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# Convergence of technical and policy processes: A study of Indonesia's health information systems

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**Abstract.** This paper discusses the process of implementing a district dashboard as the means for integrating health information systems (HIS) in Indonesia. The project involved two processes: a bottom-up one with iterative design and implementation process and a top-down one involving data policies. Using moments of translation, we discuss the complex processes of aligning actors' interests necessary for the implementation of HIS in developing countries. The paper contributes to the existing discussions of HIS integration and information sharing in developing countries by providing a better understanding of translation processes and thereby of ways to handle fragmented HISs.

**Keywords:** Integration; Translation; Health Information System; Dashboard; Information Policy; Developing Countries; Indonesia

## 1 Introduction

This article addresses the issue of developing integrated Health Information Systems (HIS) in Indonesia through what is labelled a dashboard strategy, which is seen by the local actors as enabling integration without disturbing the underlying systems. The development started as a small bottom up project working on extracting data from national databases to present in dashboards at national level and in a pilot province [1]. Gradually, however, the dashboard process increased its importance and organisational anchoring and in 2018 it converged with a top-down national initiative called One Data to integrate data from different governmental sectors to be made accessible in one portal. This process is being analysed using Callon's concept of translation [2].

The process of HIS development in Indonesia is unfolding in a context shared with other developing countries; poor infrastructure in parts of the country, inadequate capacity, fragmentation of reporting systems, suboptimal HISs and limited funds [3-5]. The health sector is heterogeneous, consisting of multiple subsystems such as health programs (for example, HIV, TB and Malaria), and multiple administrative hierarchy levels. Indonesia has adopted a federal government structure where provinces and districts are relatively independent from the national administration, which add to the fragmentation and complexities of the HIS. The HIS is fairly typical with multiple vertical health program-specific systems with own platforms working in

‘silos’ with little data sharing. For example, health programmes such as TB, HIV/AIDS and Malaria have their own reporting systems running in silos with minimum information sharing. The Data and Information Health unit in the Ministry of Health (MoH) in Indonesia called Pusdatin, is responsible for developing and supervising health information regulation across the country and in charge of the project described in this article. Therefore, our study positioned itself to understand how diverse actor’s interests can be aligned to develop an integrated information system. Specifically, we aim to answer the research question, how can diverse actors in a heterogeneous environment be aligned in the development of an integrated dashboard information system? Using the concept of translation, we identify and analyse the different stages involved in aligning diverse actor’s interests. The dashboard strategy is shown to be useful in aligning stakeholders in pursuing integration in a context of fragmented HISs. We illustrate this by showing how the bottom-up dashboard process and a top-down policy processes got more aligned and started to converge despite starting out independently.

The article is organised as follows; in the next section is a literature review outlining the concept of translation used in the analysis; then follows a section on methods before the analysis section where the case is analysed according to four moments of translation. The final section provides a discussion and conclusion.

## **2 Literature Review: Translation**

The paper uses the concept of translation from the Actor Network Theory (ANT) to understand the complex social processes involved in the implementation of health information system. The ANT theory highlights the heterogeneous nature of actors within a network, their association and interactions; and importance of balancing both social and technical aspect [6-8]. Translation is seen as a process which generates ordering effects and aligns interests of heterogeneous actors within a network into a common one [9]. “Translation occurs as actors enrol allies in the actor network and align their interests in a continuous process of renegotiation where claims become well-established facts and prototypes are turned into routinely used pieces of equipment” [10]. According to Callon, the translation process is described to have four phases (problematization, interessement, enrolment and mobilisation) which may overlap one another as one goes through them [2]. In general, the first two phases describe how one can start by identifying actors and their problem nature while establishing the possibility of interaction among them. The strategy for negotiation and manoeuvre and assigning actor roles while strengthening the network is more elaborated by the latter two phases of the concept.

## **3 Method**

The empirical material is gathered through a longitudinal process from January 2015 to February 2019 in Indonesia. The study took place within a HIS strengthening implementation project including national, province, district and facility levels. The

project has followed an action research approach [11] including prototyping and participation from users and researchers in planning, implementation, evaluation and dissemination activities [12-13]. During an intensive period over 18 months 2016-2017 the authors were engaged in implementation in 10 pilot districts in 5 provinces where the districts were visited one week each in a sequence over three cycles. While the sequential approach allowed learning from one district to be shared with and applied in the following districts, the cyclic approach allowed for learning from one cycle to be analysed and used in the next cycle.

