Investigating emergent data use innovations: An affordance perspective on Education Management Information Systems in sub-Saharan Africa

PhD Upgrade Report

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1. Introduction

The development of DHIS2[1] – the world's largest health information management system – is led and coordinated by the HISP Centre[2] at the University of Oslo (UiO). DHIS2 is currently being used in more than 100 countries for the collection and analysis of health data, benefitting more than 2.4 billion people (University of Oslo, n.d.). DHIS2's flexible design affords the use of the system in other domains, and it has been implemented as an information management system for "education, water and sanitation, agriculture, and more" (University of Oslo, n.d.). In 2010, DHIS2 was implemented in The Gambia as the country's health management information system (HMIS; Valbø, 2010). In 2019, The Gambia started piloting DHIS2 also as an education management information system (EMIS).

1.1. Main research aims and objectives

This PhD project seeks to investigate the data use innovations afforded by the platformization of the EMIS in The Gambia. In particular, I want to understand how the adoption of DHIS2 as the EMIS backbone enables, or possibly constrains, information use by education managers at all administrative levels of the education system in the country. To do so, I zoom in on the teacher attendance registration practice and look at how this practice has changed because of the implementation and use of DHIS2-EMIS in the educational sector. Teacher absenteeism is a major obstacle for learning outcome, and in The Gambia "it is estimated that up to 10 per cent of teaching time is lost due to teacher absenteeism" (Akseer, 2021, p. 9). I use affordance theory to analyse the case findings. The preliminary findings show promising results for theoretical contributions to an IS-flavoured affordance theory.

1.2. Project and scientific background

1.2.1. Project background

DHIS2's growth the last decade – charting new domains

For the past 20 years, DHIS2 has afforded public health managers the possibility of collecting, reporting, analysing, and acting on timely data. During the last decade, DHIS2 has grown in several dimensions. First, the number of implementations of DHIS2 as a country's HMIS has grown from one national (+eight pilot) implementations in 2010 to 66 national (+8 pilot) implementations in 2022[3], and it is estimated that 2.3 billion people benefit from the services managed by the numerous DHIS2 implementations (Nicholson et al., 2020, p. 10).

Second, additional features and platform extensions have been implemented in a similar exponential way: the implementation of the DHIS2 Tracker, which manages individual records, app has increased from 9 to 85 from 2016 to 2022.

Third, DHIS2 is being adapted and used in several new domains and has for example been implemented as Logistics Management Information System (Adu-Gyamfi et al., 2020; Nielsen & Sæbø, 2016) and as EMIS (e.g. Ommundsen, 2017). Currently, there are six countries which

[1] District Health Information Software 2; https://dhis2.org/

[2] https://www.mn.uio.no/hisp/english/

[3] In addition, DHIS2 was used by 23 Indian sates in 2010, and in 22 states in 2022.
Implementation statistics in this paragraph are retrieved from https://www.dhis2.org/in-action, visited 15 March 2022.

are using (piloting) DHIS2 as EMIS: Eswatini, The Gambia, Mozambique, Sri Lanka, Togo and Uganda.

Fourth, DHIS2 is gaining acknowledgement and attracts major funding bodies. Since 2011, several influential actors in the international development landscape (e.g., Norad, Global Fund, PEPFAR, CDC, UNICEF, GAVI and Bill & Melinda Gates Foundation) have contributed with funding, and the total investment in the core platform has increased sixfold from $ 2 million in 2011 to almost $ 12 million in 2019[4].

Fifth, and maybe the underlying condition for the four aforementioned dimensions, DHIS2 has evolved from a monolithic HMIS software to a malleable, flexible digital software platform, facilitating development of extensions (apps) and the adaptation and transferability to new contexts. One example of how DHIS2 has been adapted and transferred to another context (geographically speaking) is the use of DHIS2 as the primary tool for Covid-19 infection tracing in Norway. From being fairly unknown in Norway, DHIS2 is now used for Covid-19 infection tracing in more than 2/3 of Norway's municipalities[5]. Another example of context adaptation (domain change) is the recent piloting of DHIS2 as EMIS, which is coordinated by the HISP Centre at the University of Oslo. These examples show that DHIS2 provides a flexibility that facilitates the usage in new contexts, both in terms of geography and domain.

