Information Systems in Developing Countries

How to ensure sustainability?

Systèmes d'Information dans Pays en Développement

Comment assurer la durabilité?

faculty of economics and business

Master of Information Management

Vercaempt Aurélie

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Thesis submitted to obtain
the degree of

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Comment assurer la durabilité?

Cette recherche évalue les problèmes et les défis les plus fréquents ainsi que les influences environnementales sur le succès d'un système d'information dans les zones en développement. Il produit et applique un modèle basé sur les théories du succès des SI de DeLone & McLean, le Technology Acceptance Model (TAM), la Unified Theory of Acceptance and Use of Technology (UTAUT) et le Integrated Model of Business Value (IGB). Ce modèle répond à la nécessité d'intensifier la recherche dans le domaine de la durabilité par le biais de recherches multi-cas dans des contextes en développement. Il permet d'obtenir de nouvelles perspectives pour la littérature, de confirmer et de remettre en question certaines affirmations existantes et de proposer de nouvelles hypothèses pour les recherches futures. Une liste de contrôle à l'intention des futurs concepteurs ou chercheurs de systèmes d'information a été ajoutée afin d'intégrer les éléments les plus importants de cette recherche. Le document conclut sur l'importance de l'utilité perçue de la SI, des influences sociales et de la localité de la SI, ainsi que sur l'audace de sortir des sentiers battus pour travailler avec les ressources disponibles et pour encourager la créativité

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General Introduction

Heeks’ study showed that almost 75% of all information system deployments failed partially or completely (Heeks, 2005). This rate brings its subsequent economic reaction. However, now almost 15 years later, we have tons of research on information system failure that can help us resolve these problems. Let us just apply that research worldwide and solve all problems, … right?

Most IS[[1]](#footnote-1) deployment and failure research is based in industrialized and developed contexts. Can we generalize this data, the found principles and its strategies to each situation on the globe? Or should we make distinctions? E.g. between developing and developed economies? Heeks’ research was based on data for developed and industrialized contexts, and there is currently no such data available for developing unindustrialized contexts. However, there is no reason to think their numbers should be any better. I can take you back to the summer of 2017, where I was asked to take part in a fantastic social project, 11 375 kilometers from home, in Zambia. The area’s local kiosk needed a better way to track its stock, products and profitability because, with everything written down on paper, it was difficult to get a financial overview. I was a student, in my master’s, I thought I knew exactly what I was doing. Or, I did not think it, I was convinced that I knew it. Let me help these poor people on the other side of the world with the universal knowledge I had worked so hard to acquire. My team members and I ended up designing a digital application for the record keeping and analysis of the kiosk, but the experience we had in doing that was entirely different from what we had anticipated. We were just going to implement an IS and we had all the knowledge to do that, you see.

Today’s technical world

Nowadays, the pace and direction of ICT and ICT research are set primarily by the ‘North[[2]](#footnote-2)’ (Avgerou, 2008). Information systems are deemed objective and do become more efficient and effective through best practices. Therefore, many theories conclude that Western innovations can be used to develop poor economies (Qureshi, 2015) and that all current information systems literature is freely transferable to the developing contexts. We like information and the systems that manage it because they help us to gain competitive advantages (Agha, 1992), to improve profitability (Qureshi, 2015), and to accelerate business processes (Dwivedi et. al., 2015) … Governments see their social services flourish, state governance progress and democratic participation rise (Avgerou, 2008). IT innovations receive increasing attention worldwide.

Industrialized countries have taken the lead and proven for themselves that IT contributes to economic growth, development and organizational excellence (Avgerou, 2008; Qureshi, 2015). Developing countries have now spotted the potential as well and are eager to jump right in. The ‘North’ is inspired and enthusiastic to help in this quest and to develop the poorest of countries through digitalization and technology. But do these countries really benefit from digitalization? And if so, are the chosen efforts lasting in the long term?

