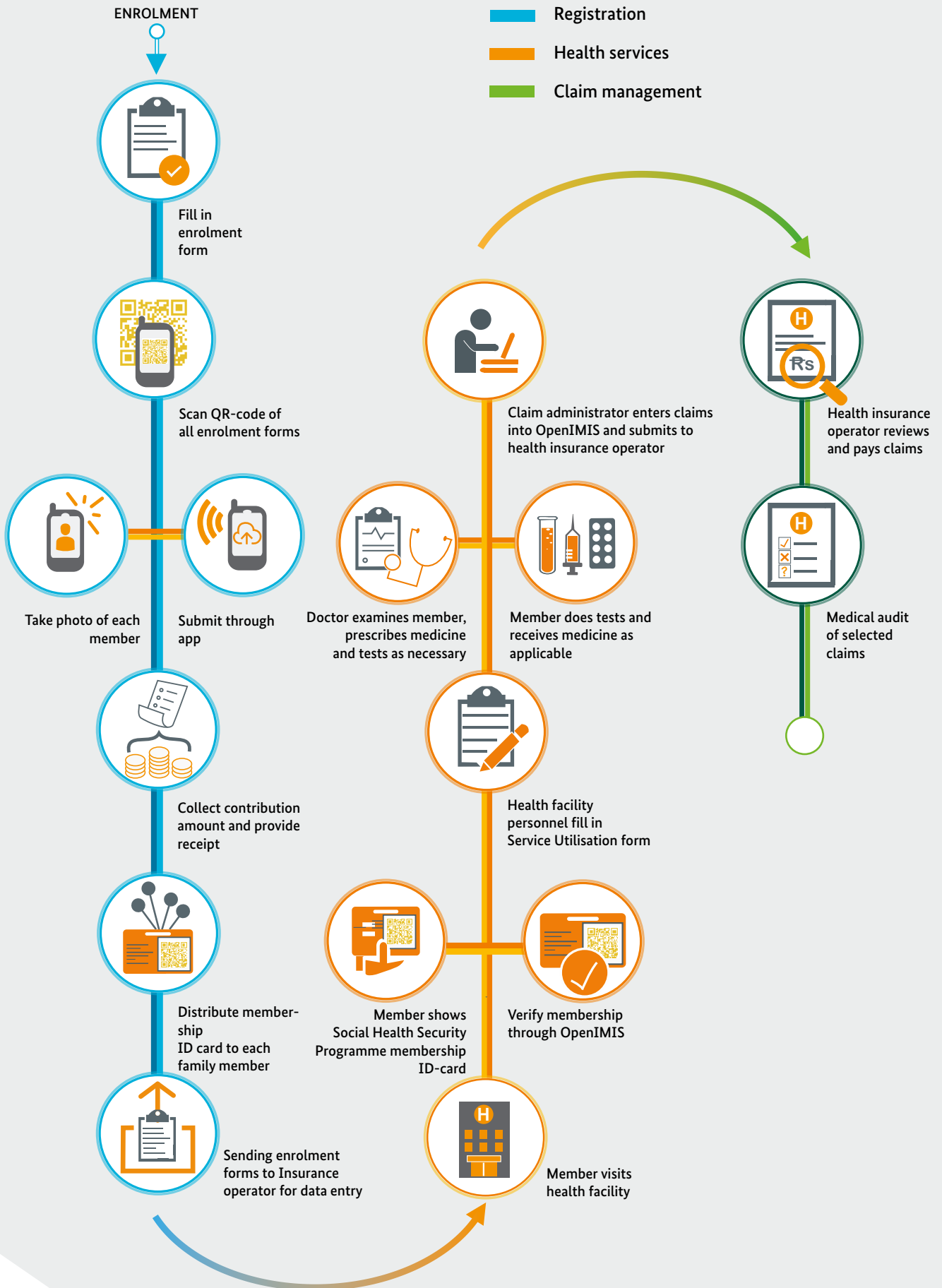
### BOX 10. AN OPEN-SOURCE SOFTWARE FOR THE MANAGEMENT OF HEALTH INSURANCE SCHEMES

The global OpenIMIS software platform is being developed as a collaborative effort between Swiss and German Development Cooperation and aims to foster an open-source solution for health financing schemes that is affordable, easy to manage, continuously optimised and interoperable with other ICT tools for health and social protection. This initiative aims to form a global community of practice focused on the open-source OpenIMIS software as a digital global good that supports the achievement of universal health coverage and universal social protection. In the OpenIMIS community, experts from a range of disciplines collaborate to develop and promote digital solutions that are open-source, affordable, easy to manage and continuously updated, as well as interoperable with other digital tools.