DHIS2 as an EMIS in The Gambia

The DHIS2-EMIS initiative in The Gambia started in early 2019. Using DHIS2, which has been used by the ministry of health in The Gambia since 2010 (Valbø, 2010), The ministry of basic and secondary education (MoBSE) designed individual learner modules that capture learners' socio-economic data, attendance history, continuous assessment, and their disciplinary record. In 2020, MoBSE successfully piloted the individual student admission and registration component in 200 schools using Chromebooks. Thereafter, MoBSE leveraged the existing resources from the pilot to collect and register students throughout the country. The national EMIS team, which has been trained on DHIS2 configuration and maintenance by HISP West and Central Africa, have configured thematic dashboards and analysis tools on the digital platform. This allows schools to visualise their own data and school cluster monitors (i.e., school inspectors) to inspect reporting rates from schools and attendance data for teachers and learners.

Teacher absenteeism in The Gambia

Teacher absenteeism is considered "one of the most cumbersome obstacles on the path towards universal learning in developing countries" and "is particularly prevalent in sub-Saharan Africa" (Akseer, 2021, p. 12). There are several reasons for teacher absenteeism, including challenges in receiving salary, inadequate monitoring of schools and teachers, lack of transport, teachers' engagement in administrative tasks at the schools, health, and social responsibilities (e.g., naming ceremonies and funerals; Akseer, 2021). According to Akseer's findings, regular monitoring of schools and teachers has a positive effect on teachers' punctuality: "When cluster monitors check and follow-up on attendance sheets collected by head teachers, teachers appear to take extra measures to ensure they are punctual, to avoid

[4] Numbers from a presentation held by Professor Kristin Braa, September 2020.

[5] KS reported (on 1-Sep-2020) that 94 municipalities used DHIS2 through Fiks (https://www.ks.no/fagomrader/digitalisering/felleslosninger/fiks-smittesporing/hvilke-kommuner-med/, visited 22 Oct 2020), while ReMin claimed that 220 municipalities used their DHIS2-based software in November 2020 (https://remin.no/vre-kunder, visited 15 March 2022).

having their name included in the attendance books" (p. 22). There is however an increasing workload on the cluster monitors, as the number of schools they should follow up is continuously growing (p. 23), effectively resulting in fewer and shorter school visits. Additionally, the current teacher attendance reporting practice is paper-based and involves sending paper forms from the school to the cluster monitor, who enters the data into a computer program to create a report. This report is shared with the regional office, which in turn forwards the information to the ministry. This long chain through which the information travels causes a time lag before ministerial decisions can be taken.

The Gambia has recently started to pilot a teacher attendance app in their DHIS2-EMIS instance. Once a teacher's attendance is registered into the system, the information is instantly accessible at all levels (i.e., schools, cluster monitors, regional offices, MoBSE). This practice affords a range of action possibilities, which will be the focus of this study. Possible effects of the new practice are less workload on the cluster monitor and better informed decisions at ministerial level.

1.2.2. Scientific background

Even though EMISs have been around for several decades, they are surprisingly understudied by IS scholars. There is a practice-oriented body of knowledge concerning EMIS, though mostly in the form of grey literature from the education sector. Against this backdrop, there is an ongoing process of framing EMIS as a research object within the IS field, defining EMIS and positioning it in the IS literature.

