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Free and Open Source Software and Standards for Public Health Information Systems in India: "Making them Work" by bridging the policy-practice gap

Free and Open Source Software (FOSS) for Public Health Information Systems in India.

Workshop Background Note[1]

Dr. Sundeep Sahay[2]

The workshop titled 'Free and Open Source Software and Standards for Public Health Information Systems in India: "Making them Work" by bridging the policy-practice gap' is aimed at understanding how Free and Open Source Software (FOSS) can be leveraged upon for effective strengthening of Public Health Information Systems (HIS) in India. To move towards this objective, we need to understand the existing policy landscape around FOSS, the normative policy measures that need to be in place, and the gaps that exist with respect to what is happening in practice. As a background note, this paper seeks to elaborate on:

1. A policy perspective based on a Global Public Good (GPG)
2. Why should health information and FOSS be treated as a GPG
3. What are the gaps in making this perspective work in practice

In the next section of this note, we first define what we mean by a GPG. In the following section we discuss Public Health as a GPG, followed by a discussion on the argument that a FOSS based HIS should be treated as a GPG. An example is provided then of how the open source platform of DHIS2 (District Health Information Software – Version 2), a de-facto global standard for HIS in developing countries, is being positioned as a GPG by various global actors. We also discuss the use of DHIS2 across India. We conclude this note with a

[1] While the workshop covers topics of FOSS and Standards, this note is primarily focused on FOSS

[2] Professor, Department of Informatics, University of Oslo, Norway, and Founder and Mentor of HISP India

section on what are some of the gaps for such a GPG to work in practice. Such gaps will be the major point of discussion during the course of this workshop, and possible approaches are to be identified to help address these gaps.

1. Defining a GPG

Global and national public goods have been an object of study in public policy for centuries. The thinking is that society needs government to overcome the failures of the market in achieving the efficiency and equity required in the allocation of resources. The private sector is seen as having inadequate incentives to supply goods that society needs for collective consumption, and they thus tend to focus on the provision of private goods. Public goods include social security, health care provision, national parks and various others. In today's era of globalization, the idea of a public good necessarily needs to take on global dimensions, reflected in issues such as human security, global health security, or the reduction of environmental pollution coming through climate change and ozone depletion. We term them as Global Public Goods (GPG) which also subsume the national and levels below.

But before going further, let us define what we mean by a GPG. Public goods are those whose benefits cannot be confined to a single buyer or a set of buyers, for example street names and a clean environment. The benefit of spending money to get a person educated, is not only confined to the first employer of the person, but also includes the various employers the person will have in his/her lifetime. The employed person pays taxes to the state, and this contributes to the development of roads and public hospitals, which imply the benefits of investments in education spread, directly and indirectly, to the public at large. An interesting challenge for policy makers is how to ensure a more reliable provision of public goods in society. Such provision is often distorted by market failures.

An archetypical example of a "pure" public good is traffic lights. Imagine a busy marketplace where there are many people, traffic, shops, with people moving around to do shopping. Without traffic lights, people and transport would be stuck in gridlock traffic or be unable to cross busy streets. Some might even have serious accidents on their way to the market. The provision of traffic lights then helps to benefit the public at large.

Traffic light, seen as a public good, satisfies two key criteria. First, is that these goods are marked by a high degree of publicness, and that they are characterized by ***nonrivalry*** and ***nonexclusivity***. In the above example, one person's consumption or use of the traffic light does not rival the use of the same by another. If one person crosses the street using the traffic light, then it does not distract from the utility of the light to other persons. Also, it will be uneconomical and infeasible to restrict the use of the traffic light exclusively to just one person. Thus the benefits of the light are non-excludable, or if technically excludable, only at completely prohibitive costs. Second, the benefits of public goods are quasi universal across groups of people, social groups, geographies, and also generations. One can argue that as more people obey traffic lights, its benefits to each individual grows. Frequent use indicates broad public acceptance of the light's role in regulating traffic flows. Without this broad

acceptance, its utility will be low, and can even turn into disutility. The lights, their shared meaning and the behavioral expectations they entail, together constitute a public good.

There are various other issues around a GPG which we are not discussing in the context of this short note. These include the public, private and hybrid provisions of GPGs, pure versus impure public goods, the difference between national and global public goods and various others. All these issues are relevant to the challenge of making FOSS work effectively in practice.

Next, I discuss public health as a GPG.

