HISP Centre Strategy Update

2023-2025

> **Mission Statement**
> We support countries and regions to strengthen their information systems and information architecture in a sustainable way to achieve the SDGs in the health sector and beyond. We pursue this goal through DHIS2 platform development, capacity building, action research, local ownership, and innovation sharing through the global community.

The worldwide expansion and adoption of DHIS2 drives this update to the strategies of the HISP Centre. It builds on the [HISP UiO Business Plan for DHIS2 Core Resources](#) (2016-2021) and the previous [HISP UiO Strategy Update](#) (2019-2022).

1. HISP Network Principles and Approaches

1.1 HISP Centre and the HISP network

The HISP Centre at the University of Oslo manages development and maintenance of the DHIS2 software, performs research related to DHIS2 and information systems, provides implementation guidance and products to support best-practice DHIS2 configurations, designs and creates DHIS2 training programs and informational materials, and manages global DHIS2 projects. In addition, the HISP Centre plays a coordinating role in the global [HISP network](#), including collaborating with HISP groups on regional and country-level projects and capacity building, and establishing a set of general principles to guide the work carried out under the HISP umbrella.

This strategy document is written by the HISP Centre with input from the HISP network, and is intended to serve as a guide for the HISP Centre's priorities and how we collaborate with the network of HISP groups to deliver on our mission. Individual HISP groups may also have their own strategies that support, build on, or diverge from this document depending on their local context and goals.

1.2 Underlying HISP Principles

HISP groups are vital contributors to our overall mission. The collaboration between the HISP Centre and HISP groups is based on and organized through values-based principles of solidarity and collaborative behavior, based on the Scandinavian participatory design tradition, which support the creation and maintenance of DHIS2 as a digital public good and feed innovations and knowledge back into the community. This collaboration is formalized through a [memorandum of understanding](#) (MoU) that elaborates our underlying principles. These principles include prioritizing local ownership and capacity; building sustainable and resilient systems; supporting research and innovation; promoting transparency, reciprocity, and trust; and a commitment to produce and share our work as a free and open-source public good. A full list of these principles can be found in Appendix 1.

Capacity building is a core principle that underlies all HISP work, as it is essential to sustainable country ownership of and innovation with DHIS2 systems. The HISP mode of capacity building goes far beyond DHIS2 Academy and in-country training courses to include academic partnerships, action research, networks of innovation and knowledge sharing, direct country support, and core team strengthening through an apprenticeship model. This model is explained in more detail in Appendix 2.

We also recognize that the increased scale and scope of DHIS2 deployments, and in particular the rapid growth in collection of potentially sensitive individual-level data, have led to additional ethical considerations and challenges related to privacy and security that extend beyond the list of principles enumerated in our MoU. We have drafted the following statements of principle to help guide us in our work as we address these concerns.

1.2.1 Ethical considerations

As developers and implementers of the world´s largest health information system we acknowledge a certain level of responsibility to the populations whose data are recorded into DHIS2 systems. Health Information Systems facilitate the collection and use of information to improve health services and provide good health care to isolated populations. Unfortunately, like any technology, if used maliciously they can also play a role in mass surveillance, anti-immigrant violence, minority prosecution, health-related stigmatization, and other human rights abuses all over the world. As maintainers of an open-source software project, the HISP Centre cannot control or limit the use of DHIS2 for whatever purposes people decide to apply it to. However, the HISP Centre can decide which DHIS2 projects we are directly involved in, and influence how DHIS2 is implemented in those cases. In response to these ethical challenges, we will pursue two broad lines of action to ensure ethical considerations are institutionalized in the DHIS2 software and in our implementation practice:
- We are committed to strengthening our internal mechanisms to evaluate potential new DHIS2 features and implementations from an ethical standpoint, to always consider how

a new feature could potentially harm people, and to document and address any privacy or security concerns related to all the work in which we are involved.
- We will explore different software licenses and other legal or policy levers which could help to protect the freedom – and fundamental human rights – of the many people impacted by the use of DHIS2.

1.2.2 Security and privacy

The digitization of health data through DHIS2 involves expanding security and privacy risks. These risks are not necessarily related to the DHIS2 platform itself but embrace the complexity of organizational, technological, regulatory, and ethical aspects of security and privacy within DHIS2 implementations. To address and mitigate these risks, we will strive to work according to the following principles:
- Simplicity: with respect to the growing complexity of the DHIS2 ecosystem, we promote robust, simple, and secure software design patterns and organizational practices.
- Transparency: we adhere to the DHIS2 vulnerability disclosure policy and have open and trusted communication with our users, security researchers, and media.
- Compliance: we maintain a matrix of applicable security and privacy standards and advise our users on the implementation of local regulatory requirements.
- Knowledge sharing: we facilitate sharing best practices and encourage the reuse of secure technologies in the DHIS2 community.

1.3 The HISP Model

The HISP model is a three-legged approach where software development, capacity building and action research are all equally important and inter-related activities which are carried out in collaboration with local partners and with a high degree of focus on good governance and building trust. This has been described as the success formula for DHIS2 growth and the sustainability of DHIS2 systems and implementations. We will use this model in the following section to frame how we will carry out activities that support our strategic priorities. It is important to note that while these are listed as separate areas of focus, the activities described within them do not happen in isolation. Instead, they enable and contribute to each other. This mutually reinforcing and iterative relationship is illustrated in Figure 1.
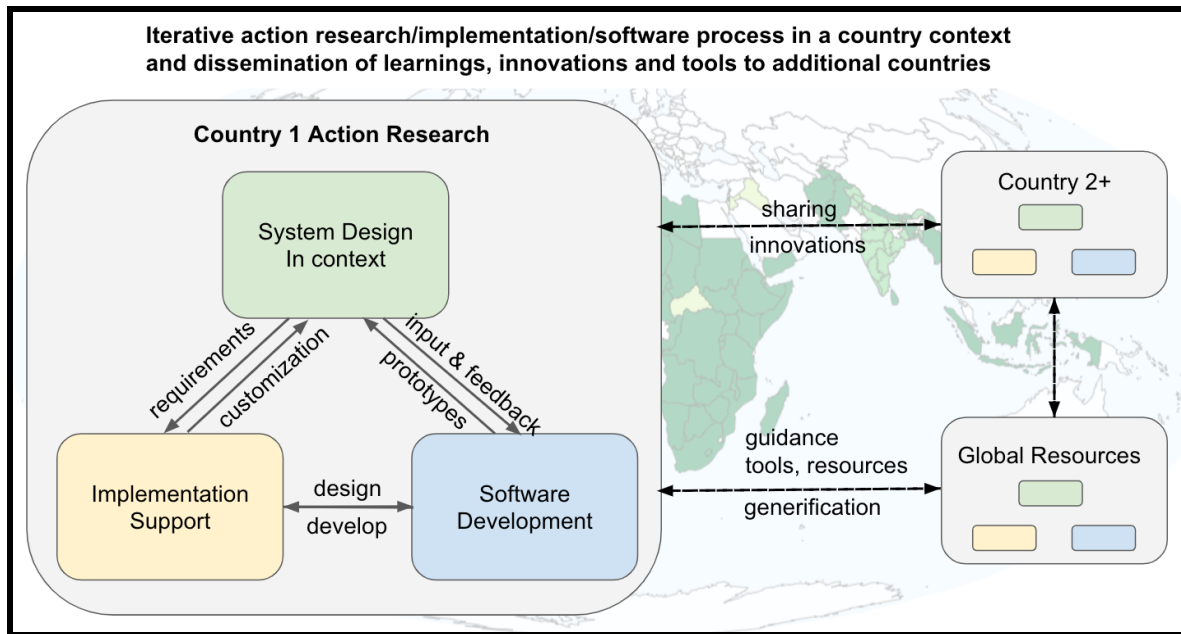
Figure 1: The HISP model of interrelated Action Research, Capacity Building/Implementation Support and Software Development activities.

Action research is an integral part of the DHIS2 project. By action research, we mean exploring real-world problems and developing solutions in a local context, generating knowledge about what elements of the solution are contextual vs. generic, and transforming the generic elements into frameworks that can be shared globally at the same time as they inspire local innovation and adaptation in other countries. These processes of local problem solving and generic platform development occur in parallel, forming a cycle of innovation, country-to-country sharing, and feedback between local stakeholders and the core DHIS2 team. HISP researchers also investigate information systems and related concepts, such as Digital Public Goods, that can help increase understanding of these systems and their use. Research is also a core activity of HISP groups, and the collaborations between the HISP Centre, HISP groups and academic partner institutions in low- and middle-income countries contributes to building DHIS2 capacity and supports the long-term sustainability of DHIS2 systems.