Although there are several attempts at defining EMIS, a commonly shared definition is lacking. With reference to the Latin American context, Cassidy (2006) notes: "There is no universally-accepted definition of EMIS in popular use throughout the region. The acronym, EMIS, means different things to different people" (p. 2). Cassidy then provides an extensive definition himself, which has been widely referred to by others (e.g., Abdul-Hamid, 2014; Bhatti & Adnan, 2010; UNESCO, 2007):

> *An Education Management Information System (EMIS) is a system for the collection, integration, processing, maintenance and dissemination of data and information to support decision making, policy-analysis and formulation, planning, monitoring and management at all levels of an education system. It is a system of people, technology, models, methods, processes, procedures, rules and regulations that function together to provide education leaders, decision makers and managers at all levels with a comprehensive, integrated set of relevant, reliable, unambiguous, and timely data and information to support them in completion of their responsibilities.* (Cassidy, 2006, p. 27)

I find that Cassidy's definition includes all important functions and properties which constitute a successful EMIS and presents these in a way that lends itself to operationalisation in the context of IS research. Hence, I adopt this definition in my research on EMIS.

Ultimately, the goal of an EMIS is to undergird informed decision-making that leads to equitable quality education and improved learning outcomes (Abdul-Hamid, 2014). To achieve this, information needs to be relevant, accurate and timely (Abdul-Hamid, 2014; Bhatti & Adnan, 2010; Cassidy, 2006; Chapman, 1991; Hua & Herstein, 2003; Powell, 2006). IS researchers can help identify digital tools and procedures that enhance the appetite for and governance of education data, facilitate access to and scrutiny of education systems through

open data, and strengthen data-driven decision making at all levels of national education systems.

DHIS2 as a digital global public goods software platform

Public goods have two main properties: *Nonrivalry in consumption* and *nonexcludability* (Kaul et al., 1999, p. 3). In essence, nonrivalry in consumption means that even though a *good* is consumed by an individual, it does not affect the availability of the good for other individuals. Nonexcludability means that no one can be excluded from the consumption of the good. *Digital global public goods (DGPG)* thus relate to digital public goods with a global scope.

As in Tilson et al. (2013), the term *platform* results from "*plat*, meaning flat or level, and *forme*, meaning shape or arrangement of parts" (p. 2). Drawn together the terms imply a "flat, possibly raised surface onto which something can be placed", meaning that a platform is in the first place a foundation on which to build. Tiwana (2014) defines a software platform as a "software-based product or service that serves as a foundation on which outside parties can build complementary products or services" (p. 5). A software platform is thus an innovation platform for complimentary software products and services (Evans & Gawer, 2016).

DHIS2 is an example of a *DGPG software platform*: An individual's usage of the software does not prevent others from using it (nonrivalry in consumption); it is free for all to download and use (nonexcludability; global scope); it is a free and open-source software and facilitates thus the development and integration of new functionality through modification of source code or the development of add-ons apps (i.e., DHIS2 is a software platform).

Platformization and data use innovation

Platformization is a step-wise transformation process, transforming the existing IT silo solutions into a platform-oriented digital infrastructure (Bygstad & Hanseth, 2018, pp. 3&12). The platformization process enables new possibilities, such as new, innovative ways of using data (i.e., *data use innovations*). "A focus on the practice of data use involves investigating how data enters into streams of ongoing action and interaction" at the workplace (Coburn & Turner, 2012, p. 102). Moss (2012) points out that "this entails tracing not just the mechanisms through which data use innovations result in intended outcomes but also the mechanisms that lead to indirect, secondary, and unintended effects" (p. 224).

Affordance Theory

Affordances is a concept that describes the action possibilities that emerge in the relation between a subject and an object. It was first introduced to the field of evolutionary psychology:

> The *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill. The verb to *afford* is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson, 1979, p. 127) (emphasis in original)

The concept of affordances has later been adopted in IS research (e.g., Markus & Silver, 2008; Norman, 1988; Zammuto et al., 2007) and serves as a useful tool to explore the sociotechnical relations between human actors and technology and the implications the technology have on organizations.