2. Public Health as a GPG

History makes a strong case for public health to be treated as a GPG, especially relating to the provision of care for communicable diseases. The Athenian plague from 430 BC, the first recorded transnational epidemic, the European black death in 1347, successive waves of plague and cholera, the most recent being in 1990s in Latin America, the recent Ebola crises in various West African countries, and now the fast spreading Zika virus in Brazil and other countries especially in Latin America, are all examples of health challenges that affect multiple countries, and are not localized to a single location or country. Provision and control of these diseases are then best provided within the framework of a GPG.

Undoubtedly, the control of communicable diseases can be treated as a GPG, but can the same be said for non-communicable diseases (NCDs) and injuries? Are these primarily private rather than public goods, coming through individual choices? The dividing line between public and private among these diseases was traditionally seen to be rather clear cut. Because of externalities, the treatment of communicable diseases was seen as a public good, but treatment of NCDs and injuries was seen as private as risk factors which were largely a function of individual choices relating to unhealthy diet, lack of exercise, consumption of tobacco or other unsafe habits. Because private choices have personal consequences, there is a correlation between individual risk and private burden of sickness.

However, with the intensification of globalization, the balance between a public and private good is undoubtedly blurring. By compressing time and distance, globalization is fundamentally influencing the world economy, culture, spread of ideas, labor migration and other facets. There are direct implications of globalization on cross-border travel, changing cultural habits, transmission of information, the growth of international trade and the associated media market. There is the rise of global concerns related to climate change and ozone layer depletion, with direct implications on health. As a result, with all this arguably the distinction between public and private is dramatically eroding. Furthermore, there is the emerging “third wave” of health threats – new infections, novel environmental threats, resistance to antibiotics and other diseases and behavioral pathologies. The blend of the

new and resurgent older diseases is planetary in scope, and threatens all countries, rich and poor.

There is thus a stronger argument to treat global health or public health strengthening, rather than the control of a set of transmissible diseases, as a GPG. This provision of public health care should ideally be as a GPG as it should imbibe characteristics of nonrivalary and nonexclusivity, with primarily a universal focus. Such health provision should be nonrival as provision of care to one person, should not rival providing care to the other. Similarly, provision of care should not be exclusive to a single or group of individuals, but needs to be provided to the public at large.

While nonrivalry and nonexclusivity are normative aims that public health care strives for, achieving this is fraught with various distortions and challenges. There is the key challenge of resolving the tension between global equity and social exclusion and justice. There is the information distortion relating to who is reporting on diseases, the quality of that information, how is this information then disseminated to other relevant groups, and how is it acted upon. These questions are largely of relevance to this workshop, which we turn to next.

3. Health Information as a GPG

After having defined a GPG, and the provision of health care as a GPG, I argue that health information which is fundamental in enabling the provision of health care should also be treated as a GPG.

Knowledge is generated through health information, and it being put into effective practice. Knowledge is nonrival and nonexclusive in nature, as all can benefit once it is produced, and its use by one does not exclude use by others. Information about an epidemic in a particularly country or region will benefit other groups as it will allow them to take measures to protect their people and strengthen their medical institutions to take preparatory measures. There are some caveats to this of course. Not all diseases are expected to strike all countries and regions, and thus there will be varying interests in taking action. Some countries are better equipped to deal with the diseases than others, so the interest in drawing upon help and helping others will also vary. Sometimes countries may have interest to withhold information from fear of sanctions, such as travel bans. In the past, prior to decolonization, countries had sound knowledge of the disease burdens of their colonies. Historically, many countries have been lukewarm in reporting on disease outbreaks to the WHO. These and more such issues distort the provision of care as a GPG.

Health information thus plays a key role in enabling public health systems at facility, national and global levels to provide for care that can inscribe the characteristics of a GPG discussed earlier. As the WHO health systems framework has emphasized, there are 6 inter-connected pillars for health systems strengthening including governance, finance, technologies, human resources, information and research, and service delivery. Our focus is on the information component of this framework, and the supporting software systems to enable the provision of this information.

The recognition of the fundamental role of information in public health goes back more than a hundred years. In 1897, countries attending the International Sanitary Conference recognized the need for international health surveillance. In 1903, countries adopted the International Sanitary Convention, which called for the formation of a global organization which could monitor the international ecology of diseases. There were various organizations established over time, which served as precursors to the establishment of the World Health Organization (WHO) in 1948. Amongst the multiple roles that WHO plays, a key one is to encourage countries to accurately report outbreaks, for which they need to actively strengthen their surveillance and other health information systems. For achieving this, they seek to strengthen international cooperation between state and non-state actors, including towards building capacities to report, validate, and actively act on information. And in recent years, WHO has also been actively engaged with the supporting software systems and standards, which can strengthen these health information related capabilities.