In addition to the fieldwork, the authors gathered empirical data from multiple information sources at national and regional level, such as strategic documents, project reports, minutes from meetings (monthly technical meeting with local and national level), interviews, strategic documents, training materials and supervision and technical assistance reports, training materials and participation in trainings at national and regional level. During field activities, an analysis part of data took place through a continuous process of data collection in the field to identify important themes and relate them to the theory. While initially, the focus was on understanding and documenting the health information data sources, data flows and routines for data use, later the focus was more on participatory design and implementation of dashboards and other aspects of the DHIS2 dashboard system. We discussed with people in all positions and at all levels of the health system both in formal and informal settings, about our and their views on the current situation and strategies. The analysis continued to evolve through an ongoing review of relevant research literature and theories, thus representing an evolving “conversation” between data and method.

All authors are part of health information system strengthening implementation in Indonesia. The first author has been in HIS development and implementation, and one author has been part of formulating regulations at the national level. The other two authors have extensive experiences in HIS implementation in developing countries as part of Health Information Systems Programme (HISP) [1, 14].

## **4 HIS Implementation: Indonesia’s Journey**

In this section, we will give a chronology sequence of events prior to and leading to the implementation of district dashboards in Indonesia and its designation as the official platform for integrated health information within the Ministry of Health. We categorise these chain of events into three phases as illustrated in the below section.

### **4.1 Initial HIS Efforts**

In 2010, Indonesia’s government through the President's work unit for development supervision and control or commonly known as “Unit Kerja Presiden Bidang Pengawasan dan Pengendalian Pembangunan (UKP4)” initiated the “Satu Data” policy, meaning One Data and created a national portal (<https://data.go.id>). The Satu Data policy was formulated to address the observed challenges in relation to quality

and use of governmental data [15]. Data collected were in diverse formats and not following standardised mechanism making it difficult to analyse and use both within and across the different government agencies [16].

In the health sector, the Satu Data policy is labelled “Satu Data Kesehatan”, meaning One Health Data, with the principle of having one standard, one metadata, and one portal for information dissemination. The Satu Data Kesehatan policy has been developed by Pusdatin with the aim of providing accurate, integrated and up-to-date information, accessible through integrated information systems using standard metadata services [17-18]. Indonesia has a federal structure where provinces and districts are relatively independent from the national ministry of Health. The adoption of information systems at provincial and district levels follows local regulations with little involvement from the ministry of health. At the national level, health programmes have their own systems with some using web-based systems such as TB and HIV/AIDS and others using Excel based systems, such as Malaria and immunisation. Realising the HIS fragmentation within the health sector, Pusdatin implemented a nation-wide system named KOMDAT collecting data for about 130 national health indicators, based on data aggregated by district. The KOMDAT design however, limited the district data managers to enter data until they have received a complete set of data from all reporting puskesmas (health centres) in their districts.

## **4.2 District Dashboard as a strategy**

The DHIS2 dashboard process in Indonesia started with a demonstration at the AeHIN conference in Manila, December 2014, which was attended by top level Ministry of Health managers from Indonesia. The leader of Pusdatin, now secretary general of MoH, was impressed and, as he saw it, ‘dashboards can be used to integrate data without disturbing the underlying systems - too much’. Following this, the University of Oslo (UiO) team was invited to Indonesia and Pusdatin, UiO and Gadjah Mada University (UGM) formed a joint project, funded by Global Fund, to develop an integrated dashboard system, starting in 2015. See [1] for an account of this early part of the project.

In November 2016, the second phase of the project started when the dashboard approach and the UiO became part of a large pilot project to implement dashboards in 10 districts, also funded by Global Fund [17]. The initial strategy for data capture was to enable interoperability by extracting data from existing national and local systems and four national applications were selected as priority data sources for routine data extraction to the DHIS2. These were HIV (SIHA), TB (SITT), malaria (eSismal) and KOMDAT, which included key data elements collected as district aggregates. Ten districts were selected from five provinces across Indonesia as pilot sites to test the district dashboard concept [17].