Critical realism and generative mechanisms

Critical realism is an epistemology that originates from the domain of philosophy. It is however becoming influential in several other domains, such as economics, organization theory, sociology and research methods in general (Mingers, 2004). Bhaskar, the initiator of critical realism, started out by arguing that "science is not just recording constant conjunctions of observable events but is about objects, entities and structures that exist (even though perhaps unobservable) and generate the events that we observe" (p. 92). The argument begins with a phenomenon and seeks to find the underlying reasons (i.e., *generative mechanisms*) causing this phenomenon to occur.

Generative mechanisms are a key concept in critical realism. Generative mechanisms are "causal structures that generate observable events" (Henfridsson & Bygstad, 2013, p. 911). Bunge (2004) defines a mechanism as "one of the processes in a concrete system that makes it what it is—for example, metabolism in cells, interneuronal connections in brains, work in factories and offices, research in laboratories, and litigation in courts of law" (p. 182).

Scientific foundation

The research questions (Section 2.2) have their foundation within the critical realist tradition, seeking to identify mechanisms which can explain a phenomenon of interest. The phenomenon of interest is the problem of teacher attendance in The Gambia, and I want to explore new ways of mitigating the problem. Can this new and emergent digitized practice contribute to equitable quality education (SDG4) and societal changes?

The concept of affordances has gained increased recognition in IS research in general, but there also exists a broad body of IS literature applying the lens of affordances in the research stream of information and communication technologies for development (ICT4D): Thapa and Sein (2018) used affordances to explore emergent technological solutions and their impact on the society in an underdeveloped context in Nepal, Chhetri et al. (2019) applied affordances as an analytical framework for their evaluation of two mHealth apps in Malawi (CommCare and DHIS2's Tracker app), and Bernardi et al. (2019) used affordances to explore the dysfunctional HMIS-related routines and practices of the Kenyan HMIS.

As the foci of my research will be DGPG software platform-based EMIS data use innovations in a sub-Sahara African context, the concept of affordances positions itself as a useful tool for exploring the data use innovations emerging in the sociotechnical relations between the the DHIS2-EMIS users, the DHIS-EMIS instance itself and other involved entities.

Digital EMIS platforms afford decentralised information usage and decision-making in a developing country context and provide thus opportunities for better education in developing countries enabling and supporting a culture of information-based decision making, management and policy formulation for better education outcomes (Hua & Herstein, 2003).

2. Research questions and scientific challenges

2.1. Scientific challenges

As an affordance can be broadly defined as a possibility for action (Bygstad et al., 2016), *information usage* is an example of an affordance. The *information usage affordance* emerges in the relation between the technology (in my research DHIS2-EMIS) and the stakeholders (the goal-oriented subjects, human actors). Hua and Herstein (2003) outline that «one of the most critical factors that contributes to the success of the EMIS development is an institutional

culture of making policy decisions based on data and information» (p. 7). Hence, understanding what contributes to this institutional culture of information-based decision-making might help reveal the key factors contributing to successful EMIS implementations in resource-constrained contexts.

2.1.1. Observation of affordances and generative mechanisms

Observing intangible artefacts can be a challenging task. As affordances are action possibilities that emerge in relations between subjects and objects, it is the researchers' task to interpret and identify these.

2.1.2. Multidimensional affordances

One of the challenges of applying affordances as an analytical framework for my research, is that it is not fully translated to the IS research setting. For example, traditionally, from the evolutionary psychology, affordances are seen as action possibilities emerging in *two-dimensional* relations, e.g., in the relation between an animal and the environment. In IS literature, affordances are also discussed as two-dimensional, mainly emerging in the relations between technology and human actors. However, all relations are complex and seldom only two-dimensional. Nevertheless, it will often make sense to let *composites* play the role as either the object or the subject; for instance, the environment consists of trees, plants, the weather etc. In IS literature the technology is a composite, involving computers, computer components, software, etc. Often such composites are intuitively and easily identified, but not always. One example is the booking affordance mentioned in the work of Bygstad et al. (2016). They explain that for a user to be able to make a flight booking, there are three entities involved: the web site, the credit card and the user. Although these are three very distinct entities involved in the booking process, the authors posit the booking affordance in a two-dimensional relation between the user and a composite consisting of the web site and the credit card.