Capacity building is included in all priority areas, and is also a means to achieving them. As described above, the HISP capacity building approach cuts across research, implementation support, training, network-building and communications activities. The HISP Centre coordinates our global work on capacity building–including designing DHIS2 Academy curricula, documentation and other informational and training materials–and builds HISP group capacity on specialized topics. At the same time, HISP groups build and reinforce country capacity by providing regional Academy and in-country training, and offering hands-on learning through an apprenticeship model, instead of simply providing technical support. The HISP groups' sustained engagement as long-term partners of the Ministry of Health helps move countries along the maturity path: DHIS2 countries are not simply deploying DHIS2 as a product, but building local access to data and the ability to use it.

Software development is a foundational, ongoing activity to continue to maintain the stability, performance and security of the DHIS2 platform in the face of an ever-growing worldwide user base and increasing performance demands, and to expand the platform functionality to meet new country and partner requirements in health systems, which are prioritized through a transparent roadmap process that drives our biannual release schedule. This development cycle is closely linked to action research and implementation, which help identify and analyze local requirements through a user-oriented design practice, field test and provide feedback on new features, and share local technology innovations for potential inclusion into the core DHIS2 platform. The increasing use of DHIS2 in new domains beyond health–such as education, logistics and climate–also leads to new development needs. The value proposition of developing these features within the DHIS2 platform is that they also strengthen the platform for health systems, maximizing investments through the ongoing work of a consistent software team.

Over time, these combined action research, capacity building and software development activities form an iterative loop of local innovation (through participatory design and use) and global product development to support the evolution of the generic DHIS2 tools. (see Figure 2)
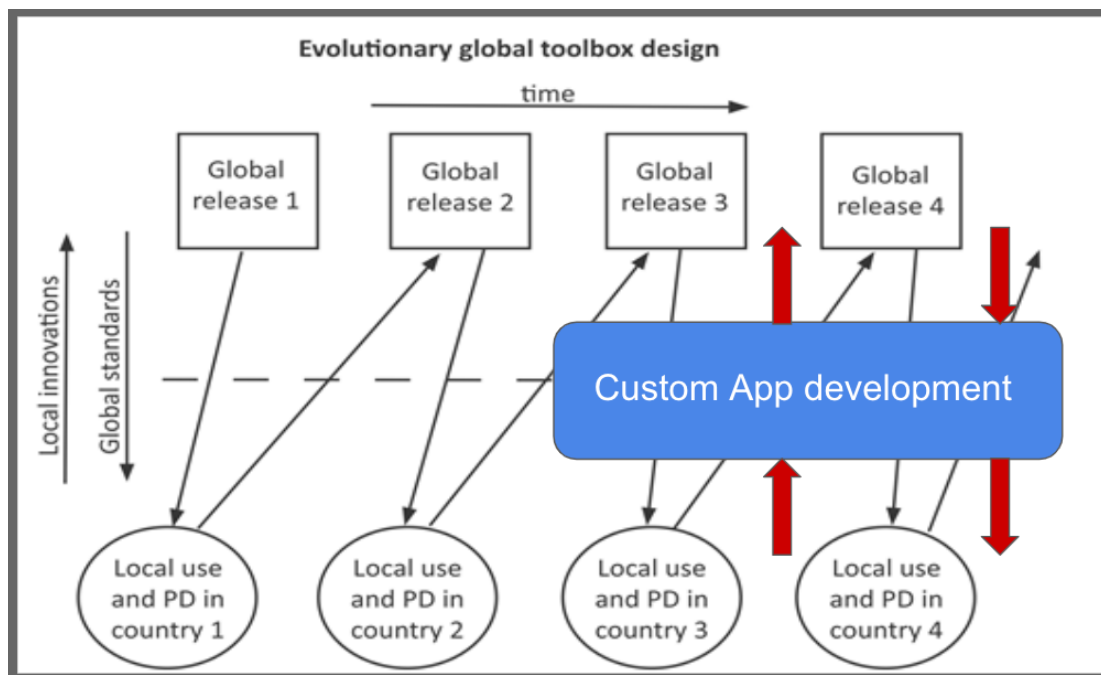

Figure 2: Distributed development model of distributed participatory design (PD) with local-global feedback loops to optimize global public goods.[1]

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[1] Titlestad, O.H., Staring, K. & Braa, J (2009). *Distributed Development to Enable User Participation: Multilevel design in the HISP network*. Scandinavian Journal of Information Systems, 21(1). Available at: https://aisel.aisnet.org/sjis/vol21/iss1/3.

2. Lessons learned & challenges from 2019-2022

2.1 Lessons learned from the 2019-2022 strategy

No discussion of our work over the previous three years can avoid the central importance and impact of the **COVID-19 pandemic**. With the global spread of this disease in early 2020, much of our planned and ongoing work was immediately put on hold, as the HISP network pivoted, at both a global and country level, to helping countries respond to this urgent crisis. Thanks to the support of our donors, we were able to reprogram some existing funding and acquire additional funding to support development and deployment of COVID-19 surveillance and vaccine delivery systems in 59 countries (see Figure 3), the development of global guidance and tools, and the pivot from in-person to online capacity building, implementation support and research activities. This experience demonstrated the resilience, flexibility and strength of the HISP approach and the DHIS2 platform.
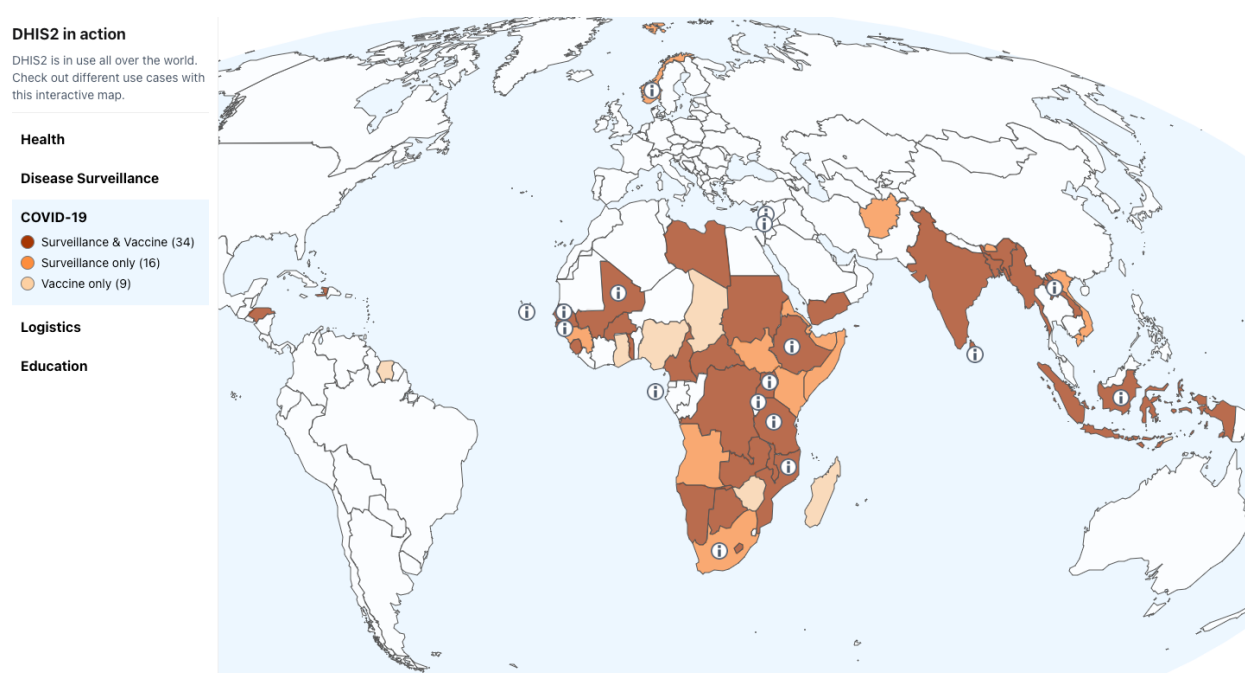

Figure 3: Global scope of DHIS2 deployments for COVID-19 surveillance and vaccine delivery as of the end of 2022.

Our work on COVID-19 also strengthened the HISP organization and DHIS2 software. In particular, the distance between Oslo and the HISP groups disappeared overnight once everyone was working remotely, leading to closer collaboration, more frequent joint meetings, and more opportunities for knowledge sharing and capacity building within the HISP network. The DHIS2 software, particularly the Tracker and Android applications, were pushed well beyond its previous limits, and demonstrated that it is able to perform reliably at scale. The pandemic also showed us the critical importance of integration and interoperability in specific

country use cases, reinforcing the importance of designing DHIS2 as a platform for extensibility. We carry these learnings forward in our current strategy.

The previous 3-year strategy for the HISP Centre was titled "A Focus on Data Use and Country Health Information System Strengthening" and included four areas of focus: 1) Data quality and use at the district level, 2) Improved alignment between DHIS2 products and data use practices in the field, 3) Prioritizing robust systems over scope broadening, and 4) increasing capacity both within the core DHIS2 team and country teams. While many of the activities planned in these areas were disrupted by the COVID-19 pandemic as described above, the learnings from the work we did achieve in them has informed the drafting of this 2023-2025 strategy.