*Does IT innovation equal development?*

IT has definitely improved our economies in the ‘North’ and boosted our processes. But does this apply to developing countries as well? Avgerou (2003) critically reviewed the link between ICT and development and found that ICT innovation, unfortunately, does not always guarantee development. ‘ICT’ and ‘development’ are not static states but are constantly evolving processes (Avgerou, 2003). ‘Development evolution’ and ‘ICT evolution (innovation)’ have been very different in ‘North’ and ‘South’. Currently, it is unrealistic to expect that developing contexts are able to acquire innovation-driven free-market economies, to build or strengthen grounded institutions and to install complementary ICTs, all at the same time. This does not mean that ICT is inappropriate. “Sustainable development is about matching the most appropriate approach with the needs of the community” (Qureshi, 2015, p. 514). The best solution in the ‘North’ is not necessarily the best solution in the ‘South’. One must stress the importance of adaptations to the local contexts and one should support improvisations on site. So ICT does play a critical role in the growth and development of developing countries (Roztocki & Weistroffer, 2009), but it should be done right.

*How to approach digitalization projects in developing contexts?*

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| Manager ABX wants to introduce an information system that has the potential to improve process efficiency by 35%. It has proved to work excellently in his company in the USA and now he wants to implement this within a potential Tanzanian partner.  | He copies the information system and asks the Tanzanian organization to adapt to some new processes for it to work. Given his good experience in the USA he feels confident about the project and goes about his way. The organization is struggling quite a bit with this much change in such a short time period and after a while manager ABX decides that they are not taking this project seriously. He returns to the USA and the Tanzanians have no idea what just happened, so they return to their previous way of working. No partnerships were established. |

Can we freely transfer all information systems literature and methods to developing contexts? The literature did discuss this question for us a bit already:

After reading that scenario, one can ask: ‘What happened?’

‘What went wrong?’.

Manager ABX worked with an “if it works for us, it will work for you” mentality (Heeks, 2002, p. 106) and this mentality makes no attempt to take into account the differences in both worlds (Heeks, 2002). Qureshi (2015) further explains that the applicability of Western findings is mostly very limited for people in poor countries (Qureshi, 2015). And then Heeks (2002) points out that “the most extreme situation appears when industrialized-country designers create a system for an industrialized-country context, and then transfer that system to a developing country” (p. 106). Oh wait, is that not also how my own project started out?

*Now what?*

ICT has proved to be an important factor in development – when applied correctly – so it is crucial to understand which elements make its employment successful and which factors hinder it. Even when a project looks successful at first, we must strive to understand whether this success will last. Up until now, “few studies have emphasized the sustainability of information systems, particularly within a multi-country comparison”

(Moucheraud et al, 2017, p. 3). It is time to change that, and therefore this research will focus on the sustainability of information systems in developing contexts. More specifically we will have a look at the most occurring problems and challenges further studied with possible influences from the surroundings.

Literature review

*Methodology*

‘What do I already know?’ and ‘What do I want to know? These were the starting points for this literature review. For what I wanted to know, the following questions were used as basis for my review:

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| What is an information system?Why is an information system important? What is a developing country? |
| What is sustainability?What is the sustainability failure?Why is the sustainability failure important? |
| What is the current state of research on the sustainability failure?What has been done in IS research for developing countries so far?What are the pitfalls and lessons in this research? |

Then, each question was researched for existing conclusions and was labelled. Google Scholar, the KU Leuven Economics Library and the online Limo KU Leuven library were my resources. Papers were initially found by search terms including the words ‘sustainability’, ‘durability’, ‘developing’, ‘information system’, ‘ICT4D[[3]](#footnote-3)’ … Then, the snowballing technique[[4]](#footnote-4) brought me further. Only referenced papers were included and a special attention for papers from authors in Africa, Asia and Latin America was established. Papers assessing the current state of literature were high on my list and all papers had to assess developing countries. After a while, given the abundance of papers, I made a selection for papers from 2014 onward.