The spread of the HIV virus and AIDS in the early eighties, and an increasing recognition of drug-resistant diseases, provided a wakeup call to countries to strengthen their reporting systems and surveillance, and to understand the advantages of information sharing. Various disease outbreaks in the world in the nineties accelerated this rising interest. The significant cost implications of these diseases made the politicians take notice. It was reported that the plague outbreak in India in 1994 cost the country more than USD 1.5 billion through trade and travel restrictions. However, the flip side of information sharing is that often the media overreacts, or outbreaks are reported wrongly, leading to inappropriate consequences.

Some of the lessons learnt through these experiences include:

1. Prevention at source is more effective and cost-effective than border controls.
2. Information provision and action on it benefits from a multiplicity of efforts.
3. Network approach is the most effective. For example, WHO's FluNet is a network of specialists, who share information on different strains of influenza.
4. Transparency of information is key, but should be based on and backed up with certified testing, opinions of specialists, and permissions to visit affected zones.

After having discussed the need and importance of treating health information as a GPG, in the next section we discuss the urgent need to also consider the supporting software systems in the same vein.

4. FOSS for HIS to be treated as GPGs

Defining FOSS: As per Wikipedia, FOSS is an acronym for Free or Open Source Software. **FOSS** programs are those that have licenses that allow users to freely run the program for any purpose, modify the program as they want, and also to freely distribute copies of either the original version or their own modified version.

The concept of Free software was inspired by Richard Stallman, where free software was not 'free' as in 'free beer', but rather 'free' as in 'free speech.' Open Source Software was inspired by Linus Torvalds' LINUX. Free software and Open Source Software is used in combination as FOSS. While Free software represents a total philosophy, 'open source' is a practical solution to specific problems in software development. There are many philosophical debates around these terms, which we will not go into here. However, what is important to note is that neither free nor open software is anti-capitalist, but can be seen to be *differently* capitalist. While the free software community sees the role of property and markets as being acceptable outside software code, for open source developers, property and market methods are acceptable if chosen by developers, but not when imposed from outside.

When we talk about the GPG elements of a FOSS based HIS application, it becomes important to unpack it further. There are two relevant dimensions:The first relates the need to think differently about the ***production and consumption*** of software. Second, is to consider the ***different levels*** of a FOSS based HIS application.

Production and consumption of FOSS: While production relates to the development of the core software platform, the continuing creation of new releases and patches, and providing the required technical support to users. The software code is hosted in software repositories like Github, from where it can be downloaded by anyone and used for their respective purposes. In this way, the software is provided in a form that characterizes a GPG's properties of nonrivalry and nonexclusivity. If one person downloads the code it does not detract another person from doing the same. Further, the code is made available for universal use, and no one in principle is excluded from this. Those who download, then can "own" a bundle of rights around the code (modify, copy, run etc) which are more extensive than traditional proprietary licence models. "Ownership" of the code is a misleading binary term which reinforces a maximalist IP narrative – that code is like handbags, cars or shoes. What we are talking here is a bundle of rights around the code.

On the consumption side, the situation is more complex, as it depends on various factors such as the particular Open Source license under which the code is released and also the choices of the user on whether they want to share and what. Suppose the IT unit of the Ministry of Health (MoH) in a particular country download the code, and use it to customize a particular application, whether or not they choose to share that code with another country, is dependent on their choice. However, within the public health sphere, we should expect code developed by a particular department or health programme within the MoH should at the least be available to all other programmes and departments. In practice, this is often not the case, but could be a larger ideal to strive for through policy and practice. If the code is released under General Public License (GPL), then the users are obliged to put back to the repository all the enhancements to the code that they may have made. However, with other FOSS licenses like BSD (Berkeley Software Distribution), there is no such obligation for the user to put their code back to the community. So there can be exclusions

and rivalries inherent in this consumption process, which may detract the application from being a GPG.