Two of the four focus areas in our previous strategy were related to **data use.** From 2020-2022 we created a full-time position in the HISP Centre research team responsible for coordinating our data use action research efforts, held bi-weekly meetings with HISP groups and researchers to discuss ongoing work and findings, engaged in local action research projects, designed tools and guidance to support data use (including collaborating with external software partners to address problems of local denominator data) and published a literature review assessing the state of data use at a high level. Through this work, we identified several barriers to data use, both structural and technical, and developed interventions to address this, such as the Districts of Excellence. Some specific lessons learned include:

- Approaches to calculating population denominators for use in routine health information systems: Triangulation of sources to assess the quality and reliability of the denominators, identification of gaps in documentation in using denominator data at different levels/for different purposes, widespread reliance on census data and subsequent estimates for population data with few examples of more more precise or advanced methodologies at national scale.
- Health Information Systems can highlight exclusion/marginalization from health care services: Using DHIS2 to compile family and household information from the village upward can create a baseline for catchment population for monitoring service provision, reducing the need for parallel systems. Digital registers can enable data entry from the point of care and simplify visualization of areas with poor coverage and high dropout rates. Identifying the under- and non-served is only one step: cultural, social and health service barriers also need to be overcome.
- Use of data: Organizational factors are the biggest challenges due to the lack of guidelines on use of data at any level, little demand for data overall, and an absence of feedback mechanisms able to return valuable information to data collectors and managers. Technical evaluation shows that DHIS2 is adequate for the purpose, but requires a level of engagement from all fronts to review metadata to make it relevant to the context. Parallel systems do not necessarily feed into the knowledge of the districts or DHIS2, leaving a gap in triangulation possibilities. Human factors are intrinsically linked to the lack of digital competencies and knowledge of data management and interpretation. As a result, the lack of exposure to data and analysis leads to low data

use. A switch to robust use of data does not occur overnight and needs to be continuously nurtured with supervision, guidelines, and training. In particular, the empowerment of local knowledge provides more strength to the contextualization of the interpretations and ensures continuity. All this is irrelevant if there is no engagement and support from the national authorities.

Data use remains an area of focus in this strategy, and our work in this area will be informed by the results of our work from the past several years.

In some ways, our COVID-19 work supported our goal of prioritizing **robust systems** (though the planned limitation in scope-broadening needed to be abandoned to respond to urgent country needs). The software team delivered significant performance improvements, and through online, real-time collaboration with HISP groups, developers and implementers were able to quickly identify and deliver fixes for breaking problems in critical country systems. The need for custom applications and extensions also contributed to our goal of improving the extensibility of DHIS2, with many improvements to the platform architecture, developer tools, and the App Hub. However, on the implementation side, the pandemic identified specific gaps in country capacity to sustain robust systems, such as a generally low capacity for server administration and weak security protocols. We have already started to address these issues, and will build on this work further in this coming period.

Our final area of focus, **capacity building**, was the most disrupted by the COVID-19. While online courses had been a component of our Academy training approach prior to the pandemic, its onset forced a sudden, radical change in the methods available to the global team and HISP groups to provide training and implementation support. Our digital pivot helped us continue to offer live Academy courses and in-country training and support through the exploration of new online tools and platforms, which brought some benefits and some drawbacks. Some significant achievements include the launch of an updated and improved series of DHIS2 Fundamentals online courses, and a doubling in the size of the online DHIS2 Community of Practice. During this period we also completed a model for country maturity assessment that is intended to help identify needs for capacity building to strengthen core teams, which will help guide the capacity building activities in this strategy.

2.2 Strategic challenges following the COVID-19 pandemic

HISP increased its budget by 50% during the pandemic by quickly supporting 59 countries with COVID-19 surveillance and vaccine delivery systems. To meet the demands of this work, HISP groups grew dramatically in size. Now that the pandemic appears to be moving toward its end, new projects and financing are necessary to make use of this increased capacity. HISP received increased attention beyond the health domain during the pandemic, and we see that there is significant demand for digitization competence in the public sector in general.

As mentioned above, the long-term success of HISP is based on achieving impact through action-research-based development and strengthening of national health information systems in the Global South. This will continue to be a priority, with an increased focus on system strengthening, shared solutions, and digitalization across health programs. The COVID pandemic illustrated the importance of having a solid foundation of competence and flexible digital platforms that can be adapted to new challenges. In a challenging economic moment, both for global health and international development in general, it is critical to get global partners–especially those with health-program-specific investments like vaccination, HIV, TB, and malaria–to work together on smart investments in shared digital solutions for the health sector. Due to our experience with integrated health information systems, HISP can play an important role here.

In parallel, with increased HISP capacity and demand, it is natural for us to identify other public domains where our capacity and competence can be leveraged and improved. There is a clear and pressing need to strengthen digitalization competence in the public sector in LMICs. This general digitalization capacity must also be further developed in the HISP network, with the ultimate aim of transforming HISP groups from IT experts to digitalization partners. There is a lack of obvious sources of funding (from donors, investors, or otherwise) to support this kind of capacity building.

HISP has already had some success in this approach with digitization of national education information systems. Climate and health is another relevant area, and we also now see a clear focus on digitalization of monitoring of country progress toward SDGs (such as climate indicators), which involves demanding work across public domains.

Close collaboration between researchers, implementation experts and developers is essential in order to build more general digitalization capacity in HISP groups and countries in the Global South. It will be especially important to build capacity in research-based implementation and action-research within the HISP groups to support this work.

3. Priority Areas & Activities for 2023-2025

While our overall mission remains constant, we have identified the six high-level priority areas to help structure and focus our work over the next three years, which will be supported by cross-cutting activities carried out through the HISP model (Figure 4). These priority areas are explained in greater detail in the "key activities & strategies" section below.

3.1 Priority Areas

- **Strengthen in-country capacity:** Strengthen, promote and share the HISP model for building country and regional capacity to build mature and sustainable national information systems.

- **Architecture & Interoperability:** Support locally driven architecture, direct our efforts towards realizing the use value of integration, and facilitate and influence health information system architecture and interoperability.
- **Data Use:** Facilitate increased national and sub-national data use as well as building analytical capacity.
- **Health & Beyond:** Develop mature approaches to leveraging DHIS2 to support SDGs in and beyond the health sector. Respond to country demand to explore the use of DHIS2 as a platform for cross-sector e-governance.
- **Innovation Sharing:** Facilitate local innovation, community collaboration, and reuse.
- **Communicating Results:** Improve evaluation, documentation and visibility of DHIS2 and HISP impact**.**

Figure 4: Mapping priority areas across the three pillars of the HISP model

3.2 Key Activities & Strategies

To operationalize our strategic areas of focus, we have identified key activities to be carried out or coordinated by HISP UiO. The activities and their corresponding goals are grouped by priority areas and further subdivided into software development, capacity building and action research

components where relevant. The table below summarizes these key objectives, activities and indicators in each of these areas, which are explained in detail in the following subsections.

Software	Capacity Building	Action Research
Strengthen in-country capacity		
Objectives		
Encourage and support distributed software development	Provide adequate capacity building tools and opportunities for countries to strengthen their DHIS2 capacity	Strengthen linkages between research, implementation and software development across countries
Activities		
- Engage and support the DHIS2 developer community - Improve developer documentation and training resources - Host DHIS2 Academies on app development - Build HISP capacity for software development - Increase donor awareness of software development project planning and sustainability models - Increase focus on security	- Establish routine schedule for country maturity assessments - Improve tools and engage with countries to build country strengthening plans - Increase HISP group capacity in key technical areas - Focus on implementation toolkits for disseminating best practices - Maintain and expand the DHIS2 Academy program	- Strengthen local university collaborations and learning opportunities - Facilitate graduate and postgraduate researchers' involvement in ongoing implementations - Complete collaborative in-depth evaluations of selected countries - Promote our capacity building approach within donor and DPG communities
Indicators		
- Number of face to face software workshops with core developers and HISP staff conducted. - Number of Maturity Assessments conducted. - Number of in depth country evaluations completed		
Architecture & Interoperability		
Objectives		
Make DHIS2 more extensible and scalable	Provide capacity building tools and opportunities to the HISP network to enable supporting countries with their interoperability needs	Investigate changing architectural demands on DHIS2
Activities		
- Generate and document interoperability requirements - Develop features and evolve data	Define and communicate a clear interoperability approach and to provide guidance and training	- Support implementations of interoperable HIS architectures - Develop and publish

model to better support a variety of standards ● Support locally driven architecture and local architects ● Improve engagement between software teams and with the wider ecosystem	● Develop generic tools and approaches for interoperability ● Build CoP around interoperability ● Improve stakeholder engagement ● Amplify learnings from exemplary local integrations ● Strengthen HISP capacity on integration related focus areas	country-level user stories ● Advocate for appropriate architectural approaches in local practice

Indicators

- Number of countries where DHIS2 is part of the national architecture integrated with one or more systems
- Number of Interoperability academies and online training events
- Number of interoperability-related articles and country stories published