*Information systems and developing countries*

An information system is a system that collects, manages, transforms and exports useful data to meet varying information needs of a community. Information systems will be further referred to as ‘IS’ (Information System) and can be applied in all sorts of contexts. They are often seen as important resources to organizations and even societies. Further, a developing country is a country that exhibits low standards of living. It has high levels of unemployment, low levels of skilled labor, it has low consumer spending, the capital market is thin, and infrastructure is weak. (Roztocki & Weistroffer, 2009). The term ‘Developing country’ is used to refer to the ‘Third World’, the less-industrialized and least-developed countries, or the ‘South’ (Kent, 2014). Global efforts are made to develop, innovate and nurture these countries and sometimes, only certain areas are ‘lucky’ to develop while other districts need some more time. A country may be large, having different areas in many different development phases and therefore I do not wish to speak for countries as a whole, but instead, I prefer to speak of ‘areas’, ‘regions’ or ‘contexts’, and will further refer to these as ‘DC’ (developing contexts).

*The start of the fairytale*

Nowadays, it is trendy, popular, and uttermost altruistic to help a developing country in need. Entire organizations, organs, countries and global unions are in the business of development. Think for example of the Millennium Development Goals of 2015 and the Sustainable Development Goals of 2030, where poverty reduction, education for all and booming economies are just a few of the agenda points. It all started in the remainder of the World War II destruction where the well-known Marshall Plan came into action (Qureshi, 2015). Entire European economies were restored thanks to the Americans (Moyo, 2009) and Europe thrived again as never seen before. Aid worked in Europe, so people thought it should definitely do the same everywhere else (Moyo, 2009).

Yet we mentioned that blindly copying what we know about information systems does not always end well. But why? IS failure is no desirable outcome. It leads to financial losses and other undesired risks (Dwivedi et al 2015).

*Applicability of IS*

The critical reader may (truthfully) argue that ‘Northern’ innovation does lead far beyond ‘Southern’ innovation, however what many researchers do not realize is that the applicability for developing and developed contexts is very different:

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| - Strategic objectives are different in both contexts (Roztocki & Weistroffer, 2009). ‘Northern’ ICT is used to replace (expensive) human labor, whereas in the ‘South’, labor costs are low, and technology is applied to compensate for poor infrastructure (Roztocki & Weistroffer, 2009).  |
| - Different purposes call for different designs. |
| - ‘Southern’ technological, electrical, building… infrastructures differ from ‘Northern’ ones. |
| - Local organizational customs and cultures differ. |
| - Need of different training methods because of differing culture/differing human capital/… |
| - … |

Not taking into account these elements may ultimately lead to failure and quite some examples of total and partial failure exist (Walsham & Sahay, 2006). One failure in particular for developing countries is the sustainability failure (Heeks, 2002).

*The sustainability failure*

Sustainability comprises the long-term continuity of an IS after original support from the executing party ends. It implies that program activities continue, benefits for users last and that information needs for the community remain satisfied (Moucheraud et al., 2017; Scheirer, 2005; Harris et al., 2007; Agha, 1992) while the IS should continually adapt to changes in its environment and have a reason to exist (Agha, 1992). The failure of sustainability concerns an IS initiative that at first succeeds but is then abandoned after a certain period of time (Heeks, 2002). It means that major goals are unattained and that the registered outcomes are undesirable.

Both developed and developing countries have extremely optimistic expectations for the role IT can play in development (Avgerou, 2008), however the high failure rate is quite disturbing. Developing countries feel a rising pressure to catch up with the ICT-mediated advanced economies (Avgerou, 2008), yet what about those high failure rates? And, is failure actually a problem? Can it not be seen as a learning opportunity? In the ‘North’, although undesired, there may be room for that failure under the notion of ‘research and development’, but unfortunately, the opportunity costs of failure in developing countries are much higher (Heeks, 2002). “In poor economies, organizations cannot afford to squander badly needed funds on poorly planned projects” (Agha, 1992, p. 39). In the literature, the sustainability failure has been studied, but the body of literature is still fragmented and underdeveloped (Wiltsey Stirman et al., 2012). Furthermore, even though literature on IS in DCs has grown, it is a domain dominated by case studies of individual IS projects and taken alone, these provide no basis for overall failure/success rates. (Heeks, 2002). Moucheraud et. al (2017) pointed out that few studies have looked at sustainability in comparing multiple countries, thus multiple cases. This research gives an answer to that need.