Different levels in the FOSS based HIS: We could conceptualize different levels to exist in a FOSS based HIS application. At the core is the platform on which the HIS is developed. It is this platform that is released under the FOSS license. Using this platform, the user can carry out different kinds of enhancements: a) add new functionalities in making changes in the source code; b) make particular customizations and configurations which do not involve any changes to the source code; c) develop third party Apps which link to the core platform through web API services. It is important then to note it is only the base platform and the subsequent source code modifications which can be treated as a GPG, while user specific customizations and configurations are in the domain of the user, and may or may not be treated as a GPG. Users would need to make significant investments in making customizations, building capacity, managing servers and support, and they may want to treat these investments as exclusively belonging to them.

A key point of relevance in our workshop is that FOSS based platform is not burdened with proprietary license encumbrances, implying that in principle the user (the Ministry of Health in the context of HIS) owns the code and the freedom to modify it. This property has the potential to address some of the key challenges that have plagued public HIS especially in developing countries over the last few decades, such as:

1. Avoidance of vendor lock-ins: Many a system has failed in various countries because the HIS has been developed on a proprietary platform, which could only be modified by the vendor who owns the code. But the information needs of the health system are never frozen, and always evolving, which require the supporting HISs to also evolve. However, vendors often disappear after the initial delivery of the software, or demand significant contractual modifications to make any required changes. The extra money and time which comes into play for making these modifications means the system remains in its original state, and dies a slow death. A new, rather than an extended, system comes in as a replacement often with similar consequences, at regular intervals. Vendor lock-ins refer to prohibitive exit costs. Typically a software tender might be for 3-5 years. But after that time, it can be impossible to go back to the market looking for alternatives. Because the vendor has locked himself into the r institution/government/etc. This point thus refers both to vendor lock-in and risks of obsolescence.

2. Proliferation of fragmented systems: For various technical and institutional reasons, including the non-sharing of data across systems, a health system is typically characterized by a multiplicity of systems, often being used for the same purpose. For example, in many countries, we have seen separate software applications being used for malaria – coming from the routine HMIS (Health Management Information System), the disease surveillance programmes, and the vertical national malaria programme. Data on the same disease coming from multiple sources only confuses

the decision maker of what is "true" while increasing the work burden of the data providers. The end result is that information is not used for improving the disease situation in the country. Contributing to this situation is the fact that these different systems are based on different (proprietary) software platforms which restrict the sharing of data across them. We can of course always build dysfunctional systems with FOSS silo platforms. Today, building integrated national systems is acknowledged as the single most important agenda of MoH and global development partners. FOSS platforms are seen to be more appropriate to achieve this goal since it allows users to access the code and build interoperability with other systems to enable integration.

3. Potential for building in-house capacity: Given that the user has the freedom to modify the code, their technical team at least have the potential to work with the code and in the process be able to build their capacity around it through a process of learning by doing. Such a possibility is not available in proprietary systems. Another enabling factor for capacity building is that since the Ministry is not paying exorbitant fees for software licenses – its procurement and maintenance, the funds saved can potentially be directed towards capacity strengthening efforts. Given that HIS are socio-technical and not merely technical systems, it is advisable in a project, that 10% of the costs are spent on the technology, while the remaining resources are spent on the human, organizational and implementation issues. Within a FOSS context, it is possible to reach this balance, as compared to the 90% which typically gets spent on technical systems with projects involving proprietary software.

4. Greater possibilities for the scaling and sustaining of systems: Many HIS projects in developing countries die as pilots, a phenomenon referred to as "*pilotits*." A public HIS necessarily needs to have properties of scalability and sustainability to be effective. A state in India may typically have many dozen hospitals, and user based licensing costs makes the scaling of the systems extremely difficult to achieve. And the lack of scalability of systems directly and adversely affects the sustainability of systems, as managers want health information covering the whole catchment population, and not from individual pilot sites. If managers are not motivated towards a system, resources are not directed to it, making the same unsustainable over time. A FOSS based system, because of the absence of licensing costs have more possibilities for it to be scaled, and with it enhance possible sustainability. This created a governance issue, since if the state pays for software it should not have to pay for the same thing multiple times.

So, it is argued that FOSS has the potential of removing some of the distortions in existing proprietary based HIS, and moving closer to the normative goal of a GPG. However, it should not be seen at all as a silver bullet which can do away with all the technical and

institutional challenges in play. Identifying what are the distortions in achieving this state of GPG, and what can we do to address these distortions, is a key aim of this workshop.