Data Use

Objectives

Enable and promote software innovations aimed at improving data-driven decision-making	Strategically engage with country initiatives to increase data use	Identify areas of intervention for HISPs to investigate and support data use in countries

Activities

● Improve alignment between DHIS2 software development and data use practices in the field ● Explore enhanced functionality in priority areas such as offline use, and "pushing" or sharing data ● Improve custom app extensibility ● Explore machine learning/big data ● Improve data quality and statistical analysis functionalities ● Facilitate public data sharing while maintaining privacy	● Support HISP group led in-country data use training ● Exploring potential and approaches to utilizing data science techniques in relation to DHIS2. ● Update our Academy courses and guidance with new data use tools and guidance ● Provide guidance and support to countries on specific data use challenges, such as denominators ● Collaborate with WHO and other partners to promote data analysis standards	● Engage with research infrastructure such as the District of Excellence model ● Conduct field testing of tools to support and evaluate routine data use ● Explore Tracker data use at the service delivery level ● Evaluate actual DHIS2 data use and communicate findings and impact

Indicators

- Number of software features supporting data sharing / use
- Number of data use academies and trainings conducted
- Number of articles and country stories on DHIS2 data use published

Health & Beyond

Objectives

Expand potential of DHIS2 as critical	Support the broad use of DHIS2	Investigate and explore emerging

digital infrastructure across populations and programs	across new key sectors	cross sector use cases to identify best practice
Activities		
- Provide core software support for integrated national information architectures and interoperability - Strengthen scalability - Incorporate specific software requirements for EMIS and LMIS and cross-cutting health use cases such as OneHealth	- Create implementation frameworks, guidance & training materials that facilitate cross-sector DHIS2 and data use - Health: Build capacity to support goal of universal PHC including through "pathfinder" programs - Education: Engage stakeholders and build capacity to establish DHIS2 as leading EMIS resource - Logistics: Promote best-practice use of DHIS2 for LMIS among the broader donor community	- Explore cross-sector e-governance platform use - Work with partners to explore DHIS2 for SDG progress monitoring, One Health, Climate and Health, and other emergent uses - Strengthen local e-governance through PhD scholarships
Indicators		
- Number of EMIS and LMIS features deployed - Number of countries using DHIS2 for EMIS and LMIS - Number of PhD researchers working on projects related to priority domains		

Innovation Sharing

Objectives		
Cultivate ecosystem for co-development and sharing of innovative solutions	Build HISP capacity for developing local innovations, including participatory design processes	Understand and exploit mechanisms of innovation sharing within the community
Activities		
- Elevate external developer capabilities for DHIS2 core code - Strengthen developer tools for web app platform and Android - Enhance App Hub feedback loops and extension functionality - Explore expanding the App Hub concept to metadata/configuration - Develop security, privacy and trust framework for sharing extensions	- Build capacity in the larger DHIS2 community through Academies and developer advocacy - Raise awareness around sustainability models for innovation - Update our guidance to facilitate community contributions and maintenance	- Research sustainability models for innovation development and sharing - Explore iterative design processes, specifically around adapting global tools to local contexts with the Design Lab
Indicators		
- Number of third party apps deployed to app hub - Number of app development capacity building events conducted - Number of local innovations investigated		

Communicating Results

Objectives		
Improve understanding of global use of DHIS software features and communication of internal development processes	Improve communication capacity within the HISPs and community	Increase the visibility of HISP research for audiences beyond information systems
Activities		
● Investigate features for collecting, aggregating and publishing usage analytics ● Develop features for increased data access and use to support M&E ● Evaluate the impact of software development work through design feedback and post-launch review ● Improve transparency of the software development process to show responsiveness	● Develop guidance and capacity to improve documentation and communication of DHIS2 impact ● Facilitate community sharing of DHIS2 stories and results ● Strengthen multilingual capacity at HISP Centre to engage other language communities	● Publish results at arenas for academics, practitioners, and policy makers ● Develop methodologies for measuring DHIS2 impact and HISP capacity building outcomes ● Explore linking DHIS2 design and development research (such as Design Lab courses) to experimental approaches for evidence generation
Indicators		
● Number of usage metrics collected ● Number of country/impact stories with input from HISP groups ● Number of impact measurement methodologies evaluated		

3.2.1 Strengthen in-country capacity to build mature and sustainable information systems

Capacity building is the cornerstone of the HISP approach to enable countries to implement sustainable systems and achieve the SDGs. We will further strengthen the HISP capacity building program to support the increasingly complex implementations and digital transformation needs of national systems.

In order to guide efforts to strengthen country information systems, it is important to understand current strengths and weaknesses in country DHIS2 implementations. In 2022, an initiative to develop *DHIS2 maturity profiles* was started, measuring the maturity of DHIS2 implementations in foundational domains as well as their performance in key programmatic areas. We will work to make this a routine activity repeated every 1-2 years, enabling measurement of improvements to DHIS2 implementations over time. A key output is a plan for DHIS2 strengthening in the country that covers both system-wide and programmatic recommendations, which will be a key resource in aligning stakeholders within the ministry as well as the donor community, and HISP will help facilitate country coordination around these joint plans. To build on and complement these assessments, HISP will conduct more in-depth evaluations in selected country implementations to develop a deeper understanding of what it takes to build

mature and sustainable systems. Learning from this research will directly support new cycles of country planning as well as feed into global guidance on DHIS2 strengthening that will be disseminated across the HISP network and to all countries using DHIS2.

We will continue to provide global implementation guidance and tools that can benefit the whole DHIS2 community. This includes DHIS2 Academies and other training resources, general implementation guidance and tools, and configuration packages and implementation toolkits. Strengthening country systems and building in-country capacity requires a long-term perspective, and building strong core teams within Ministries of Health in particular is critical to the success and sustainability of DHIS2 implementation. We will therefore, together with Ministries and local HISP groups, help develop capacity building plans for country core teams. DHIS2 Academies play an important role in building in-country capacity, but need to be complemented with ongoing support and mentorship, and a conscious approach to building capacity when technical assistance is provided. HISP groups are therefore key in this longer-term capacity building in countries, and both contribute to and make use of tools and guidance developed by the HISP Centre. Continuing to strengthen implementation and research capacity within the HISP groups is a key activity to achieve the strategic goals.

Publishing *configuration packages* as installable files for DHIS2 has been a key component in our approach to strengthen country systems over the last few years. We are now learning that the most useful aspects of this initiative are collaboration and capacity building. This collaborative process helps to identify and translate global standards and guidance from WHO and other partners into information system design approaches that strengthen an integrated RHIS, illustrate how DHIS2 functionality can be used to address particular use cases, and provide the community of implementers with examples of "best practice" design and configuration. Going forward, we will focus more on strengthening this form of capacity building through "implementation toolkits" for different health areas, and less on producing installable metadata packages for all different use cases and health programmes.

We will continue to maintain and further develop the global and regional *DHIS2 Academy* curriculum, complemented by tailored in-country training, to enable countries to build strong and diverse DHIS2 teams. In particular, we will review our courses to ensure that they directly address the skills needed by DHIS2 country teams, explore methods for assessing knowledge transfer, and modify or develop new course materials and methodologies to address training gaps and/or facilitate greater learning retention and skill development. We will explore options for online and blended training, both at a global and regional level, and continue to provide high-quality self-paced learning materials, including in translation to priority languages. We will engage HISP groups more in the development and delivery of Academy courses, and also work to build HISP group capacity on key areas such as information architecture, software development, integration, security, documentation, usability design, training and data use.

Software capacity building will also be an area of focus, to support local innovation and the growing role of DHIS2 as an extensible platform. We will continue our developer advocacy

program to drive community building and engagement in the larger network of DHIS2 application developers. This work will also include reviewing and expanding developer documentation and self-paced guidance, as well as helping to channel input from the larger community into the developer tools we build. We will continue to host annual DHIS2 Academies on App development to build capacity in country teams, the DHIS2 community at large, and the HISP groups. For the HISP groups, this will be supplemented by additional HISP-focused training and direct engagement with the core software team. We will enhance our developer training to emphasize security, offering training on how to build secure software. We will also work to build capacity among donors and stakeholders for planning, budgeting and managing DHIS2 application development projects, with a focus on sustainability, raising awareness of the true costs of software development and maintenance over time, and building capacity for software product and project management.

Within **action research**, we continue to embed PhD and Postdoc researchers in the efforts to strengthen country DHIS2 implementations and develop research capacity in the HISP groups. Through direct engagement in country implementations we strengthen the linkages between research, implementation and software development teams, and document and disseminate findings to inform our own work and the greater community. To support the goal of long-term sustainability, we continue to strengthen university collaborations and learning opportunities regionally and in-country. Through our global and in-country PhD and MA programs we will add the body of knowledge on developing mature and sustainable country information systems.