OpenIMIS is the first and currently only open-source software that links beneficiaries with service providers, as well as payers. The system is designed to manage complex interactions of a healthcare system, covering processes from enrolling beneficiaries to transmitting and processing claims and calculating provider reimbursements. See [www.openIMIS.org](http://www.openIMIS.org) for further information.

<sup>5</sup> For more information, please see this link to an article in *Healthy DEvelopments* on the German-supported [Unified Benefit Registry in Malawi](#).

**FIGURE 7. FROM REGISTRATION TO PAYMENT OF CLAIMS: USING IMIS FOR MANAGING NEPAL'S HEALTH INSURANCE SCHEME**



Nepal plays a major role in the global OpenIMIS community. The experience of customising and introducing IMIS in Nepal has made important contributions to the technological development of the OpenIMIS software, including a web-based dashboard, GPS coordinates for visualising coverage and definition of first service points for insured members for effective referrals. With support from the S2HSP team, Nepal will transition to the master version of the programme during 2018, with the aim of testing and supporting its further development.

The successful experience of adapting and introducing IMIS in Nepal has attracted attention from other countries. In March 2018, Nepal's Ministry of Health and Population hosted a high-level delegation from Cambodia, keen to understand how IMIS enables access to health insurance for the informal sector.

In Nepal, smart-phones or tablets are used to register households during door-to-door visits, taking and storing photographs of each household member that are linked with their details and entered directly into the IMIS system. In the absence of this digital technology, families would have to travel to the nearest town to join the scheme, taking photographs of each household member, which would be prohibitively expensive for poor families.

The IMIS software has a modular and interoperable structure that allows it to be adapted to the needs of different countries and settings and linked with other digital applications. When social health insurance is rolled out in Bidur and the surrounding municipalities, digital applications such as the EHR and e-reporting programmes will be linked with OpenIMIS, able to share and exchange data. All digital programmes will use the same identification codes for patients, facilities and services, making Trishuli Hospital one of the earliest, successful examples of interoperability in Nepal's health system.

## INTRODUCING MOBILE SOLUTIONS FOR EQUIPMENT MAINTENANCE AND REPAIR

Poor quality and non-functioning equipment in public hospitals in Nepal remains a major barrier to accessing services and has contributed to low expectations of the health system among the population. High levels of dissatisfaction have contributed to increasing use of private facilities, including by the poor (CBS, 2011; Gurung & Gauld, 2016). When new equipment is supplied, the suppliers provide a one-year warranty for its repair. Beyond this timeframe, the lack of reliable data on hospital equipment, financial constraints and weak biomedical engineering technical capacity in the Ministry of Health and Population mean that hospital equipment is rarely serviced or repaired.



→ High-level Cambodian delegation visiting Nepal.

From 2011 to 2014, with support from KfW through the Nepal Sector Programme for Health and Family Planning, the Ministry tested a new and innovative approach for the corrective and preventive maintenance of equipment, which was introduced in the Mid-West and Far-West regions, covering 24 of Nepal's 75 districts.<sup>6</sup> This initiative included all district facilities as well as zonal, sub-regional and regional hospitals.

The pilot introduced a public-private partnership model for the preventive maintenance and repair of a defined range of complex medical equipment, contracting private engineering teams based in each region. The software PLAMAHS (Planning and Management Assets in Health Services) was introduced and adapted to the needs of Nepal, allowing the ministry to manage equipment inventories, to maintain a central, up-to-date log of all equipment serviced and repaired, and to automatically generate invoices payable by the ministry to the contractors for the maintenance work carried out.

The three-year pilot programme raised functionality of the equipment from an initial 64% to 99%, and in July 2015 the Ministry of Health and Population took the decision to scale up the approach nationwide, with technical cooperation provided by KfW. A similar outsourcing approach was adopted for the national scale-up of the programme, and the selected maintenance contractors started working in the field in 2017 with a total of 60 qualified engineers and technicians stationed in eight strategically located workshops.

With KfW support, a web-based version of PLAMAHS is now in the final stages of development, which will allow the engineers to access data and enter information about the state of the equipment, and any repairs undertaken

<sup>6</sup> At the time of the pilot, the country had an administrative system of districts which has since been replaced by the federal system of municipalities.

while in the field. The web-based version is open-source and uses a standard data structure, which allows for the exchange and sharing of information with other digital applications, thereby contributing to the interoperability of Nepal's digital health system.