There are various FOSS based platforms in use in various developing countries within the public health system. There include the District Health Information Software Version 2 which is being used as a platform to develop different forms of HIS which is being used in nearly 60 countries. Then there is the OpenMRS (Open Medical Record System) which has been developed as integrated Electronic Medical Record (EMR) in various contexts, including in India. There is also the iHRIS (Integrated Human Resources System) which is used for development of Human Resources IS; also in Bihar and Jharkhand. There are various other platforms, which is not possible to discuss in this short background note. However, I will discuss the example of DHIS2 which is being positioned as a GPG by a consortium of global health partners.

5. The DHIS2 Experience as a GPG

5.1 Globally

The growth and impact of DHIS2 (see dhis2.org) globally has been significant. The robust, open-source health information platform has become a global necessity with its implementation in about 60 countries. DHIS2 is a product of the Health Information System Program (HISP) research and development movement initiated in 1994 by researchers from the University of Oslo (UiO) and collaborating partners in South Africa. Since its relatively small initiation in South Africa in 1997, DHIS2 has become the dominant de facto platform globally to develop HISs. It is a platform upon which governments and MoHs across continents are relying upon for analysis, decision-making and investment in the tracking, managing and prevention of disease and pandemics, and for monitoring and evaluation support. Methodically crafted more than a decade ago by pioneering PhD and Master's students from the Department of Informatics, University of Oslo, this platform has left the largest footprint on the globe for national HIS.

Over the years, the HISP movement has thrived and evolved into a diverse and heterogeneous group of entities committed to strengthening public HIS in countries, including Universities, MoHs, NGOs, social entrepreneurs, individual consultants, and others. The network is built largely on principles of reciprocity, where individual members draw upon the collective good of DHIS2 and associated resources and, in turn, contribute with their individual experiences and technical enhancements.

The success of DHIS2 is unique and has created a paradigm shift in HIS management that its donor community has acknowledged. It has been uniquely constructed through a long-standing participatory action research based approach focusing on experiences from the field and the ground up, which is the most logical and relevant place to define information requirements for decision-making. The platform is open-source, free and unencumbered from license restrictions—which was the "Achilles' heel" of many HIS projects in the past. The innovation that occurs on the ground, in-country, is built back into subsequent DHIS2 versions and training—thus enabling dissemination of best practices globally. This drives

how the system and the community evolve and share information, and the GPG gets disseminated globally.

The system's architects thoughtfully preserve its simplicity and flexibility based on design and development principles of a platform with a low-maintenance philosophy to uniquely address challenges of sustainability and scalability. The platform is based on the latest technology to ensure interoperability with complementary HIS and mobile applications to enable robust data warehousing to help achieve the key health systems goal of integration. DHIS2 allows and encourages countries to layer in unique applications and add-ons, and to link and tailor to their specific needs. Ownership is local with a core commitment to institutional strengthening. Innovation through the research and development engine and talent of the UiO and collaborating Universities keeps the platform *and* the in-country implementation on the cutting edge.

Given the rising global demand for DHIS2, there was an exponentially rising need for supporting the evolution of the platform, else the investments already made by donors and MoHs in DHIS2 in countries would be put to risk. There is growing consensus among the donor community that funding for the 'core' team is imperative to maintain and grow DHIS2 both in country implementation sites and in its home office at UiO. Understanding these risks and need for collective action have encouraged various donors and global organizations such as PEPFAR, NORAD, Global Fund, WHO, UNICEF, and various others to come together to jointly fund the core platform development, and build the capacities of the UiO and its regional partners (such as HISP India and HISP Vietnam in South Asia) to provision for technical support to countries and build strong regional and national teams.

This status and acceptance of DHIS2 as a GPG is not something that has been conferred from the "top" but is something that has been earned, through more than 2 decades of solid and intensive work on the ground, founded on an ideology and practice of FOSS and universal sharing. Replicating such an extremely intensive model of development and implementation, based on empirical experiences, is never something which will come through normal software vendors, for whom software development is only about formalizing requirements and converting it into code for a handsome fee. A GPG oriented ideology backed by practices and techniques related to FOSS need to underlie the efforts.

There are various gaps and distortions which exist for DHIS2 as a platform to achieve this stage of a GPG. Understanding these and also the strategies to address them in policy and practice is a key aim of this workshop. We discuss these needs in the following section, before which we discuss the DHIS2 experience in India.