In a first round visiting all 10 districts, the focus was on system advocacy, socialisation, training and a rapid situation analysis to identify data sources and routines for data use in the districts. Through socialisation meeting and mini-workshops in all districts, the DHIS2 dashboards and concepts were demonstrated and participants trained on the use of DHIS2 and analytic features, such as maps, pivot

tables, charts, and dashboards. Feedback from the training as well as findings from the situation analysis reveal that in order to be relevant, the scope of data captured in the dashboards needed to be extended from the initial TB, HIV and Malaria programs to included data on the main activities in the health centres, such as Mother and Child Healthcare and Immunisation. Key data from these programs are included in the KOMDAT system, but only as district aggregates, which are not useful at the health centre level. Furthermore, the situation analysis found that all health centres conducted routine monthly meetings called 'Lokakarya Mini (Lokmin)' with great potential for use of facility dashboards, provided that relevant datasets were included. These findings led to a revision of the strategy to include data capture at facility level and the promotion of facility dashboards to be used at Lokmin meetings. These facility dashboards became very popular in the pilot districts and this strategy is now becoming national policy. The initial plan and mandate from Pusdatin were to only import data from existing electronic systems. The main problem with this strategy was that local data were captured in more or less un-standard Excel sheets, which made systematic monthly import of these data impossible. DHIS2 capacity building for the central core team on issues such as metadata management, DHIS2 and server maintenance, customisation, data interoperability and managing user roles was another initiative going on in parallel with work in pilot districts. The core DHIS2 team consisted of the UiO team, Pusdatin and the UGM team. Metadata for the selected health programmes were designed and implemented in the DHIS2 allowing for their indicators to be visualised using DHIS2 analytics tools and dashboard. Feedback gathered during the system advocacy and socialisation sessions were feed back to the dashboard design as well as the overall integration approach used for other programmes. In this process, local capacity was strengthened, a team composing of members from national level, Technical Assistance (TA) assisting the districts, local universities, local data managers and stakeholders from province and district level were trained in the administration of DHIS2, as well as designing dashboard for local information utilisation. This allowed transfer of knowledge and technology from UiO team to DHIS2 Indonesia team.

A sequential implementation approach was adopted to introduce and support the district dashboards in the 5 provinces and 10 districts. The sequential approach was useful in directly comparing the perspectives at province level with how different aspects of the HIS were regarded at district level. Lessons learned from one district were incorporated in the subsequent one, enabling accumulation of knowledge as the implementation progressed. Supervision visits followed immediately after the deployment of the district dashboards. During supervision, the team was engaged with activities focused on data dissemination using analytic tools on mobile and desktop/laptop, troubleshooting and technical assistance. The visits enabled the Pusdatin and UiO team to conduct several formal as well as in-formal meeting with local government officials, re-training end user and updating data import mechanism based on the feedback received. The activities were carried out routinely, one in each quarter, collected feedback from the end user as well as strengthening the use of information at the local level. DHIS2 became popular at both local and national levels attracting other health programmes to integrate their information with it. One data

manager at the national level revealed that "DHIS2 is the best application, and dreams come true because since past, the national level has daydreamed to provide data were integrated for facilities and district levels". Dashboards customised for each health program visualising their key indicators became popular tools for data analysis and dissemination and became an important drawcard attracting new programs to join the process [19]. Dashboards were promoted used in routine monthly and quarterly meetings at health facility and district levels and which were already including data verification, validation, and dissemination. This approach enabled the dashboards to be a reference point and used in regular routine activity at different levels.

### 4.3 Convergences of HIS processes

Following the implementation of DHIS2 dashboards, Pusdatin felt the need to get further support from the senior levels. They started to use routinely, data extracted from the DHIS2 dashboards and introduced the web portal for public information dissemination. Earlier, the use of DHIS2 dashboards had been challenged and competed with another software named Tableau. The senior level managers were more in favour of using dashboard generated by Tableau due to their ability to illustrate the indicator performance for high-level staffs with less technical knowledge. However, as DHIS2 already included the integrated data from multiple sources used to power the dashboards and as more powerful dashboard features were added in new version of DHIS2, customised dashboards in DHIS2 became increasingly popular among senior managers for analysis and public data dissemination [20].