As illustrated above, forcing affordances into two-dimensional relations is an oversimplification. When exploring affordances in the usage of a digital EMIS platform, I will explore multi-dimensional affordances and thus contribute with new knowledge to the affordance theory. There are attempts on exploring collective perception of affordances (i.e., shared affordances; Importante, 2017; Leonardi, 2013). These attempts address how a collection of multiple human actors perceive affordances, thus separating the human actors composite into human individuals. Similar separation of the object composite has not been attempted in the IS literature. Paving this way will be a challenge.

2.2. Research questions

Given the lack of IS literature on digital EMIS and the relatively sparse usage of affordances as a tool and analytical framework in the research on management information systems in general, my novel research will contribute to this understudied area of the IS research field. Zooming in on the impact of teacher absenteeism, the following research question will guide my research.

- Which are the generative mechanisms of the Gambian DHIS2-EMIS implementation supporting an increased learning outcome due to reduced teacher absenteeism?

I understand the term *implementation* not as the *act of implementation*, but rather what follows a successful implementation process, namely the persistent usage of an information system.

To answer my research question, I will break it down in the following sub questions.

- How has the usage of the DHIS2-EMIS teacher attendance app in The Gambia affected teacher absenteeism?
- What are the novel action possibilities that emerge from the digitalization of teacher attendance monitoring in the Gambia?
- Which generative mechanisms can be identified through the observed affordances?

2.3. Status regarding reaching beyond the state-of-the-art

In the following I outline four areas to which my research can potentially contribute.

2.3.1. EMIS – a new IS research object

A search for scientific publications on "education management information system" in 2020 and 2021 in Web of Science[7], returns five papers from their databases. For comparison, a search for "health management information system" for the same years returns 94 articles. In Masiero et al. (2022) we use two vignettes from The Gambia and Uganda to demonstrate the importance of well-functioning EMISs and their potential societal impact in developing countries. In Valbø and Sanner (2022) we use a case study from The Gambia to illustrate how mid-level affordances emerge in an EMIS implementation. See section 6.2 for further details on these two papers.

2.3.2. Affordances in digital artefacts

In Valbø (2021) I conducted a systematic literature review, revealing trends in how extant IS literature applies affordance theory. The findings show a divergent understanding of the concept, and in half of the articles reviewed, technology use, features and attributes are considered to be affordances. In Valbø (2022) I delve deeper into the 71 articles in the review set and the 306 affordances identified in the papers. See section 6.2 for further details on these two papers.

2.3.3. Multidimensional affordances

The idea of multidimensional affordances (see section 2.1.2) is still to be explored. When the findings from the February and April field trips are fully analyzed, this idea will be revisited.

2.3.4. Mid-level affordances

IS scholars seem to agree that there is a notable difference between basic lower-level affordances and more abstract higher-level affordances, as they speak of affordances at lower and higher levels (e.g., Burton-Jones & Volkoff, 2017), first- and second-order (Leidner et al., 2018), and individual- and organizational-level (Strong et al., 2014). However, there is no consensus among IS researchers on how to distinguish granularity levels from one another. Since there is a huge span from basic technology feature use affordances to societal impact affordances, the IS community could benefit from guidelines on how to identify affordances at various granularity levels. In Valbø and Sanner (2022) we introduce the notion of mid-level IT affordances. Mid-level affordances are affordances on a granularity level between lower-level technology use affordances and abstract higher-level affordances and can be defined as

[7] https://webofscience.com/

the affordances emerging from direct technology use, serving as a prerequisite for the emergence of higher-level abstract affordances.

2.3.5. Linking affordances with generative mechanisms

I intend to contribute with publication(s) addressing Thapa and Sein's (2018) call for research examining affordances through a critical realism lens. Affordances are already linked with generative mechanisms (Bygstad et al., 2016; Leidner et al., 2018; Volkoff & Strong, 2017), although – to the best of my knowledge – not in IS research on management information system artefacts.