5.2 DHIS2 in India

DHIS2 was born in India in 2006, collaboratively developed by the Oslo technical team supported by developers from HISP India. The team worked intensively over a few months in the beach setting of Kovalam in Kerala, before the first version was introduced in a PHC (Vizhinjam) outside Trivandrum in February 2006. There was a continuous process of getting feedback in use by health practitioners, which led to the State government of Kerala

adopting DHIS2 as a state wide system in 2007, and this status has continued since. Seeing the evolution of DHIS2 in Kerala, state governments of Gujarat, and then Jharkhand and Maharashtra invited HISP India to initiate DHIS2 implementation efforts in their respective states. These processes were initiated with mixed results.

In 2008, under the NRHM framework, National Health Systems Resource Centre (NHSRC) collaborated with HISP India during the process of redesign of the national HIS. HISP India, based on their experiences of working with HMIS in various states, presented a situation assessment of the strengths and weaknesses of the existing systems. This provided useful inputs to the national HIS redesign. NRHM in October 2008, issued instructions to states to adopt new formats, and also suggested states could use DHIS2 as a state portal, which could interoperate with the MoH adopted national web portal.

There were ongoing tensions for states to work with two systems – DHIS2 and national web portal – and over time many states left the use of DHIS2. Today, about 9 states use DHIS2 and it is firmly institutionalized at the state level in Bihar, Orissa, Kerala, Himachal Pradesh, Uttar Pradesh, Haryana. Further, specific portals have been customized for Madhya Pradesh and Punjab. The advantage it provides to states include:
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1. For the state, the base platform is without cost, and they pay minimal costs to HIS India (less than USD 500 a month) for ongoing routine maintenance and support. Outside routine support, if states require larger customizations and development, these are costed additionally based on pre-agreed rates. So, states pay only for the human resources time required for customization, support and training, and there are no licensing costs involved.
2. The states use the DHIS2 as a state data warehouse, where all their health program data is entered, from which the reports required for the national HMIS are generated, and uploaded into the MoH web portal through Excel export functionality. The advantage of this warehouse approach is that states need and use more data for programme management than what they need to report to the national level, and DHIS2 helps to provide this functionality.
3. Since the states own the code and the freedom to modify it, the DHIS2 provides the states with the flexibility to:
    a. Add new data elements, indicators, reports, data validation rules etc.
    b. Incorporate GIS analysis based on open source GIS module inbuilt in DHIS2.
    c. Create new functionalities and modules as required for different programmes in the same platform.
4. DHIS2 provides strong analytical functionalities, and easy to use dashboards which can provide users the ability to analyze data quality and view their indicators by charts, graphs, tables, maps to help aid evidence based decision making. Analysis and use of data is easily decentralized to the district and levels below.
5. DHIS2 provides open APIs to enable integration with other systems and also other data entry devices such as mobile phones. Support for offline entry also makes DHIS2 an attractive option to use in areas of weak internet connectivity.
6. The states choose options for server hosting which include in-house data centres, third party data centres, and the cloud. HISP India supports some of these hosting

options by managing the application, while the hosting services provider supports the infrastructure. Non Disclosure Agreements (NDA) are created with the states, and states own their data without ambiguity.

7. The new versions and modules developed by the Global DHIS2 community are made available to the states without cost. Similarly, learnings and developments from DHIS2 in India can be shared with the global community.

Some of the learnings from the more than a decade of experience of supporting DHIS2 in states include:

1. States need to build stronger in-house capacity to do at least the routine management and extensions to DHIS2 to become more self-reliant.
2. States need to strengthen capacity to analyze and use information, to take full advantages of the functionalities in offer.
3. Governance systems for the overall HIS in a state needs to be formalized so that the relationship between the different systems in the state are made clear, and strategies for integration formalized.
4. States need to adequately budget for the long term adoption and evolution of the platform.

While there are some characteristics of a GPG inscribed in the manner in which DHIS2 is being used in India, we need to do a lot more to achieve this goal. A first step in this regard would be to have clearer policy directions on how the MoH wants to adopt FOSS products. There is a strong commitment from the HISP global community to work with the MoH to support the use of DHIS2 to strengthen public health information systems in India. A dialogue between the different stakeholders involved would help to initiate future strengthening processes, which build upon the learnings from India and global experience which stretch over more than 2 decades across multiple countries.