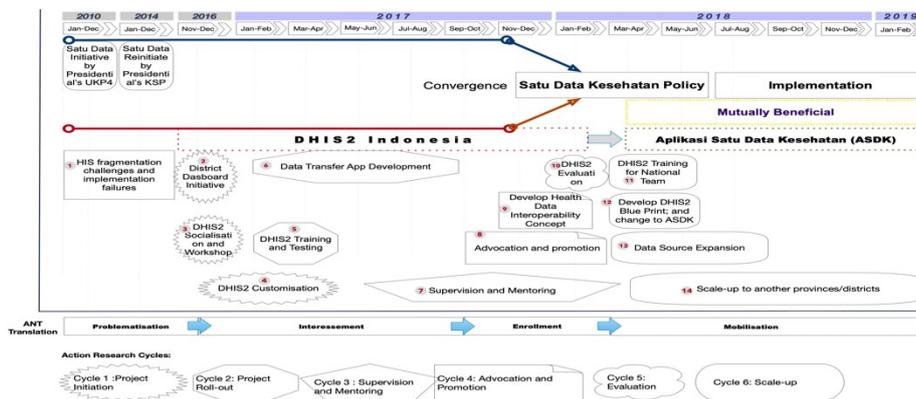


Fig. 1. Series of events for the implementation of DHIS2 dashboards in Indonesia

In order to strengthen and sustain the DHIS2 dashboard momentum, regular training and support sessions were conducted in collaboration with local universities at province, district and health centre levels, including taking part in local HIS conferences to establish more alliances. In the pilot project budget, ten health

facilities in each of the ten districts were funded as pilot sites. However, as the project progressed, in many cases local government provided funds from their budget to enable expansion of the project to the remaining health facilities in their district and to the remaining districts in their province. At the national level, Pusdatin and its stakeholders demonstrated DHIS2 functions and dashboards to the minister and other top-level managers, leading to approval for the system to be utilised nationally. Ten universities selected as ‘Centre of Excellence’ based on their academic programs in HIS, have been enrolled in the project and have been active in providing support in their regions [17].

In mid-2018, the district dashboard implementation was evaluated to provide insight on results and achievements. The evaluation concluded that the results in the pilot districts were good and recommended DHIS2 to be used also in other districts and provinces. Following this, a DHIS2 Implementation blueprint was developed to shape the scaling approach and to provide technical guidelines. The guidelines targeted provincial and districts managers to enable them to expand the project within their administrative boundaries. The implementation guidelines included issues such as team formation and training, expansion of data sources, end-user training, advocacy and promotion, funding sources, training material and troubleshooting. In the development of the guideline, DHIS2 were renamed to “Aplikasi Satu Data Kesehatan (ASDK)”, meaning One Health Data Application. This renaming reflects the official buy-in and solid organisational anchoring of the ASDK process, which we label the third phase of the DHIS2 dashboard project.

Pusdatin has continued to include new datasets from existing priority data sources as well as from new data sources, such as on human resources, stunting, national indicators, health equipment, and facility profiles. The process of scaling the process to new provinces and districts and expanding data sources are led by Pusdatin and is consisting of multiple activities including training for old and new system users and staff from provinces and district levels; engaging with national level health programs and organisations for enrolling them in the process and engaging the universities participate in training and support in their regions [21]. An online DHIS2 certified course using the Indonesian database for training has been developed by UGM and had 350 registered learners in their first batch (late 2018).

## 5 Analysis

In this section, we analyse the dashboard implementation process in Indonesia and its convergence to the Satu Data policy using the four moments of the general process of translation as a framework [2]. In our case, these moments depict cyclic and overlapping stages in the evolving project as it increases in scope (health programs, user groups and data sets to include) and scale (new provinces and new districts).

### 5.1 Problematisation Moment

Callon and Latour identified problematisation as the moment when an actor defines an ‘Obligatory Passage Point’ (OPP) as points of consensus, or in our context agreements on design or specifications of the system to be developed [2, 10]. Callon & Law define this point as a connection between ‘two sides’ of the actor network, the local network and the global network [9]. While in our case the local network consists of those involved in development and negotiations at the technical development and implementation levels, the global network consists of actors at the higher level of policy funding and decision making.

KOMDAT was the first effort of integrating national key indicators but proved early on to be a sub-optimum solution. The integration strategy then became to go for an all-encompassing electronic patient record (EPR) system called SIKDA Generik. With all data in one system, there would be no more fragmentation and all data would be available, was the thinking. However, the EPR process met technical problems and dragged out. At the same time, instructions from the central government to implement the Satu Data policy loomed over Pusdatin, increasing the pressure for standardisation and health information integration.