3. Scientific method

3.1. Theoretical framework

I will apply affordance theory in my research. Through a literature review (Valbø, 2022, 2021) I point out the divergent use of affordance theory and emphasize the importance of choosing an appropriate level of granularity of the affordances to be studied. In Valbø and Sanner (2022) we introduce the notion of mid-level affordances as a tool for IS researchers to make it easier to focus not solely on the mere technology use, but what technology use affords the users. Affordance theory has been linked to critical realism (Bygstad et al., 2016; Leidner et al., 2018; Volkoff & Strong, 2017), and I intend to derive generative mechanisms from the affordances identified in my research.

3.2. Research methodology and research methods

To reach my scientific goals, I will use a qualitative case study approach. Identifying the generative mechanisms of an EMIS is well in line with Yin's (2017) suggestion to use a case study approach when exploring the contextual conditions relevant to the phenomenon (DHIS2-EMIS) being studied.

The research is scheduled to take place over a timespan of three years and have several forms:

3.2.1. Literature review

In 2021 I performed a thorough Literature review on all 71 articles on affordance theory published in the Basket of 8[8] (Valbø, 2021). I worked further on the literature review to lift it to a journal version (Valbø, 2022). The extensive literature review has contributed to a good understanding of affordance theory and overview over how it has been applied in IS research.

3.2.2. Interviews

Interviews have been conducted with key education data stakeholders in The Gambia, selected through purposeful sampling, augmented by "snowball sampling". The participants' views will be transcribed and analysed, and the data will be categorized (i.e., coded) to further support the process of identifying affordances and generative mechanisms. NVivo will be used as a supporting tool in this process.

3.2.3. Observations

Observations of managers using DHIS2 for data reporting, analysis and decision making at all levels of the education system.

[8] https://aisnet.org/page/SeniorScholarBasket

4. Ethics

4.1. Discussion of relevant ethical issues and how they have been dealt with

The main unit of analysis in my research, is information system use. As such, there is no need for storing sensitive data, such as personal identification numbers. Further, I will not process any beneficiary data (i.e., data of pupils and students), only data (names, addresses and phone numbers) of interviewees relevant for the research (i.e., teachers, managers, analysts, teachers, data entry clerks and other people actively using EMIS). Informed consent will be sought in all interaction with the action research informants and the purpose of my information system strengthening research will be communicated to all informants/ participants.

As highlighted by Dearden and Kleine (2018), ICT4D research brings together researchers and participants from different contexts and is thus diverse and complex. They have developed 20 guidelines for ICT4D research, and some of the things they mention, are discussed in the following subsections.

4.1.1. Researchers do not have moral or legal right to study other people

I do acknowledge that it is not my right to intervene in other people's lives and demand their time. I travel with locals and ask politely people of interest whether they would like to participate in research, emphasising that it is completely voluntary.

4.1.2. There might be power differentials causing the researchers to be perceived as important and influential actors

This is an important thing to keep in the back of the mind, and I strive to understand whether an interviewees consent is genuine or whether it is due to whether he/she thinks he/she *has* to comply.

4.1.3. Unrealistic promises should never be used as a device to gain research access and cooperation

It has not been given any unrealistic promises. I promised to reach out if I end up using a quotation from an interviewee in any form of publication.

4.1.4. Where it is culturally appropriate and expected, researchers may give and/or receive small gifts to partners or participants, as well as compensation for research participation

We travelled together with locals, and compensation for participation in research was not considered a necessity and nor was it expected by the interviewees.

4.1.5. Researchers should resist the pressure to shape the content of their findings or recommendations to fit expectations

This is something I will be very cautious of when I use examples from the case to illustrate theoretical contributions.

4.1.6. Research findings often require interpretation and there is a high risk of misunderstanding and misinformation if the findings are being interpreted by people who are coming from outside the local cultural context

I will run all my findings and interpretation through colleagues in The Gambia before submitting papers.

