

Medical Informatics for COVID-19

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[AP2-E1-1-02] Agile Response to Poorly Known Threats in COVID-19 Information System Implementation: A Case Study from Sri Lanka

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Keywords: COVID-19, Pandemic Surveillance, Surveillance System, Sri Lanka

Pandemics are critical contexts that requires agile response by countries with low resources. The study aims at identifying sociotechnical determinants in addition to the technology in-troducing and agile response for pandemic surveillance. Qualitative methods were utilised in assessing the case study of COVID-19 surveillance system implementation in Sri Lanka. The study identifies a mix of governance and multisec-tor collaboration, leveraging on existing capacity, obtaining best use of a lightweight platform and networking with global community of practice as sociotechnical determinants in the country's swift response during the pandemic.

Agile Response to Poorly Known Threats in COVID-19 Information System Implementation: A Case Study from Sri Lanka

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Abstract

Pandemics are critical contexts that requires agile response by countries with low resources. The study aims at identifying sociotechnical determinants in addition to the technology introducing and agile response for pandemic surveillance. Qualitative methods were utilised in assessing the case study of COVID-19 surveillance system implementation in Sri Lanka. The study identifies a mix of governance and multisector collaboration, leveraging on existing capacity, obtaining best use of a lightweight platform and networking with global community of practice as sociotechnical determinants in the country's swift response during the pandemic.

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Introduction

High levels of uncertainty characterize pandemics as they go through unpredictable and rapidly changing circumstances, making it impossible to anticipate their responses. What is certain, however, is that for health providers and policy makers to respond optimally, timely and quality data is crucial. The subject of this article is how to better build information systems (IS) to respond to the health crisis as a pandemic, based on an empirical study of the response of the COVID-19 information system in Sri Lanka.

Lessons from the previous Information Systems responses for pandemics reveal that practice of agile, iterative methods of software development as opposed to traditional 'waterfall' approach has proven to be successful in H1N1 outbreak in Japan[1]. Lai has highlighted the need to understand the determinants of implementing agility in an outbreak situation for successful IS implementations[2]. Therefore, agile response in software development have been identified as a fruitful approach in pandemic situations with rapidly changing requirements. While agile methods emphasise over the agile process and tools[3], we identify lightweight software and platforms as determinants of agility in a pandemic situation. Lightweight software thrives on easiness in design and implementation as well as ability for swift follow-up pilots as opposed to heavy-weight software which is driven by IT professionals and well-structured systematic specifications[4]. Platform are products and services in which outside parties can build complementary products or services[5]. This could further be supported for multiple actors such as end users and developers. Understanding the sociotechnical determinants in agile response to falling on threats in COVID-19 IS response which

can be best materialised in low and middle income (LMIC) context is little known. This paper aims to explore this area of IS research vacuum based on the efforts behind swift response in Sri Lanka in establishing COVID-19 information system.

Methods

For this paper, we adopted a case study methodology as it allowed us to analyze in detail both the context and the dynamics associated with the phenomenon-agile creation of HIS in a pandemic situation within Sri Lanka's LMIC context. This approach provided the researchers more freedom to explore new and less developed research areas in phenomenon investigated through the study[8].

Some of the authors were directly involved in the design development and implementation of the information system in focus and their lived experiences inform of narratives were obtained for analysis. In addition, observations at stakeholder meetings and design documents were also analysed. The qualitative methods used also involved interviewing and thematic analysis of key stakeholders of health administration, public health surveillance, ICT implementation and system users.

Case Study

Context of HIS Capacity

Sri Lanka is a country which provide free education from the primary education up to the University level. The medical education in the country is no exception and this extent further by the government providing financial support for medical doctors for their post graduate education. During the last decade selected set of medical doctors have been provided with postgraduate training on informatics who were then employed at national and district level supporting the planning and implementation of health information systems as well as building health informatics capacity throughout the country.