The solution, as discovered by the director of Pusdatin in a conference in Manila 2014, was a district dashboard, a programmatic strategy for integration, which does not disturb the underlying systems and political structures, creating a ‘win without losing’ situation. This provided support from the top, which was important, but there were other already planned applications with their own stakeholders, who did not necessarily agree in changing the strategy. Unfortunately for the DHIS2 project, the supporting director was transferred to another position just a few months later. One important negotiation process was with the group working to implement SIKDA Generik in all health centres, who didn’t want DHIS2 to go into their scope of work, i.e. patient data. The first perception and agreement from a week position, was that DHIS2 should only operate at district level as ‘district dashboard’, then, after arguing the case for ‘health centre dashboards’ and demonstrating the usefulness of this strategy in the pilot districts, the agreement reached was that also health centres should use dashboards, based on data extracted from other systems. In the pilot districts, however, health centre data were captured. In 2018, when the dashboard became the official Satu data project, and after a survey of all the then 9,993 registered public health centres had documented that only 28% had EPR systems, i.e. no electronic sources for the bulk of health centre data, it was agreed that essential aggregate data should be captured directly in the DHIS2.

Given this narrative of the evolution of the negotiations and decisions regarding the core data use and data input part of the DHIS2, promoted and ‘allowed’ activities in the health centres, we see that the process has cycled through three distinct OPPs; 1) Dashboards only at district level, no data entry; 2) Dashboards also at facility level, a priority; 3) DHIS2 also used for data capture of essential facility data. Building on Callon and Law, we see that the local network started out as being very heterogeneous and weak and not very strongly attached to the global (policy level) network, which

has also become gradually stronger [9], as illustrated by now being supported even by the president's office.

## 5.2 Interessement Moment

Whitley described the interessement as the moment when 'actors try to impede alliances that may challenge the legitimacy of the OPP' or formulating the alliances to support the OPP [22]. In our case, we see that the OPP has been gradually strengthened through the three phases described above as the various actors saw how their interests could be served as becoming custodians of the increasingly more important project. For the users of dashboards and data, interessement means formulating strategies enabling them to pursue their interest regarding the data. In new districts, the provinces managers and data & IT staff were the first to get engaged in a complementary way. While district and program managers were genuinely interested in dashboards displaying their own key data, the data and IT folks were similarly eager to be capacitated to manage data and dashboards in the new system. Identification of key players and champions and building their capacity as trainers of trainers were key part of the strategy and the involvement of the Centre of Excellence (CoE) universities was important in this regard.

In order to foster interest for the dashboards among data users in the health centres, it was necessary to expand the data scope beyond TB and HIV/AIDS and to include the health programs data being used at local level as well as to identify important areas of use. Through the initial situation analysis, the project identified the monthly routine meetings (Lokmin) in the health centres as the key area for data use and the creation of facility dashboards to support these meetings became a priority. Since local data on the key programs were not available through import from national systems, these data had to be captured locally, an option that was not yet 'allowed' as discussed in the above section. However, in the pilot districts, the KOMDAT data set was included in the DHIS2 for data capture at facility level from 2017 enabling the creation of very popular local health centre dashboards. When a delegation from national level including the WHO visited Ambon district in 2017 the person responsible for data in a meeting became so emotional that she started to cry when she told the audience how good it felt to 'own your own data and be able to make graphs and dashboards by yourself'. The WHO got so impressed by this account of success that they suggested making a film to document the project in Ambon.

To conclude: availability of facility-based data and capacity are key to the creation of interest and a sense of ownership to the dashboard system at local level.

## 5.3 Enrolment Moment

Bargaining and reaching concession are major elements observed in the enrolment moment [22]. The process of enrolling actors passed through several phases at different levels with the initial ones including key stakeholders in MoH, universities and key health programmes such as TB and HIV. In later phases, other stakeholders such as for example human resource department and health worker registers and

district and province level actors were enrolled in the project through negotiations and discussions. The inclusion of facility level data in the district dashboards enabled the scaling of dashboards to all facilities within the pilot districts to be used in their routine monthly meetings. The example of the emotional presentation of the facility data-based district dashboard in Ambon, illustrates the enrolment process at local level, but also how success at local level enhances enrolment at the global levels. With WHO on board, also other global actors were enrolled. The World Bank, for example, is holding back 11% of the funding for the building of 3 new hospitals in the poorer eastern part of Indonesia, until all districts have implemented the dashboards including some key indicators they have identified.

The enrolment of health programs for data integration has however met several challenges. While the HIV programme, for example, has been actively participating in the process, other programs like TB and human resources required detailed and continuous negotiations involving senior level managers. Some system owners were reluctant to join the network fearing to lose control with a tighter integration. However, continuous negotiations and application of dashboards to visualise their data provide a solution to reduce some of the challenges faced.