4.1.7. *Researchers should familiarise themselves with the legal rights of participants and partner institutions in relation to research data*

The interview guide and details around the interview processes have been shared with and approved by the Norwegian centre for research data (commonly referred to as *NSD*).

4.1.8. *Personally identifiable data should be stored for the minimum length of time*

Names and contact details will be stored separately from the transcriptions of the interviews and will be deleted at the end of the PhD period.

4.1.9. *Collection of personal data should follow principles of data minimisation, so that no more data is collected than is necessary for the purposes or the methodology of the research, and personal data is anonymised and protected as soon as practically possible.*

NSD has approved the personal data that is collected and the handling of such.

5. Changes in the project

5.1. Deviations from the plan

The PhD project has taken a more theoretical turn than first intended. Initially this project set out to investigate the data use innovations afforded by the platformization of the education management information systems in The Gambia, Uganda and Togo and use affordance theory to understand the differences in the DHIS2-EMIS implementations in the three countries. The reason for the change of plans is threefold.

First, due to the Covid-19 pandemic and lockdowns, Norwegian authorities did not recommend international travels. Employees at UiO were also for larger periods obliged to work from home office. After the restrictions were lifted in January 2022, I had my first field trip to The Gambia in February 2022.

Second, The Gambia, Uganda and Togo are at very different stages in their DHIS2-EMIS implementation. Comparing the DHIS2-EMIS use across these three countries would be a bit like comparing oranges and clementines. They are apparently similar, yet different.

Third – and related to the two preceding reasons – the scope of three countries were quite wide. Due to the differences in the DHIS2-EMIS implementations in the three countries and the limited time left of the PhD period, it is unrealistic to do in-depth studies in all three countries.

During the work with my master thesis (Valbø, 2010) I spent three months in The Gambia and learned a lot about the country, the culture and working environment. When narrowing the scope down to one country, it was thus natural to choose The Gambia over Uganda and Togo.

I will use findings from The Gambia to contribute to affordance theory.

6. Project plan

6.1. Detailed project implementation plan

6.1.1. Educational components

Course		**Credits**	**Status**
INF9200	Selected Theoretical Topics in Information Systems Development	10	Passed (Autumn 2020)
IN5390	ICT for Development: Building a Better World?	10	Passed (Autumn 2020)
MNSES9100	Science, Ethics and Society	5	Passed (Autumn 2020)
INF9571	Action Research Workshop	10	Passed (Spring 2021)

6.1.2. Research activities

Semester	**Activity**

Autumn 2020	• Course work
	  ○ 25 credits
	• Writing
	  ○ Research proposal
	  ○ Co-authoring paper #1 (see 6.2 below)

Spring 2021	• Course work
	  ○ 10 credits
	• Writing
	  ○ Wrote and submitted paper #2
	• Conferences
	  ○ Ifip 9.4 2021
	  ▪ Attendee
	  ○ AOM OCIS Doctoral Consortium 2021
	  ▪ Discussed paper #2
	  ○ IRIS/SCIS 2021
	  ▪ Author (paper #2)

Autumn 2021	• Writing
	  ○ Developed paper ~~#3~~ #2 to lift it to a journal version (paper ~~#5~~ #4)
	  ○ Co-authored paper ~~#4~~ #3
	• Field work
	  ○ Preparing interview guide

Spring 2022	• Writing
	  ○ Finalised and submitted paper #3
	  ○ Finalised and submitted paper #4
	  ○ Upgrade report
	• Field work
	  ○ Interview guide approved by NSD
	  ○ February: Field trip to The Gambia

	○ April: Fielt trip to The Gambia
Future plans:	
Spring 2022	• Writing ○ Submit paper #5 ○ Start working on paper #6, based on findings from The Gambia ▪ Zooming in on teacher attendance ▪ Use the empirics to contribute to affordance theory
Autumn 2022	• Field work ○ Date TBD: Field trip to The Gambia • Writing ○ Submit paper #6 ○ Start working on Kappa
Spring 2023	• Writing ○ Kappa (deliver by end of July) • Trial defence
Autumn 2023	• Dissertation