*ISDC[[5]](#footnote-5) research today*

ISDC research currently focuses on four large domains (Walsham & Sahay, 2006):

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| *1.* Development perspective*: what is development, how can ICT promote it, and how can specific groups benefit from it?* |
| *2.* Cultural perspective*: difficulties arise when working across different cultures. How to value local contexts?* |
| *3.* IS research in ‘North’ and ‘South’*: can ISDC research adopt and/or adapt theory from other disciplines?* |
| *4. ICT specific: in-depth studies of technologies (hardware, software, system configurations, open source, telecentres…).* |

And needs further research focusing on the following topics (Walsham & Sahay, 2006):

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| IS sustainability, scalability, action research, longitudinal studies, ICT strategy or competitive advantage development in DC, ICT security, ICT implementation-specific problems, integration with the existing literature (many papers stand isolated), more conclusions and generalizable knowledge (many papers only report facts). |

*Lessons learned in ISDC research*

Current research has already pointed out some pitfalls to take into account when either conducting IS research or deploying an IS system in developing contexts. These include white supremacy, standardization and holistic working. I discuss these further below.

White supremacy is the belief that white people are superior to people of other races and/or cultures and should therefore be dominant over them. Although many people do not want to act or think that way, they often do it without realizing it. The ‘Northern’ or ‘Western’ literature may impose and prescribe explicitly what ICT should be used for and can so (often unwillingly) restrict locally creative and meaningful improvisations. It is pretty hasty to “transfer the generic IS know-how into DC organizations with the expectation that it will result in the exact same organizational outcomes” (Avgerou, 2008, p.135). It is actually not necessary to always implement the perfect solution. When keeping an open mind, we have the opportunity to learn from the local innovations taking place (Qureshi, 2015).

Next, wishing to standardize for efficiency versus local adaptation is also a difficult question. Standardization makes comparability possible but imposing the same standards on different local contexts creates tensions (Walsham & Sahay, 2006). The world is different everywhere, but also constantly changing, and therefore standardization is best seen as a forever-ongoing process (Braa & Hedberg, 2002). Standards as well as flexibility are interdependent and thus necessary for changes to occur. Imposed standardization will probably not work because the problem is recursive (Braa & Hedberg, 2002). Ideally one should improvise locally and delay actual decisions to prevent the locking of future choices (Braa & Hedberg, 2002).

Finally, it is crucial to consider the project’s politics and local actualities. Often the complexity of the entire situation is underestimated (Littlejohns et al., 2003). “Information system design has a tendency to be rational, where technology is seen as an objective and rational entity, not as something that incorporates political and cultural values” (Heeks, 2002, p. 107). However, “topics in developing countries are often deeply intertwined with issues of power, politics, donor dependencies, institutional arrangements, and inequities of all sorts” (Walsham & Sahay, 2006, p. 19). “All information systems are tied up in a complex web of social and technical interaction” (Braa & Hedberg, 2002, p. 114) and this is also why our second research question will focus on possible influences from the environment on the IS’s success or failure.

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| Information systems in a developing context: how to ensure sustainability (durability)?* What are the challenges and most occurring problems?
* How does the environment influence the information system’s success?
 |

*Research issues*

At last, there are also some known issues in ISDC research itself. The literature has a need for “more evaluation studies with a strong methodology and comprehensive reporting” (Fritz et al., 2015, p. 486). Furthermore, the subjectivity and timing of ‘failure’ remains to be a problem. Given the multiple stakeholders, “one person’s failure may be another’s success […] and today’s IS success may be tomorrow’s IS failure” (Heeks, 2002, p. 101).

Two major pitfalls should be avoided: eclecticism and inbreeding. "The former concerns the ad hoc selection of ideas and lifting them out of cohesive theoretical contexts. The latter refers to focusing too narrowly on the work of a small number of researchers with whom one is similarly minded” (Avgerou, 2008, p. 134). This literature study was conducted with great care to avoid these.

Methodology

*Research set-up*

This research is based on the findings of several cases in developing countries. These projects have diverse factors interacting at different levels, and so I have chosen the case study method because it is “the best choice when you need to study contemporary events over which you have little control” (Tibben, 2015, p. 628). Furthermore, multiple case studies have been recognized for “their ability to develop more compelling arguments” (Tibben, 2015, p. 634).