In addition to the strategic capacity building activities outlined above, the HISP Centre will promote the HISP capacity building and platform approach to increase understanding among the donor community to secure funds for all of its components, as well as share it as a model for other DPGs to learn from.

3.2.2 Architecture & Interoperability

Our strategic approach to interoperability remains informed by the interoperability principles outlined on our [website](). We remain committed to supporting locally driven architecture and architects. We understand that integrated systems can deliver added value to system owners, users and data subjects and all of our efforts should be directed towards realizing that value. DHIS2 is often a key system within national health information system architecture and we understand that this brings a particular responsibility on the DHIS2 project to facilitate and influence health information system architecture and interoperability within the jurisdictions where it is being used.

In our **software** approach, we will continue to support DHIS2 becoming the best interoperability citizen it can be. This includes broad architectural requirements around deployment models, new features which better support interoperability, and evolution of our data model to better support a wide variety of relevant standards. This is a trajectory which started with the introduction of the DHIS2 API a decade ago and its evolution remains a strategic priority. From a platform perspective, we will aim to provide a common software infrastructure for national

information architectures by making DHIS2 more extensible, including by allowing server-side components in applications that can be shared.

Our **capacity building** activities for interoperability and architecture involves both technical work and community engagement, both within the HISP network and beyond. We have recognized that most actual integration work happens outside of the core DHIS2 project at the HISP Centre. Innovation is happening in the field, primarily involving the regional HISP hubs. Our strategic input here is to provide better tooling, guidance and training to improve the quality and ease of development of these local interoperability projects, as well as building a community of practice around interoperability and architecture. We will support this through capacity and community building activities such as regular online meetings and a DHIS2 Academy on integration, and by actively promoting available integration tools and examples of successful integration projects from HISP and the DHIS2 community.

Architecture and interoperability activities imply engagement with other actors. These include system owners and users, implementers, global fora (such as OpenHIE), fellow vendors (particularly other FOSS and DPG producers) as well as donors. Our strategic approach to balancing the occasionally divergent interests of all of these actors remains informed by our interoperability principles referenced above, and we will continue to engage with these actors and stakeholders on interoperability and architecture. We have also recognized that interoperability work cannot be seen as an isolated activity within the large DHIS2 team. It is a strategic imperative for us to improve internal engagement and collaboration across and within our multidisciplinary teams (e.g. platform, domains, data use, research etc).

Our **action research** work will be closely connected to these technical and capacity building approaches. We will support concrete implementations of interoperable HIS architecture to collaborate with countries to solve the real problems through iterations of learning and design within a framework of national country architecture. The key learnings are shared through software improvements and global materials such as guidelines and capacity building. We will investigate changing architectural demands on DHIS2 at various levels of use and service delivery, including as the use of DHIS2 extends below the facility level (such as in community health systems). We will support local architecture practice and learning by developing and publishing country-level user stories, and advocating for architectural approaches.

3.2.3 Data Use

Through action research and participatory functional design, we will identify the best areas of intervention for HISP to support data use in countries, design DHIS2 features that support data use practices, facilitate effective use of DHIS2 systems and how to build sub national analytical capacity. We will ensure that data use is emphasized across priority areas and domains.

Action research plays a key role in our goal to facilitate increased national and sub-national data use. Will will continue the data use research work begun in the last strategic period, including building on the District of Excellence model. We will work with HISP groups to

investigate local data use practices in focus countries where DHIS2 is used, identify barriers to data use and collaboratively generate strategies to resolve or mitigate them, and work with local partners to plan data use interventions, including iterative development and field testing of tools and development and implementation of guidance and SOPs to support routine data use. In relation to Tracker, we will explore methods to support data use at the service delivery level, including how we can design or package information products for low-literacy scenarios to help get people at the community level engaged in data use. We will evaluate actual DHIS2 data use and communicate our findings, as well as report on the impact of our data use interventions.

Software development will support our work on data use by improving alignment between DHIS2 software products (such as dashboards and analytics apps, implementation guidance and tools) and data use practices at national and subnational levels. We will link our software roadmap, requirements gathering, design, and implementation processes to research and design in the field (for example through the functional design approach). Some specific areas of functionality we will explore developing or enhancing to support data use are 1) greater support for offline and intermittent connectivity for local data entry and analytics, 2) bringing data and analytics to the people who need to see it (i.e. email push analytics, public dashboards, and use of analytics tools outside of DHIS2 for high-level program managers, etc) and 3) innovations aimed at data driven decision making (e.g. beyond charts on dashboards), such as relationship analytics, integrating external data sources–particularly geographic/GIS and population data such as geographical footprints, catchment areas, and custom population denominators–and facility profiles and semi-permanent facility registry data (services provided, staff capacity, etc.). We will work on ways people can better integrate their apps and extensions into the DHIS2 platform, and explore potential for machine learning/"big data" use of DHIS2 data and advanced statistical analysis, potentially through linkages with other systems. We will increase support in DHIS2 for data quality checks, validation checks, and advanced data science analysis including outlier detection, seasonality, and predictive analysis (to support use cases such as outbreak prediction, capacity forecasting, etc.). We will also support secure public sharing of DHIS2 data by building tools to allow use of data while maintaining privacy (ex. anonymization of data, tracker to aggregate, etc.)

We will support local data use through **capacity building.** This will include supporting HISP groups to deliver and expand in-country training on data use, building analytical capacity and building HISP capacity in programmatic data use and data science. We will update our Academy courses and guidance to reflect new software tools and implementation guidance for data use. We will also support countries with better approaches to specific data use issues, such as denominator data challenges. Global, regional and country partnerships with domain experts in health, education, logistics will strengthen our ability to bring information system design together with data use practices to achieve impact. For example, continued collaboration with WHO to promote data analysis standards through software design and integrate normative guidance for programmatic data use strengthening.

3.2.4 Health & Beyond

We will work with local and international partners to develop targeted and sustainable approaches to using DHIS2 in Health and other priority sectors that leverage generic software tools and existing DHIS2 capacity to achieve digital transformation in-country in support of progress toward the Sustainable Development Goals. We will respond to country demand to explore the use of DHIS2 as a platform for cross-sector e-governance. We will support this area with cross-cutting activities that support our work across all domains, and supplement this with specific strategies for our work in our priority domains–**Health**, **Education**, **Logistics** and **Climate & Health**–that are summarized below.

The experience during the pandemic highlighted how different sectors and Ministries must collaborate for public health emergency preparedness and response. It also highlighted the importance of sharing data across sectors to provide a solid base of information for action. Our goal in this area is to support long-term sustainability of national DHIS2 implementations that are responsive to changing priorities and support cross-sectoral collaboration on key national objectives, such as the Sustainable Development Goals. Calling on lessons learned and investments made during the COVID-19 pandemic, we will seek to institutionalize the practices of cross-sectoral information sharing using DHIS2 as a platform. A key strategy will be to embrace OneHealth approaches through 1) core software support for integrated national information architectures; 2) implementation frameworks & guidance that enable cross-sector information sharing; and, 3) building global capacity and networks of local experts to serve Ministries of Health, Education, Agriculture/Livestock and Environment.

We will work with donors and partners to assess country maturity to help identify core areas of **capacity building** and facilitate coordination of country DHIS2 investments through assessments and dialogue with partners. We will update our global communication and capacity building materials and approaches to better support a cross-sector approach. Across all of our priority domains, we will engage with global, regional and local stakeholders and strive to facilitate alignment with global guidance and standards. Through **software** development, we will expand the potential of DHIS2 as critical digital infrastructure that supports mission critical services, facilitates local ownership, enables local innovation, and allows for global resource sharing, maintaining and modernizing the platform, strengthening the scalability of DHIS2 systems to capture and analyze data across populations and programs, and emphasizing architecture and interoperability to support cross-sector e-governance. We will scale up our **action research** program with 10 PhD scholarships from Norad under the DPGA to build country capacity and strengthen e-governance across sectors.

In addition, we will pursue the domain-specific strategies summarized below:

Health: This health domain remains the primary focus of our work with countries. The strategies and activities described throughout this document are largely based on our work in this domain. Through collaboration with global institutions, Ministries of Health, national institutes of public

health, national programs, and regional partners, we will strengthen the design and use of DHIS2 for improved decision making in public health, including renewed focus on emergency preparedness & response.

For decades, HISP has consistently promoted integrated health information systems. In the new strategy, we see this principle as a key driver for achieving universal coverage of primary care and measuring progress toward SDG3. New entry points to PHC through NCD programmes will be used as 'pathfinders' to conceptualize, test and refine HIS design principles and implementation approaches to support UHC. These will build upon the important investments in vertical program and disease-specific implementation tools and software functionality; and complement investor strategies for health system strengthening alongside vertical program support.