After the first six months of implementation, the results are encouraging, showing an improvement of equipment functionality to over 90%. Although the 4-year, nationwide programme is in its early stage, the Head of Office at KfW Nepal, Mr. Shanker Pandey, is proud of these achievements, stating:

➔ ***'This has caused a real paradigm shift – a turnaround in the way that equipment is maintained in Nepal. It is building the capacity of the government in private sector partnerships and engagement, management of multi-year contracts, and developing the bio-medical engineering market in the country.'***

## **PUSHING THE BOUNDARIES OF INTEROPERABILITY**

As well as investing in digital solutions that address current priorities and ensuring they contribute to the vision of an interoperable digital health architecture, it is important to think ahead and to push the boundaries of interoperability by demonstrating how digital technologies could be deployed to solve larger and more complex challenges. With financing from the Global Fund, the S2HSP team is in the process of setting up an Interoperability Lab, modelled on the successful Standards and Interoperability Lab for Asia which was set up in 2017 by AeHIN in partnership with the University of the Philippines and ADB. The S2HSP Digital Health Team Leader, Saurav Bhattarai, explains,

➔ ***'The lab will demonstrate the benefits of linking specific digital initiatives on behalf of government partners, bringing data from different systems seamlessly together to help decision-makers see the bigger picture. Our first priority will be to demonstrate how to use the facility registry across different information systems, and our second will be to support the different electronic patient-tracking systems used by the vertical disease programmes for TB, malaria and HIV to develop and use a single patient identification mechanism.'***

The lab will provide a space – and some limited investment – for creative thinking, bringing together experts with diverse skills across health systems and healthcare delivery and digital development and programming. This will stimulate innovation and the creation of initiatives that can be tested on a small scale, improved and retested in an iterative cycle that will improve the quality of Nepal's digital health investments.

Although much work remains to be done in linking the many different digital health initiatives in Nepal, this chapter has described some of the important ways in which German Development Cooperation is supporting digitalisation in Nepal's health sector. In addition to the introduction and roll-out of digital information and management systems that will be critical for Nepal's health sector reform programme, the Nepali-German Health Programme is laying strong foundations and providing an overarching framework for the continuous development of interoperable digital health initiatives in the country.

# Key insights

The Government of Nepal has embarked on a journey towards the creation of an interoperable digital health ecosystem, and is making excellent progress despite the considerable challenges. This chapter responds to the study's guiding questions in two ways: first, by highlighting how digitalisation is strengthening Nepal's health system; and second, by providing insights based on Germany's support for digitalisation in Nepal that are relevant for health sector managers and decision-makers, as well as development partners supporting digital health, in other low- and lower middle-income countries.

## HOW DIGITALISATION IS STRENGTHENING NEPAL'S HEALTH SYSTEM

Nepali-German cooperation for digital health is supporting the Government of Nepal to mobilise resources and work collaboratively to analyse gaps and prioritise health system needs that can be addressed through the intelligent adoption of digital technologies. By developing management and technical capacities in digital health, and working to ensure greater harmonisation and alignment among digital health partners and initiatives, German Development Cooperation is enabling the adoption of digital solutions that are interoperable and scalable.

Crucially, this is laying the foundations for the continuous adoption of digital technologies in the Nepali health sector – with or without development partner support – leading to more sustainable health system improvements and reform. Digitalisation is enabling the achievement of health sector goals and objectives in Nepal through:

### **Introducing greater efficiencies and reducing waste:**

Data need only be entered once and, after being validated, are available to authorised users as well as other digital applications through Application Programme Interfaces. The roll-out of electronic reporting to Nepal's Health Management Information System (based on the DHIS2 platform) is improving the availability of accurate and complete health data. Interoperability between HMIS and the electronic health records (EHR) system at Trishuli

Hospital is reducing duplication and error and saving valuable staff time. Management dashboards are being introduced which facilitate analysis that can highlight gaps in access to and provision of services, and enable a more efficient allocation of resources.

**Increasing accountability and transparency:** Digitalisation is improving the accountability of resources, both financial and human. For example, OpenIMIS enables the efficient and transparent settlement of insurance claims by generating invoices and payments to health facilities that are matched to the services provided. The EHR system links data on the medicines coming into and out of the pharmacy with the number and type of services provided to clients as well as reported stock-outs of medicines, shining a light on inefficient practices and possible malpractice.