To structure the research, I have produced a framework based on the following theoretical models:

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| Model | Objective |
| The Updated DeLone & McLean model of IS Success (DLM) by DeLone & McLean (2003) | The updated DLM defines whether the implementation of the IS was deemed (un)successful. The studied cases are at the SME[[6]](#footnote-6) organizational level and DLM is specifically aimed at SME. It was reviewed and cited many times and moreover, approved for intercultural[[7]](#footnote-7) use (Ghobakloo & Tang, 2015). |
| The Integrated Model of Business Value (IGB) by Melville, Kramer & Gurbuxani (2004) | Each case has its own system, environment, background and culture. Governmental choices, political situations, internal leadership systems… all these complex interactions define divergent patterns of development, and thus (non)priorities for IS infrastructures. For that, each situation should be evaluated on a full scale. IGB can assess these macro, meso and micro environments. |
| Technology Acceptance Model (TAM) by Venkatesh & Davis (2000) | IS success is also related to the actual usage of an IS or the willing to use it. TAM assesses this. It has been widely cited and evaluated, and was approved for intercultural use (Oshlyanski et. al, 2007). |
| Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et. al (2003) | UTAUT is an elaborated model of TAM and was expanded for non-voluntary usage of IS. It has also been widely evaluated, cited and was approved for intercultural use (Oshlyanski et. al, 2007). |

The guiding questions of each theoretical model were compared and ordered in a question scheme and further completed with insights from Moucheraud et. al (2017) and Agha (1992) (these were given a ‘\*’ in the question scheme). This gave rise to nine subjects for the first research question – on the most occurring problems and challenges, and six subjects for the second research question – on environmental influences. Each subject was respectively labelled ‘a’ to ‘i’ for research question 1 or ‘1’ and ‘1b’ to ‘5’ for research question 2.

The first column depicts the label given to a certain subject, which is named and explained in the second and third column.

The final two columns describe already known problems in the literature, with their sources, classified by these subjects.