Collaborative design processes with health experts serve as a catalyst for increasing understanding between public health practitioners and information system specialists. Resource-intensive efforts to develop standard "packages" and then install them in country systems fell short of achieving true country system strengthening goals. Our approach going forward will acknowledge that global standards cannot replace local design processes, nor can global goods replace local capacity for high quality implementation and use. We acknowledge that new strategies and coordinated efforts with WHO, UNICEF, CDC and health partners are needed to overcome barriers to country HIS strengthening such as limited data use practices/capacities, resource constraints, gaps in IT capacity, poor coordination between health and IT stakeholders, fragmentation, and lack of national plans for long-term sustainability. Looking ahead, we will incorporate normative guidance and subject matter expertise into the development of implementation toolkits, prioritize products that strengthen data analysis, and increase focus on capacity building for system design and data use.

The COVID-19 pandemic demonstrated the power of the DHIS2 platform and the DHIS2 community in responding to public health emergencies. Surveillance now stands as a core pillar of our health strategy, with 40+ countries using DHIS2 as a routine national surveillance system and 59+ having implemented DHIS2 as part of their COVID-19 response. In line with OneHealth approaches, we are embracing new partnerships such as with FAO and with Ministries of Agriculture & Livestock to strengthen animal disease surveillance and promote cross-sector data sharing for early detection and response. Through the action research tradition, we will learn from early adopters of DHIS2 as a OneHealth platform, improve our core software and implementation tools, and accelerate progress in other countries.

Education: We aim to make the DHIS2 platform a leading EMIS resource, leveraging existing software features, in-country/regional IT capacity and the global community of researchers, developers and implementers to define how we can learn from health and adapt to education. We will achieve this by: 1) Establishing DHIS2 as a flexible backbone for sector consolidation and expanded use of data for both planning and monitoring at national, district and school levels, with focus on inclusion, scaling and sustainability. 2) Leveraging country DHIS2 capacity

related to school health. In particular, we will build on lessons from COVID and work on nutrition, WASH and disease management. 3) Working with global partners (ADEA, UNESCO, UNICEF, GEMR and AU-IPED) to promote a standard toolkit and African continental platform based on international standards to support SDG4 and CESA monitoring, supplemented by dashboards for all levels. 4) Providing tools for using DHIS2 to complement and extend existing country systems (e.g. StatEduc) to enable rapid cross-country harmonization in support of the EMIS shift to more granular and frequent data, backed by research and local university collaborations. Our key goals are: 1) Increase awareness of DHIS2 in the education donor community; 2) Fundraising strategy to respond to new countries and 3) Partnerships with leading actors in the education data space. In order to meet these goals, we will prioritize development of key features in the core DHIS2 platform, such as support for academic years, bulk management of students by class and expanded analytical tools.

Logistics: During the past two years, we developed a clear vision and roadmap for the use of DHIS2 as a Logistics Management Information System (LMIS), and have developed and implemented approaches to support the use of DHIS2 in this domain (stock management, temperature management, biomedical equipment life-cycle management). In the next three years, we will focus on continuing development of the features defined in the roadmap to support and expand implementations, and to explore new opportunities for DHIS2 within the LMIS sector. Strategically, we will continue to focus on last-mile logistics tools, despite requests to develop a full-fledged eLMIS in DHIS2. We will promote the use of the DHIS2 Android Capture app to enhance the quality and timeliness of logistics data available for decision making and reporting, and improve the overall quality of logistics management. To meet steadily increasing requests for LMIS implementation support–which are expected to increase further given buy-in from a number of donors on our approach–we will work with donors to align funding streams to implement DHIS2-LMIS features. Lastly, as country implementations establish a basis for using DHIS2 at facility level and integrating these with a central eLMIS or ERP, there will be a need to explore new features and innovations for future-proofing these last-mile tools. Among these, we plan to focus on the use of GS1 data matrix for managing stocks and equipment, further developing the transaction based Real-Time Stock app to manage medicines by batch number and continued improvement to cold chain management features.

Climate & Health: Climate change and its impact on human health is an area of critical importance. This is particularly true in LMICs, which are generally more vulnerable to increases in heat, climate disruptions, extreme weather events, ecological disasters, and other effects linked to the world's rapidly changing climate. Given our ongoing HISP partnerships with MoHs in 70+ LMICs, and the resulting local capacity for DHIS2 use and the existence of comprehensive longitudinal health data stored in local DHIS2 systems, DHIS2 is well positioned to play a role in both measuring the effect of climate on human health in LMICs and providing local authorities with tools to help predict and mitigate these effects. The HISP Centre is in discussion with the Wellcome Trust on a potential partnership on climate and health (C&H), through which we will strengthen the HISP Centre and HISP groups' capacity to work in this domain, and engage in focused action research projects in a selection of partner countries, with

the goal of developing a generic C&H toolkit that can be subsequently used to support implementations in additional countries, while also contributing to the global body of knowledge of climate change's impacts on human health.

3.2.5 Innovation Sharing

We will support a thriving ecosystem of developers, implementers, and service providers adapting and extending DHIS2 for use in specific contexts and use-cases. We will facilitate co-development and sharing of secure, generic, and maintainable extensions and configurations. We will build capacity for local innovation and application development.

We will engage the DHIS2 community through **capacity building**, community building and communication to strengthen the global DHIS2 innovation ecosystem. We will build capacity in the HISP network for developing local innovations, including user-centered design processes, and for the use of generic DHIS2 software tools and implementation approaches to facilitate sharing. We will also build capacity in the larger DHIS2 community through our developer advocacy program and DHIS2 Academies. In particular, we will raise awareness and build capacity around sustainability models for innovation, to help developers and organizations that develop innovations to build models for sustaining them over time (including financially). We will investigate how to facilitate contributions from the larger community (including financial, code, and innovation/extension sharing), and distribute the maintenance load of the growing core among the larger community and incorporate this into our guidance.

Our **action research** work will include research into sustainability to support the capacity building activities mentioned above. The research group will continue to investigate the use of innovations in the DHIS2 community. Through the DHIS2 Design Lab, we will also explore iterative design processes, specifically around adapting global tools to local contexts.

Our overarching **software** goal is to make it possible for others to do anything with DHIS2 that UiO developers and technical implementers can do, by making it easier to build generic and maintain high quality pieces of DHIS2 outside of the core team. A key element of this will be our work on DHIS2 as a platform, focused on infrastructure for extensibility. We will strengthen developer tools for both the web app platform and Android SDK to facilitate easier creation, maintenance, sharing and use of innovative extensions to DHIS2. We will enhance the App Hub by allowing better feedback loops (collecting usage information and error reports, and technically connecting developers with users and implementers) and more robust functionality in extensions to DHIS2 that are shared with the global community. We will also explore expanding the App Hub concept to metadata/configuration (facilitating long-term management of metadata and sharing global standards across heterogeneous country configurations), Android applications, and server side components. We will also develop a security, privacy, and trust framework for sharing of innovative extensions and adaptations.

3.2.6 Communicating Results

We will work with stakeholders to define relevant research questions and reasonable indicators, and collaborate with HISP groups to investigate DHIS2 interventions and measure progress. We will improve documentation, publication and communication of the impact of and learning from DHIS2 and HISP work in the real world.

A fundamental activity in this area will be **capacity building** of the core HISP Centre team and the HISP groups to measure, evaluate, and document DHIS2 projects, as well as to communicate results, lessons, and impact. Within the global team, we will seek to align the work of the implementation, research and communications teams, and collaboratively develop structures and guidance to formalize and improve our own work and to help strengthen the HISP groups in M&E and communication. We will also explore how to build similar capacity in the larger community through the Community of Practice and other channels, with the goal of facilitating greater organic sharing of high-quality evaluations and stories from countries, implementers and organizations using DHIS2 outside of the HISP network. We will prioritize developing approaches to measure programmatic impact in each of our priority domains. We will further promote the use of DHIS2 beyond health, and elevate the visibility of HISP group work supporting interoperability projects to support our architecture and interoperability goals. We will also strengthen our HISP Centre capacity to engage with priority language communities beyond English, to facilitate sharing of results and experiences from those communities.

In the area of **action research**, we will work to connect activities of the UiO research team with other universities, and increase the visibility of HISP research, including targeting journals that are receptive to our work (such as global digital health). We will consider partnering with other research institutions (such as NIPH) to help produce research that reaches an audience beyond information systems. We will explore linking DHIS2-related research work from design and development focused courses (such as the DHIS2 Design Lab and partner universities) to structured experimental approaches that can inform research, as well as provide evidence for donors and stakeholders. We will evaluate and test methodologies for defining and measuring DHIS2 impact and HISP capacity building outcomes, and work to improve documentation and visibility of implementation and capacity building results.