COVID-19 IS Implementation

The Ministry of Health Sri Lanka conducted a situational assessment and necessary steps in building a COVID-19 surveillance system in January 2020 before the country reported its first COVID 19 case. The above exercise was initiated by administrators and health informatics experts in the Ministry and joined by HISP Sri Lanka, the regional note of global HISP network catalysing public health information system implementation in LMIC in Africa and Asia. The existing capacity within the country, customisability without major requirement of coding, free solution which does not require lane the procurement process, scalability and familiarity of end users of

the platform geared the team to identify the free and open source software solution DHIS2 is the ideal platform to develop the surveillance system.

The system emerged with the port of entry module targeting the initial requirement of tracking the tourists during their stay within the country. The enabling administration and domain experts in the Ministry of health and COVID-19 presidential task force assessed the system and approved it to be rapidly piloted and rolled out in the entire country within a short span of time. However, following the initial deployment the epidemiological focus and surveillance response of the country changed for mandatory current in of all personnel entering the country and admission of all positive cases for inward care. This required the system to accommodate new modules for information requirements related to quarantine and in-patient care. The team of experts were quickly able to customise the modules within the DHIS2-based platform. However, there were few requirements which could not be accommodated by customisation of the platform which required development of components on top of the existing platform. This is when the government ICT agency obtain support of voluntary software developers by organising a hackathon to develop custom web applications on DHIS2-based platform. The engagement of the local note of HISP network enabled to obtain real-time support from DHIS2 global core development team. The end-users were provided rapid training on using the system online under the support and guidance of health informatics experts at national and district level. The new web apps that were deployed for local context were shared with the global DHIS2 community which catalysed further refining of the application should local requirements and were shared in DHIS2 App Store to be used by other LMICs.

Case Study

The study aims at analysing how Sri Lanka approached poorly known threats in designing and implementation of COVID-19 surveillance system. The case study identifies several broad domains of sociotechnical determinants in the country's approach.

High-level and Multisectoral Governance

Sri Lanka responded to the pandemic by realising its weaknesses and established a task force which was prompt in obtaining support of relevant stakeholders in establishing the surveillance system before the first case was reported in the country. The Ministry of health was swift in assessing the system and providing support rapid implementation. In addition, the country obtained support of multiple stakeholders spanned across Ministry of health, the ministries, non-government entities as well as the volunteer experts. Such rapid response and multisector engagement were key elements of governance which was behind the countries successful rollout of the system during a pandemic. Agile response in assessing the situation and seeking avenues of resources which were not usual practices of traditional government mechanisms such as organizing of hackathon could be highlighted as agile and innovative responses.

Leveraging on Existing Capacity & Infrastructure

the country utilised its existing capacity in health informatics produced by its free education system. The country was prepared by placing the experts in national and district level who were competent in implementing the system during crisis situation. Further, obtaining expertise of volunteer software developers in the country was a classic use of local resources in producing local innovations.

Lightweight-digital Platforms

Sri Lanka utilised DHIS2 which was easily customisable based on changing requirements. Development of rapid prototype for port of entry module and gradually incorporating quarantine, in-patient modules were customised based on changing requirements. However, when the requirements demanded features beyond the potential of existing core applications the platform supported building web apps on existing for software which prevented usual practice of scattered and duplicate software system to cater public health phenomenon. This is a classic use of DHIS2 as a platform and further extended its use by integrating with existing information systems within government hierarchy.

Networking & Community of Practice

The country was already a part of global HISP network which has a community of diverse expertise with common interest of public health Information Systems. The country shared its innovations with the network and the community which in turn provided support for local innovations by means of development support and feedback. The country shared back its innovation with the global community who then generified the product and adopted it to be used by LMIC. Therefore, the countries agile response included a fine mix of governance at all levels, while engaging with local capacity to obtain best of adopted light-weight software platform and obtaining support of global community and contributing back to the community to benefitted at a global level.

Conclusion

Pandemics are complex and rapidly evolving, requiring versatility and agile development of the IS response as well.

It is therefore both a key theoretical and practical challenge to understand how such agility can be allowed.

Our paper aimed to contribute to building awareness of how to create agility in a context with poorly known threats stressing on the fact that it is not a technological but a collective endeavor that is essentially socio-technical.

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