6. Some policy-practice gaps relating to FOSS as a GPG

In trying to understand policy-practice gaps, we draw upon learning from more than 2 decades of research in information systems has taught us that “airplanes don’t fly, airlines do”. The implication of this statement is that technology on its own can do little, and for it to be effective it requires complex socio-technical elements such as policies, institutions, people and capacities, histories, infrastructures, practices and other things to come together in a seamless manner. In the context of this workshop, a key implication is that a policy, which focuses only on the FOSS artefact, will undoubtedly fail, as many more things are needed to be in place to enable effective use of FOSS and standards. To understand what these “many other things” which needs to be in place are, the perspective of a GPG is arguably relevant, so are the policy-practice gaps in attaining this normative ideal.

With this background, we identify below the following 5 key policy-practice gaps:

i) The knowledge gap:
ii) The governance gap:

iii) The procurement gap
iv) The participation gap
v) The capacity gap
vi) The financial gap

These are now briefly discussed:

i) ***The knowledge gap***: The knowledge involved is not uni-disciplinary relating to computer but is multi-disciplinary involving informatics, public health, implementation research and various others. This requires various institutions and experts to be involved in the FOSS development and use effort. This is not easy to mobilize in practice, leading to the creation of a knowledge gap. This gap gets also enhanced because of the uneven knowledge which exists across countries in the context of a GPG. If the core development of the FOSS platform is centralized in the West, national users face the challenge of having existing knowledge to work with the core to meet local requirements. Bridging this knowledge gap has no simple solutions, and requires multi-faceted efforts.

ii) ***The governance gap***: Governing GPG based solutions is a complex task, as it involves bringing people together from difference countries, disciplines, all representing a variety of interests, sometimes conflicting. Mechanisms of governance need to be established that can give all relevant stakeholders a voice in the process of how choices are made and implemented. This is of course a political process, where certain stakeholders have more power and resources than others, leading to the creation of a governance gap. There are then issues of logistics of how such multi-stakeholder participants can be got together on a single platform, given the very busy schedules that such people have.

iii) ***The procurement gap***: Government systems have historically procured software systems based on tenders which pre-specify requirements, and which tend to be biased towards large and commercial firms. Organizations dealing with FOSS solution, typically smaller NGOs tend to get excluded. The governments often have limited experience in procuring FOSS based systems, where requirements are not necessarily fully pre-specified, and requires them to evolve in a collaborative manner between developers and users. Often there is a misconception on government that FOSS means that the whole system development is completely free of charge. However, this can never be the case, as it is only the license fees which are not relevant, but other costs of configuration, capacity development and support are to be borne as in any other system development process. These issues thus contribute to create a procurement gap in the context of such GPS.

iv) ***The participation gap***: Participation is required at various stages of the system development process from the articulation of requirements, ensuring these get taken in the development roadmap, engaging in prototyping, the system development process, and various other components. For all to be able to participate, they need the opportunities and the capacity to do so. These become difficult given the time and space separation of the developers and users, the knowledge and capacity gaps that also exist. In light of this gap, the risk gets

created of the development process being driven by the technical people, and the domain knowledge getting increasingly marginalized.

v) ***The capacity gap***: The capacity gap relates to both the technical systems, and also the ability of the users to use the information being generated by the application for improving health action. In light of this capacity gap, there are handicaps for the teams in developing countries in mastering the technology and its use. There are then dependencies created between these developing country users and the central development team responsible for the core, and there are financial constraints in them accessing the required support.

vi) ***The financial gap***: Often users believe FOSS based HIS are completely free of cost, implying they also don't need to budget for customization, capacity strengthening, server hosting and management and various others. For example FOSS might well be free, but hosting web based systems on servers and/or entering into support contracts is not. So the simple cost arguments for FOSS are sometimes disingenuous. Frequently it is cheaper, but the benefits lie elsewhere. That at least is a case which needs to be made. The relationship between FOSS and open standards is another important area to unpack, as it has significant financial implications. Being unable to determine the Total Cost of Ownership (TCO) of a FOSS based HIS and provisioning for this in the planning phase leads to significant financial gaps. In comparing proprietary versus FOSS platforms, it is important to consider what % of the costs relating to licensing.

These gaps discussed are inter-related, and one issue influences the other. The capacity gap would adversely influence the participation gap, which in the broader context hinders their ability to access, use the FOSS application, and direct it towards meeting their local needs. We believe these and other relevant gaps need to be addressed both at the levels of policy and practice. Through deliberations in this workshop, we hope to identify these gaps and strategies to address them in the Indian context, all with the aim of improving public health information systems in India.