We will also explore how **software** can contribute to measuring and communicating DHIS2 impact. We will investigate features for usage analytics and feedback that support implementations collecting this information, as well as tools to aggregate this at the global level to provide quantitative information on the DHIS2 footprint and use. This can potentially include features that allow opt-in sharing of non-sensitive aggregate usage data to global platforms like the Digital Health Atlas. Aligned with our work in the Data Use area above, we will develop features to support increased access to, visibility of and use of data (ex. public-facing dashboards), that can aid M&E of programmatic impact. We will also work to strengthen evaluation of the impact of our software development work itself. We will improve our software design and development process to emphasize collecting use cases and requirements before

building features, getting feedback earlier (such as at the mock-up stage), and performing post-launch feature reviews/validation to evaluate how well DHIS2 features fit country needs. We will document design and development processes (such as requirements gathering and testing) and their relation to user needs and country feature requests, improving visibility and access to our roadmap for various stakeholders. We will also make our internal development processes more structured and transparent, to better communicate what is being worked on, set clearer expectations, and show the responsiveness of the development team to requests.

4. Measuring & Monitoring of Success

While periodic assessments and evaluations of DHIS2 projects have been carried out in the past, we recognize that there is a significant opportunity to improve our monitoring and evaluation of HISP work. In particular, we acknowledge the increased expectations from our investors to quantify and demonstrate the "impact" of DHIS2, particularly in regards to programmatic outcomes in health and other domains and the real use of DHIS2 data.

We will work with the DHIS2 investor group to arrive at a general definition of impact for DHIS2 projects, and work with each investor to further define specific indicators within given programmatic contexts that are within the HISP network's ability to measure. We will also work to document project achievements and organizational/process outputs in a more structured and systematic way. Where possible, we will attempt to use the SMART (Specific, Measurable, Achievable, Relevant & Time-bound) framework for setting project goals. We will work with the HISP network on guidance and structures for including M&E of these indicators in our project management practices, including baseline measurements at the beginning of a given project.

In regards to data use, we will work with the HISP groups to define strategies for defining, measuring and evaluating this in different contexts, within the limits of the HISP role and responsibilities in DHIS2 implementations, and explore approaches for engaging with local health programme teams (and similar teams in other domains) to better understand and document their data use needs and practices.

It is also important that the systematic approaches for HISP support planning, outputs, quality assurance and accounting become more widely visible to a wider audience. We will ensure that HISP technical support reports or results of support are systematically available. We will also work on strategies for measuring and evaluating the effectiveness of HISP capacity building efforts for core country team strengthening, such as knowledge transfer and skill development from the DHIS2 Academy program and other HISP training and apprenticeship activities.

On a strategic level, we will implement an M&E framework to benchmark progress against the indicators indentified for the priority areas outlined in section 3.2, and gather inputs from the HISP network & partners at mid-point and end-of-strategy period. We will also analyze and make available (summary) results of key efforts such as the DHIS2 maturity profile and project evaluations to give insights on our progress at each annual investor meeting.

5. HISP Governance & Financing Strategy

5.1 HISP Centre structure and governance

From January 2022 onward, HISP UiO formally became the HISP Centre, a multidisciplinary research center located at the Department of Informatics at the University of Oslo. This change in designation (from being an academic section within the larger department) brought with it a number of concrete changes: The HISP Centre now has a much greater degree of autonomy, especially in regards to key areas such as finance, contracting, and hiring, while still enjoying the stability and legitimacy that come from being part of the university.

The establishment of the HISP Centre involved formalizing the governance and leadership structures of the organization. The center is led by a Director, who is supported by two Deputy Directors and a Head of Office. Work within the center is divided up between five groups, Research, Implementation, Software Development, Training & Communications and Project Support, each of which is led by a Group Leader. The Centre Director reports to an independent board, which convenes twice yearly to review the center's finances and activities and provide recommendations on strategic direction.

This new organizational structure and relationship with the university provides the HISP Centre with greater flexibility and independence, and reduces risk to the HISP programme due to changes in leadership within the university. It also increases the visibility and prestige of the programme, which will hopefully benefit us by opening additional avenues for collaboration and attracting talent.

In collaboration with our investor group, we have also taken steps toward greater formalization of the relationship between the HISP Centre and the HISP network, through the establishment of three regional HISP hubs. These hubs, which have each undergone a formal evaluation and validation process, support greater decentralization of regional and country-level HISP work, while increasing accountability and strengthening HISP group governance.

5.2 DHIS2 core funding strategy

5.2.1 Diversification through a multi-sector approach

The HISP Centre is working actively to diversify funding to the DHIS2 core platform, and one key strategic move is to position DHIS2 as a multi-sector platform supporting e-governance beyond health.

Key areas to expand on are Logistics, Education, and Climate & Health. DHIS2 for Education has been piloted over the last years and results in this area are attracting donors, including existing funds from Norad and GPE/IDRC, and potential for increased funding from partners like

UNICEF and the GPE consortium. Our Logistics work has led to partnerships with both public health organizations, health donors and NGOs, as well as private-sector partners such as Novartis. We will continue to pursue additional funding partnerships in these domains.

Another potential new partner, Wellcome, is considering investing heavily in DHIS2 over the next 8 years to position DHIS2 as a leading platform for Climate & Health, and have requested proposals totalling 25M GBP over 8 years. This would provide a significant boost to our core funding which would allow us to adapt DHIS2 to meet the requirements of the Climate & Health domain, while also strengthening DHIS2 for health and other domains through general platform enhancements and economies of scale.

5.2.2 Exploring innovative and sustainable funding models

Most country grants across donors (GF, GAVI, Gates, World Bank, USAID, etc.) for HIS strengthening depend on the core DHIS2 platform being available and sustained over time, and often contribute to more requirements and pressure on the core product from UiO; but investments in core vs. country does not reflect this relationship.

In collaboration with key investors, we are exploring new and innovative ways to secure sustainable funding for the DHIS2 platform. One suggested approach is to put a "core platform tax" on all country grants that relate to/depend on the DHIS2 core platform being maintained over time. UNICEF has already implemented this model:
- A framework agreement (LTA) with UiO that UNICEF country offices can "buy" into.
- Each country grant/contract under this LTA contributes 7% of the total budget to the core platform for UiO.

We will engage in discussions with our partners on this model as an alternate or supplementary means of providing core support to the DHIS2 platform.

6. Risks and Mitigation

A number of challenges are addressed by the HISP Centre strategy, of both an internal and external nature. These challenges are mostly inherent to the nature of DHIS2 as a Digital Public Good, and arise from some of the key values driving the work -- namely the commitment to providing a free and open source, generic solution; the emphasis on country ownership; the difficulties of capacity building in low-resource environments; the diversity of the user base; the pace of learning and technology improvements; and the rapid growth of the platform.

One specific theme tied to the challenges and risks described below is the tension between innovation and stability. The interest in new and exciting technologies has served as a catalyst for adoption of digital health globally, and the promise of innovation to address intractable health problems continues to drive investment. That said, the constant demand for innovation can come at the expense of the stability and maturity of the platform. DHIS2 cannot adequately progress through the lifecycle of software maturation without recognition of and dedication to the "invisible work" of maintenance, debugging, optimizing and troubleshooting, which should

comprise a significant portion of the work done by the core team. This work is best supported by core funding that is not tied to project-based priorities.

Many of the mitigation strategies described below are an attempt to elevate the importance of the stability of the platform, in the face of innovation requests. This is a particularly valid approach when considering the still nascent evidence base behind many of the proposed innovations, compared to the robust knowledge about the impact of routinely available health data.

6.1 External risks and mitigation strategies

The successful adoption and use of DHIS2 is reliant on a large constellation of external actors, in terms of funding, implementation, knowledge generation, political buy-in and more. The success of DHIS2 is particularly reliant on country context and factors, with the consistent focus on enabling local ownership and control. The interactions with and between these important stakeholders have significant impact on the future of HISP UiO and DHIS2.

6.1.1 Challenge: Balancing competing priorities

Risk: The numerous donors supporting DHIS2 have their own mandates and priorities, which are often diverse between global and local offices, and even more so between organizations. These priorities result in competing requirements and deadlines for the development and implementation of the software.

> *Mitigation*: Obtaining dedicated core funding from the various donors, untethered from specific projects or deadlines, results in flexibility at HISP UiO and high quality work aimed at supporting the full range of DHIS2 implementations. Ideally this funding will be coordinated between donors (see for example the coordination between GAVI and GF), in order to maximize impact of investment, and simplify the administration.

6.1.2 Challenge: Consolidating resources

Risk: Small projects, often in response to individual donor requests from a high level, generate expensive overhead, high administrative burden and increased reporting requirements that detract from the general activities of the core team, and increase the cost of operating.

> *Mitigation*: Discourage fragmented and small-scale funding for individual projects managed by HISP UiO, and encourage project partnerships between donors and members of the HISP community.

6.1.3 Challenge: Country buy-in and ownership

Risk: Political commitment and government ownership are both particularly important for stability and maturity of DHIS2 implementations, and particularly challenging to improve from Oslo.

> *Mitigation*: Empower MoH owners by deliberately directing recognition and work requests through their teams, using available project resources to encourage long term investment in the capacity of these teams. Publish and disseminate good practices from individual country teams, and work jointly with donors to

promote the importance of the global initiatives supporting digital health. Anchor the activities amongst the public servants at national and district level to avoid strong dependency on shifting political power.