**Improving continuity and quality of care:** Digital applications, such as Trishuli Hospital's EHR system, enable more comprehensive and better quality of care to patients in the public sector by providing accurate and linked patient data, including a patient's care history. Medical staff are able to make more informed decisions about a patient's care, and eliminating unnecessary repetition of diagnostic services and medication reduces waste. Patients who might be lost to follow-up care, such as those suffering from TB or living with HIV, can more easily be traced. This results in a better quality of care, leading ultimately to better health outcomes.

**Strengthening hospital management:** The roll-out of the EHR system in Trishuli Hospital quickly highlighted gaps in management decision-making, leading to the introduction of a new (non-clinical) hospital manager, trained in the use of the information and analysis provided by the digital applications. The success of this approach convinced the Nepali Ministry of Health and Population to introduce non-clinical hospital managers in other public hospitals of a similar size, demonstrating the longer-term effects of digitalisation on the health system, not only to make processes more efficient but to improve the underlying structures themselves.

**Empowering decision-makers through data:** Digital applications are empowering individuals by enabling new insights and analytical possibilities through the provision of reliable information and analysis, tailored to the needs of stakeholders at different levels of the health system. This is particularly important in the context of the devolved responsibilities for budgeting and planning health service delivery at the local level. For example, through DHIS2, data and analysis are easily accessible by the mayors of the new municipalities and other local decision-makers, developing their capacity to oversee and effectively manage local health services, and strengthening the health system from the bottom upwards.

## HOW GERMAN DEVELOPMENT COOPERATION SUPPORTS ITS PARTNERS IN DIGITALISING THEIR HEALTH SYSTEMS IN AN INTEGRATED AND SUSTAINABLE FASHION

The Nepali-German Health Programme is taking a systems approach to digitalisation in the health sector, demonstrating how digitalisation can strengthen health systems and accelerate health sector reform in Nepal, through:

- optimising and strengthening existing digital systems and supporting the introduction of better digital techniques
- working with government partners to introduce and scale up a digital social health protection management system, demonstrating that digital solutions can operate at scale and how they work to strengthen health systems, and
- developing digital capacities, and knowledge and understanding of digital health among key health sector stakeholders, who themselves become strong advocates for the potential of digitalisation to empower health sector decision-makers and drive health reform processes.

This important work has enabled some significant breakthroughs in a number of critical areas for Nepal's digital health development:

**Digital governance and regulatory structures:** The Government of Nepal is firmly in the driving seat of the country's digitalisation process and is rightly prioritising the establishment of a framework to govern 'digital Nepal'. In August 2018, the Ministry of Communications and Information Technology published an online summary of the government's 2018 Digital Framework. The new framework identifies 80 digital initiatives across eight sectors including the health sector, and will include important issues such as data security and privacy. As a result of S2HSP's sustained coaching and support, the Ministry of

Health and Population is playing an active part in the development of the framework, deftly showcasing the digital knowledge and expertise it has developed in recent years.

**An overarching vision for a digital health ecosystem:** Such a vision is essential for developing a national digital health strategy, and for enabling and guiding its implementation. Nepal's national e-Health Strategy (2017) articulates a clear vision for how digitalisation will 'facilitate the delivery of equitable and high-quality healthcare services to enable all Nepali citizens to enjoy productive and quality lives.' This will be achieved through fostering partnerships and collaboration, and striving for cost-effective, standardised, interoperable and user-friendly digital health solutions and applications. OpenHIE provides a framework for action, helping to prioritise investments when resources are limited, to select the most appropriate digital interventions, and above all to tackle digital fragmentation by ensuring that new digital initiatives are interoperable with one another and contribute to the development of the overall digital ecosystem.

**The intelligent adoption of digital solutions which answer real health system challenges:** Digital solutions should address the most urgent challenges on the ground. For Nepal, electronic reporting was an immediate priority, addressing the need for more accurate and complete health information from across the country, and overcoming challenges with the collection, storage and analysis of data. Social health insurance was a further priority to support progress on universal health coverage and reduce high out-of-pocket health spending. The intelligent and informed adoption of interoperable and open-source digital solutions can produce rapid and visible results for relatively low initial investment. As Saurav Bhattarai of S2HSP says,



*'It is not about the most advanced technologies such as, for example, clinical decision support systems, but about helping countries to use the technology at their disposal in a more efficient and interoperable way.'*

**Allocating sufficient resources for digital capacity development:** The S2HSP team have prioritised the development of digital capacities among key health system stakeholders through a combination of mentoring and coaching, strategic and technical advice, and peer-to-peer learning. These approaches have proven effective in enabling government partners to participate actively in negotiations, and to take the lead in Nepal's digital health development, laying strong foundations for the further development of digital capacities throughout the health sector. Nepal is implementing the first ever open-source software for managing national social health protection programmes (OpenIMIS), and Nepal's invaluable contributions to the development of this programme will benefit social protection programme implementers everywhere.