#### 5.4 Mobilisation Moment

Mobilisation moment may be seen as occurring when, as Latour argues, other actors (Pusdatin in our case) have their needs and interests met and are speaking on behalf of the focal actor [23], i.e. the initial university actors in our case. The project has gone through 3 phases; 1) the early phase before the pilot project, 2) the 10 districts pilot project, and 3) the expansion to 50 new districts, a plan for countrywide coverage and the official status as “Aplikasi Satu Data Kesehatan” (ASDK). Studying this project trajectory, we see that Pusdatin’s role has moved from being a bit reluctant and unsure about consequences for other projects (1), to being involved (2) and finally to be fully committed and the ‘project owner’ and leader. The current expansion phase started in September 2018 with regional training for the Eastern, Central and Western part of the country with 5 participants from each of the 50 districts; one person from data manager, and four persons from the programs. After the regional training two or three days ‘post training’ is planned for in each of the 50 districts, which started in November 2018. This training scheme is planned for and carried out by Pusdatin. What started as a university project in the first phase is now a full ‘mobilised’ and organisationally anchored dashboard project in the MoH. As one manager at national level commented;

*“DHIS2 is the best application with full features. Previously, we have bought expensive software, and all of that had failed. With this DHIS2 Platform, it is easy to use, it is free, Pusdatin chose the right solution now.”*

The final revision of this paper is written in February 2019 while participating in one of the post trainings organised by Pusdatin in Jayapura city and Jayapura regency, Papua province, the extreme eastern – and poorest - part of Indonesia. As according to the plan, Pusdatin was running the training and five from each of these two districts had participated in regional training November 2018. Discussion during the training

focused on how to reach the remote areas with no Internet and mobile connectivity and how to ensure offline data capture and analysis. One health centre in the district, we were told, is 45 minutes away - with aeroplane (!). This only to underline that, while the dashboard project is well mobilised and organisationally anchored, there are organisational and technical challenges not yet addressed.

## **6 Discussion and Conclusion**

We have used translation moments to analyse the project and its 3 phases; 1) the early phase before the pilot project, 2) the 10 districts pilot project, and 3) the expansion to 50 new districts and the official status as ASDK. Studying this project trajectory, we see that Pusdatin's role has moved from being a bit reluctant and unsure about consequences for other projects (1), to being involved (2) and finally to be fully committed as 'project owner' and leader. The problematisation moment has been particularly important, as the OPP has been gradually strengthened through each phase of the project, as a result of the alignment processes between and within the translation moments and in particular the problematisation and intersement moments.

An earlier study of the Indonesia project used the concept of attractor for change to analyse how the DHIS2 dashboard helped to develop a strategy for integration of HIS despite high degrees of complexity [1]. The various actors could imagine that integration was feasible 'because the dashboard was not closely embedded in complicated business processes and could stand above it'. Using the translation moments, we see that, while the dashboard has been the attractor aligning actors at policy and data use levels in the intersement moment, intersement among technical actors in the local network has been concerned with internal positioning around the OPP and relations to the global policy network. The stronger the OPP and the alignment in the local network are, the stronger the convergence of policy and technical elements in the project. In this way, the analysis based on the translation moments has provided new insight.

The Indonesia case underscores the importance of continuous negotiations and translating diverse stakeholder's interests in the implementation of health information systems in volatile environments. Kimaro & Nhampossa argued that, stakeholder's interests should be translated into the solution to address the long-term organisational needs [4]. Thus, the solution which meets the interests of different actors in the network will ultimately become the de-facto solution. While several contested interests emerged, the emergent of the district dashboard to the policy level depended on the result of contested interests reached by actors linked together in complex networks. The transition of the project to policy, as identified in this study, is caused by increased organisational ownership, local capability and strong collaboration and alignment among participating actors. The easiness with which new health programmes could be included and the flexibility of DHIS2 to accommodate new features and requirements prompted Pusdatin to design it as the ASDK. As one high level manager said: "The ministry could not continue to pay more money to new

systems, DHIS2 provides affordable solution, yet flexible to accommodate our needs”.

The use of the four moments of translation in the analysis of the dashboard process has provided new insight into how diverse groups are translating and aligning their interests into the network to achieve the project goal. It has been important to understand the strong position of the OPP, also called ‘project goal’ [9], in our case the agreed system specification as negotiated between the local and global network. Furthermore, it has been equally important to understand how the OPP is developing through stages caused by a process of overlapping and repeated cycles through the four moments of translation.

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