Risk: National system owners implementing sub-standard or unreliable implementations of DHIS2, or otherwise failing to use health data to drive decision making.

Mitigation: Work directly with multiple national scale DHIS2 implementations to undertake maturity and rehabilitation activities, while developing a package of resources, tools and guidance that can be disseminated to the global community.

Mitigation: Lower the barrier to entry to quality DHIS2 implementations by simplifying the platform; improving documentation and guidance; and promoting gold-standard pre-configured packages of DHIS2, such as the WHO configuration packages.

Mitigation: Enhance academy and online materials with updated and improved materials targeting subjects identified during evaluation activities as not well understood.

6.2 Internal risks and mitigation strategies

6.2.1 Challenge: The core HISP UiO team has grown quickly, in an effort to keep pace with demand.

Risk: Significant core costs, which must be covered by individual projects that in turn can distract from important core activities

Mitigation: Obtaining consistent core funding from global donors and stakeholders that is dedicated to core activities, rather than tied to a specific projects

Risk: Overseeing the work of a large team while maintaining a small number of overhead and administrative staff

Mitigation: Adopting efficient processes for hiring and management, including the creation of team leaders, and use of general university personnel; standardization of processes and expectations that are more easily adhered to; seconding of developers from partners that share an administrative burden

Risk: A lack of consistency in the development or technical work

Mitigation: Adoption of standardized industry practices that ensure consistency, such as agile development and release process; clear divisions of domain responsibilities; and the adoption of product management approaches

6.2.2 Challenge: The growth of the DHIS2 platform itself to cover the needs of the community

Risk: The complexity of the platform, both routine/aggregate data and Tracker, raises barriers to entry, requiring significant knowledge in order to take advantage of the appropriate tools in the platform

> *Mitigation*: Ease the user interface of the functionality for configuring the system.

> *Mitigation*: Improve documentation and guidance; provide high quality academies and online training materials; publish domain-specific configurations of DHIS2.

> *Mitigation:* Maintain emphasis on the WHO metadata packages for DHIS2, as a routine part of the development and implementation strategy of HISP UiO.

Risk: Challenge: Maintaining the roadmap in the face of many competing requests

> *Mitigation*: Ensuring a clear end-user focus, investing resources in field investigations in order to in depth understand the situation on the ground and specifically at district level, close to the users, not only at central level.

> *Mitigation*: Promote close cooperation across donors to align agendas

6.2.3 Challenge: Meeting the needs for individual data

Risk: Individual data adds an increased requirement for security and privacy

> *Mitigation*: Adopt standards (e.g. FHIR), and best practices from widely applied legislation (e.g. GDPR), both in terms of native functionality for DHIS2, but also in academy curricula, guidance documentation, SOPs and training materials.

> *Mitigation*: Build in pre-configured best practices for security and confidentiality to the WHO configuration packages.

> *Mitigation*: Ensure that any access to personally identifiable data by HISP UiO staff is governed by an MOU defining the terms and time limit of access.

> *Mitigation*: Requiring country ownership and clearly defined access policies for any projects with direct HISP UiO involvement in projects collecting personally identifiable data.

Risk: Individual data brings significant performance concerns, with a large increase in both users and data captured

> *Mitigation*: Establish testing environments that mimic real world conditions, in terms of connectivity; server requests; data load; etc.

Mitigation: Take an "emergency task force" approach to reported performance problems of large implementations, to provide quick solutions as well as learn more about the challenges countries are facing.

Mitigation: Establish a software development track devoted to performance improvements, including the replacement of existing DHIS2 apps with improved technologies (e.g. the Capture app replacing Event and Tracker).

Risk: Individual data increases the demand for offline support

Mitigation: Maintain an emphasis on Android as the key offline approach for individual data collection, keeping the development and support for Android as a core stream in the software development strategy.

Mitigation: Investigate new technologies, such as progressive web apps, which can provide alternative solutions for offline support.

Mitigation: Develop clear implementation guidance for offline projects, outlining the practices, scope and scale which will lead to the most success.

Appendix 1: HISP MOU Principles

The following is the list of principles contained in the Memorandum of Understanding that formalizes the collaboration between the HISP Centre and HISP groups to help guide our work:

1. Give priority to activities strengthening sustainable national health information systems;
2. Support development processes broadly and the capacity strengthening and empowerment of health staff;
3. Support country ownership of health information systems and build resilience;
4. Focus on the use of information to improve health service delivery;
5. Foster local innovation and entrepreneurship;
6. Support research by giving researchers access to data and empirical sites;
7. Promote reciprocity and sharing in the global HISP movement;
8. Promote transparency and trust in the global HISP movement;
9. Commit to free and open source software and standards;
10. Develop software applications that are generic and reusable;
11. Adhere to the principles of hierarchy of standards;
12. Engage the users in participatory design and development;
13. Develop integrated, not stand-alone systems;
14. Software development based on global standards and best practices;
15. Design training materials for global use and as a public good;
16. Document and share best practices, case studies and knowledge as a public good;
17. Professional project management including planning, reporting, financial management etc.;
18. Professional execution of contracts, in terms of deliverables, their quality, timeliness etc.;
19. Duly acknowledge all outputs emerging from projects or research.

More information can be found on the HISP Centre website:
https://www.mn.uio.no/hisp/english/networks/

Appendix 2: HISP Capacity building approach

HISP's strategy is multi-pronged, networked and longitudinal, focusing on a holistic / systemic approach to capacity building. The main pillars are:

- **Networks of academic training and research.** The HISP education and research network approach was developed through a Norad funded program to develop integrated Masters in Health Informatics in South Africa, Mozambique, Malawi, Tanzania, Ethiopia and Sri Lanka during 2000-2015. In parallel, a similarly networked PhD program including the same countries was created to support the Masters. Joint fieldwork and practical action research on developing DHIS pilots in the countries were a key component of the educational approach. Networks created between these countries and universities were gradually extended to new countries and became what is now the "HISP network". The Master's programs are all still running and have produced literally hundreds of candidates that contribute to the cultivation of national digital public infrastructure in different capacities and roles. A key capability that emerges from the knowledge sharing research network is the ability for people to customize generic DPG features and action possibilities into locally relevant responses to local information system challenges.
- **Networks between universities** are important in promoting DPG research and development, and it may take many forms. In Indonesia 12 universities with a geographical spread across the country are designated as 'Centres of excellence' by the Ministry of Health and are forming a network supporting the country's Health Information System, including the DHIS2, through education, training and technical support. This network, coordinated by the Universitas Gadjah Mada, provides an excellent platform for developing and distributing education and training programs across this vast country.
- **Academy training:** a range of standardized training curricula from fundamental courses offered online, level 1 academies relating to DHIS2 configuration which is the basis for commencing implementation (offered on a regional level) and level 2 academies covering more specialized courses for more advanced skills (offered globally or regionally). In terms of scale there have been over 160 DHIS2 academies training more than 10,000 learners on everything from DHIS2 analytics use, to system configuration, and even advanced application development. In addition, the free DHIS2 Online Academy has trained nearly 20,000 learners from more than 100 countries on DHIS2 fundamentals since launching in 2017.
- **Direct country support and apprenticeship:** Local HISP groups work as long-term partners with local DHIS2 core teams in country Ministries of Health and IT. In addition to providing training through the DHIS2 Academy program and on a national and sub-national basis, HISP experts work alongside their MoH counterparts, providing direct TA and helping build and reinforce country capacity through an apprenticeship model.
- **HISP PhD programme:** 70 PhD scholars have graduated through this programme. Mostly from the Global South. The PhD scholars do their empirical work in supporting their country or region in implementing DHIS2, course work and scientific writing is done

at UiO in collaboration with supervisors. These PhD graduates form the foundation of the leadership and expertise in the now 16 HISP groups that work on DHIS2 implementations globally.   Additionally many of the graduates continue to collaborate with their local universities in research and capacity building, for example University of Dar es Salaam, Tanzania; Eduardo Mondlane University, Maputo, Mozambique; University of Colombo, Sri Lanka; and University of Malawi.

- **Action Research and local innovation:** In addition to the postgraduate students conducting action or implementation research as part of their studies, the academic and research staff at UiO and the staff within the HISP network also conduct research on the design, development, implementation and use of DHIS2. This research is presented regularly at international academic conferences, such as IFIP 9.4 and ICIS, as well as published in peer reviewed journals. Beyond academic publication, knowledge is shared through HISP web-pages, blogs, newsletters, DHIS2 Academy teaching cases, DHIS2 conferences and international partner workshops and conferences.
- **Postgraduate Academic programmes:** UiO offers a number of English language MSc programmes in Informatics, such as Informatics: Design, Use, Interaction and the more recently established programme on Digitalization in the Health Sector and PhD programmes within the various research projects.

These pillars are interconnected, for example PhD students conduct research on real world problem situations which inform local innovation and provide material for the DHIS2 Academy training programmes as well as resulting in a PhD graduate that continues to engage with the HISP network in implementation and further research.