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| *Question Scheme RQ1: What are the challenges and most occurring problems?* |
| Label | Subject | Explanation | Literature sources | Information to check |
| A | System quality (DLM[[8]](#footnote-8)), perceived ease of use (TAM[[9]](#footnote-9)), effort expectancy (UTAUT[[10]](#footnote-10)) | Measures technical success. The perception that the system will be easy to use, access, navigate, learn, whether it is trustworthy and will (not) need much effort. | Fraser et. al (2005, p. 92); Fritz et. al (2015, p. 482) | System is difficult to use |
| Fraser et. al (2005, p. 92); Fritz et. al (2015, p. 483-484) | Poor system security |
| Moucheraud et. al (2017, p. 4) | Reliability concerns |
| B | Information quality (DLM) | The desirable quality of the output of the system and its usefulness to the user. The perception that the system will be accurate, current and complete. | Luna et. al (2014, p. 6); Fritz et. al (2015, p. 483); Moucheraud et. al (2017, p. 8) | Different standards and labels make for confusion |
| Agha (1992, p. 27); Scheirer (2005, p. 343) | No or bad determination of the stakeholders and their needs |
| C | Service quality (DLM), facilitating conditions (UTAUT)[External viewpoint] | The quality of the support that the user receives from the executing organization. The amount of training the hosting organization receives, the responsiveness during and after the system implementation, the reliability, flexibility and empathy of the executers (outside) of the hosting organization. | Fraser et. al (2005, p. 92); Moucheraud et. al (2017, p. 6) | Lack of technical support staff |
| Fraser et. al (2005, p. 92); Lubua & Pretorius (2018, p. 183); Luna et. al (2014, p. 5); Fritz et. al (2015, p. 483-484); Moucheraud et. al (2017, p. 6); Harris et. al (2017, p. 158) | Lack of user training and/or poor introduction of the system |
| Agha (1992, p. 27); Fritz et. al (2015, p. 486); Moucheraud et. al (2017, p. 4, 6) | Little to no evaluation is done |
| D | Use (DLM), intention to use (TAM), attitude towards using (TAM), voluntariness of use (UTAUT) | Degree and way a system is utilized by its intended users, the actual usage and whether they want to use it. | Fritz et. al (2015, p. 483); Moucheraud (2017, p. 4, 6) | Poor attitude towards the IS[[11]](#footnote-11), limited faith |
| Moucheraud et. al (2017, p. 8) | Overexcitement resulting in IS deployment at a too high pace |
| E | User satisfaction (DLM) | Whether users enjoy working with the system and like the information in it. |  |  |
| F | Net benefits (DLM), performance of organization and business processes (IGB[[12]](#footnote-12) - micro) | Impact on the organization, user or society. For example, increased/decreased returns, productivity, profitability, … |  |  |
| G | Perceived usefulness (TAM), performance expectancy (UTAUT), system goals\* | Degree to which an individual believes that using the system will help attain gains in individual job and/or organizational performance. Knowing why the system is in place and how to use it for that. | Fraser et. al (2005, p. 92); Agha (1992, p. 2); Moucheraud et. al (2017, p. 4); Scheirer (2005, p. 343) | No awareness of the systems possibilities and/or importance |
| Harris, Kumar & Balaji (2007, p. 8) | The IS project is not demand-driven by the local community\*\* |
| H | Social influence (UTAUT), rules/ structures/ policies/ culture (IGB – micro), community/ donor interactions\*, presence of a champion\* | Whether a user perceives that important others believe he or she should use the new system. These can be within-organizational people, or an outside donor. Also, whether there is a big supporter of the system within or outside of the organization (champion). | Agha (1992, p. 2, 4); Moucheraud et. al (2017, p. 7); Scheirer (2005, p. 343) | Little support from the management and/or mother organization |
| Moucheraud et. al (2017, p. 7) | Failed similar projects break trust indefinitely |
| Scheirer (2005, p. 343) | IS does not correspond with the organization’s culture\*\* |
| Moucheraud et. al (2017, p. 4, 7) | Concerns that donors (mis)use their influence |
| Agha (1992, p. 3) | Unstable parent organization/institution |
| Fraser et. al (2005, p. 92)  | Dependence on (one individual) champion |
| Moucheraud et. al (2017, p. 4); Scheirer (2005, p. 343) | Having no champion |
| I | Experience (UTAUT), HIR technological/ managerial knowledge/ human capital (IGB – micro)[Internal viewpoint] | Human information resources and experience present within the organization. Both for IT as well as management. The quality of the (technical) support users could receive from within the organization. | Agha (1992, p. 1); Fritz et. al (2015, p. 483-484); Moucheraud et. al (2017, p. 6); Scheirer (2005, p. 343) | Lack of literate, educated staff and/or staff in general |
| Agha (1992, p. 2); Fritz et. al (2015, p. 483) | No adequate IS management |
| Harris et. al (2017, p. 159) | No adequate change management |

The first column depicts the label given to a certain subject, which is named and explained in the second and third column.

The final two columns describe already known problems in the literature, with their sources, classified by these subjects.