### **Making time to continuously reflect on progress:**

Since the start of S2HSP's work on digital health, the team have continuously made time to step back and reflect on progress with their Nepali partners, asking important questions, such as: Are we on the right track or is there a better way of doing things? What can be learned from the experience of other countries? How can existing technologies and approaches be better harnessed to address Nepal's most urgent health system challenges? While dedicating often scarce resources to reflection may not show immediate results, it enables course correction and learning through implementation, while helping to build digital capacities and strengthen leadership and ownership of the digital health strategy.

Nepal is at a pivotal moment in its digital health development. The Nepali-German Health Programme is acting as an effective catalyst, bringing together the many different digital health processes and initiatives into a more coherent and integrated programme. The Programme Manager, Dr Paul Rueckert, likes to use the metaphor of a newly formed orchestra to illustrate the role of S2HSP in supporting Nepal's digital development. The Ministry of Health and Population is the newly trained conductor, while the different digital initiatives are likened to the different orchestral sections, such as the woodwind, brass and strings. Some of the instruments are still missing but harmonies are improving, and the orchestra is learning to play the same melody. One could also say that the OpenHIE framework is providing the score, which guides the musicians.

S2HSP, along with other development partners, is playing a critical role in laying strong foundations for Nepal's continuous digital development, investing time and resources to develop the capacities of the conductor so that he or she can support the musicians and one day take on an entire symphony. As the case study illustrates, the Nepali government and partners are well on the way – and momentum is building – for the creation of a more interoperable digital health ecosystem.

# Peer review

Prior to publication, each case study in the German Health Practice Collection is reviewed by two independent peer reviewers. Dr Alvin Marcelo, Executive Director at AeHIN and Dr Mark Landry, Regional Advisor, WHO Regional Office for South East Asia, were requested to respond to the following two questions: a) How effectively does the case study answer its two guiding questions? and b) What new knowledge has been generated through Germany's support to digitalisation in Nepal's health sector that could be useful for other countries seeking to digitalise their health systems?

Both reviewers felt that the case study responds effectively to the study questions and makes important contributions to the knowledge base for how development partners can support government and other partners in low- and lower middle-income countries to develop cohesive and interoperable digital health systems.

## A COMPREHENSIVE REVIEW WHICH LINKS PRACTICE TO THEORY

In the context of an ever-increasing range of digital technologies developed to address health system challenges and strengthen health service delivery, the reviewers felt that the case study provides a comprehensive presentation of the many dimensions of digital health. The study explains complex theoretical concepts through an analysis of pragmatic, real-world examples drawn from Germany's support to digital health development in Nepal. It addresses all components of effective e-health action, while being anchored in seminal guiding frameworks such as the WHO-ITU normative approach (WHO-ITU, 2012) and recent guidance from AeHIN and ADB (e.g., Drury et al., 2018; Stahl et al., 2016).

The reviewers also highlighted the following key aspects of the German Development Cooperation approach to digital health development.

## CAPACITY DEVELOPMENT IS RIGHTLY AT THE CENTRE OF GERMANY'S APPROACH

The German Development Cooperation approach to supporting digitalisation in the health sectors of low- and lower middle-income countries such as Nepal focuses on the provision of intensive coaching and mentoring with the aim of strengthening digital health programme management capacities and institutional readiness. This approach provides a blueprint for other countries in meeting the ongoing demands of strengthening an increasingly interoperable digital health environment. As one reviewer states,

→ *'GIZ does an excellent job transferring knowledge and building stronger skills and competencies with counterparts, and Nepal's digital health is on a faster and steeper trajectory with the support of German Development Cooperation, working together with other development partners such as WHO, DFID and AeHIN.'*

Germany has been able to capitalise on its long experience of supporting health systems strengthening and digitalisation to judge when and how to provide capacity development support so that government partners are enabled to take an active lead in developing their digital health strategies and systems.

## A MULTI-PRONGED APPROACH

The reviewers agree that Nepal has undertaken a multi-pronged approach to developing strong foundations for digital health development in the form of strategy development and action planning, digital governance, and the development of an appropriate digital architecture. It has achieved this while also effectively scaling-up and improving core digital health investments, such as the DHIS2 platform for the national health management information system. German Development Cooperation has worked side by side with government to strengthen institutional capacity, mitigate risks, address challenges and issues as they arise, keeping the community of stakeholders and partners engaged throughout.



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