6.2. Overview of publications that are accepted, submitted, or in progress

Paper #1

Framing Education Management Information Systems as an Object of IS Research	
Authors	Masiero, S., Amuha, M., Jallow, S. A., Sanner, T. A. & Valbø, B.
Year	2020
Status	Rejected for the ECIS 2021 conference
Content	The aim was to frame EMIS as an IS research object. We gave an overview of what EMIS is and how EMISs have been/are used, as well as an overview over extant EMIS definitions. We positioned the EMIS in the IS literature and proposed a research agenda for EMIS in IS research. iThe paper was rejected for three main reasons: 1) It was not clear to the reviewers why this work is needed; 2) some parts of the paper did not have a logical flow and would need significant restructuring; 3) it is not clear what IS researchers can do with the research

Paper #2

The IS-Notion of Affordances: A Mapping of the Application of Affordance Theory in Information Systems Research	
Author	Valbø, B.
Year	2021

Status	Published in Selected Papers of the IRIS, Issue Nr 12 (2021)
Content	A systematic literature review of 71 affordance articles from the Basket of 8. I highlight divergent understanding and application of affordance theory in IS research. For instance, half of the reviewed articles label technology use, features, and attributes as affordances, while the other half focuses on more abstract affordances. I stress the importance of a common understanding of affordances and propose a tentative IS-flavoured definition of affordances.

Paper #3

Investigating Mid-Level IT Affordances as Drivers for Societal Change: Addressing the Education Data Challenge in The Gambia	
Authors	Valbø, B. & Sanner, T. A.
Year	2022
Status	Accepted for the IFIP 9.4 2022 conference
Content	Introducing *mid-level affordances* to the IS research field. Mid-level affordances are the affordances emerging from direct technology use, serving as a prerequisite for the emergence of higher-level abstract affordances. We use findings from an ongoing research endeavour in The Gambia to illustrate our theoretical contribution.

Paper #4a

A Systematic Literature Review on Affordances in IS Research	
Author	Valbø, B.
Year	2022
Status	Rejected in the JAIS because of too week theoretical contribution. They suggested other outlets for this kind of review. I am considering EJIS.
Content	Further development of paper #3. In this paper I delve more into the articles in the review set and analyse all 306 identified affordances. The paper is first and foremost a thorough literature review in order to give a good overview of how affordance theory has been used in IS research since its introduction to the field. I stress the importance of a common application of affordance theory in IS research, and, additionally, I introduce *mid-level affordances* as an important area of study.

Paper #4b

A systematic Literature Review on Affordances in IS Research: Towards and IS-flavoured Affordance Theory	
Author	Valbø, B.

Year	2022
Status	Submitted to EJIS (“With Journal Administrator”)
Content	Minor changes to paper #4a, according to feedback from JAIS. Highlights three important dimensions for the development of an “IS-flavoured" affordance theory.

Paper #5

Meeting the Global Learning Crisis with Data: A Research Agenda on Digital Platforms for Education Management	
Authors	Masiero, S., Amuha, M., Jallow, S. A., Sanner, T. A. & Valbø, B.
Year	2022
Status	In writing.
Content	Further development/rewriting of paper #1. The paper is framed as a research opinion. We emphasise how EMIS can contribute with timely data for educational decision makers and argue that it deserves more attention by IS researchers.

6.3. Will the project be completed as (now) planned and on time?

Yes.

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8. Appendix

Abbreviations

DHIS2	District Health Information Software2
HISP	Health Information Systems Programme
MoES	Ministry of Education and Sports (Uganda)
MoBSE	Ministry of Basic and Secondary Education (The Gambia)
NSD	Norsk senter for forskningsdata (Norwegian centre for research data)
UiO	Universitetet i Oslo (University of Oslo)