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| *Question Scheme RQ2: How does the environment influence the information system’s success?* |
| Label | Subject | Explanation | Literature sources | Information to check |
| 1 | TIR/hardware and software (IGB[[13]](#footnote-13) – micro) | The organization’s infrastructure and business applications. Normally both the human as well as the technical resources, but mainly the second is assessed here, the hardware and software. | Fraser et. al (2005, p. 88-89); Agha (1992, P. 3); Fritz et. al (2015, p. 482); Kiberu, Mars & Scott (2017, p. 7) | Poor initial design: not well-thought-out database and relationships design, as well as network architecture (WAN/LAN…)  |
| Luna et. al (2014, p. 4); Agha (1992, p. 1); Moucheraud et. al (2017, p. 8) | Hardware acquisition is expensive, which could possibly lead to non-presence |
| 1b | Complementary organizational resources, financials (IGB – micro) | Organizational structures, policies, rules, workplace practices, culture. Particularly the financial situation for this study.  | Luna et. al (2014, p. 4); Agha (1992, p. 3); Fritz et. al (2015, p. 484); Moucheraud et. al (2017, p. 4) | Financing is abandoned/insufficient over time |
| 2 | Former and new business processes (IGB – micro) | Specific ordering of working activities across time and space within the organization. |  |  |
| 3 | Industry characteristics/ supply chain/ environment of similar entities (IGB- meso), institutional strength\* | Competitiveness, regulations and general characteristics of the industry. |  |  |
| 4 | Trade/ partnering with other organizations (IGB – meso), similar projects\* | Similar and non-similar organizations nearby, with which there is cooperation or not.  | Luna et. al (2014, p. 5); Moucheraud et. al (2017, p. 7); Kiberu, Mars & Scott (2017, p. 7); Harris et. al (2017, p. 159) | Not knowing of existing similar projects and/or information is scattered |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5 | Country/region-specific information (IGB – macro), political/ regulatory/ educational/ social/ cultural influences (IGB – macro) | Characteristics of the region, e.g. level of development, employment, infrastructure, education, climate… | Luna et. al (2014, p. 5); Agha (1992, p. 39); Moucheraud et. al (2017, p. 6) | IS initiative competing with more basic needs (e.g. food, health care, education…) |
| Luna et. al (2014, p. 5) | Legal uncertainty |
| Agha (1992, p. 2) | Government does not value ‘information’ |
| Agha (1992, p. 2); Fritz et. al (2015, p. 484) | Unfavorable political attitudes |
| Fraser et. al (2005, p. 92); Luna et. al (2014, p. 4); Fritz et. al (2015, p. 483) | Unstable power supply and lack of battery back-up |
| Luna et. al (2014, p. 4); Fritz et. al (2015, p. 483) | Low quality or expensive Internet access |

*Preparatory work*

After the literature review it was decided that the cases would be handled via a replication strategy[[14]](#footnote-14), triangulation and mixed methods. The India case would be studied in depth, and the successive cases (Zambia, Benin) would be examined to compare the literature and the pattern found. Triangulation further encourages me to adopt multiple perspectives when collecting and analyzing my data (Tibben, 2015) and so increases the internal validity of my research (Miles et. al, 2014). Triangulation can be done on four different levels, and these were also applied:

|  |  |
| --- | --- |
| Data triangulation | Variety of data sources: data is collected from India, Zambia and Benin. |
| Evaluator triangulation | Variety of researchers: in India, two researchers were present, in Zambia and Benin unfortunately only one. |
| Method triangulation | Variety of methods: the study uses interviews, qualitative surveys, quantitative surveys and document review. |
| Theory triangulation | Variety of theories: DLM, IGB, TAM, UTAUT. |

Mixed methods (comparable to the method triangulation) integrate qualitative and quantitative data for a more multidimensional approach. The careful measurement of quantitative studies combined with the deep understanding of complex contexts in qualitative studies give a powerful mix (Miles et. al, 2014). However, this study does focus more on the qualitative side, because these are often advocated as the best strategy to discover and test hypotheses (Miles et al., 2014).

To assess the most occurring problems, a quantitative survey and a first part of the interview guide were made to go through the question schemes. Each question was labelled according to the subjects and when necessary, the questions were translated to the local language. To assess the IS environment, a qualitative survey was made, completed with a second part of the interview guide. Questions were again labelled and translated if necessary. Of course, additional documents of value were also incorporated in the research. For an overview of the document list, see appendix (Document overview of attachments).

The questions themselves were based on DLM, TAM, UTAUT, IGB, Moucheraud et. al (2017), Agha (1992), Fritz et. al (2015) and Luna et. al (2014). The quantitative questions served the purpose to confirm or deny the literature in a particular case (Abu-Dalbouh, 2013), while the qualitative questions looked for new information that was not present in the literature yet. For the interviews, I have chosen a semi-structured manner as this allowed me to bring both foreseen and unforeseen insights to light (Hove & Anda, 2005). Primarily ‘What’ - ‘How’ questions were used, ‘Yes’ - ‘No’ questions were avoided, and sensitive matters were cared for last. The initial surveys and interview guide were also reviewed by Mr. Dupulthys (well-known with the India case, currently on the advisory board) and Ms. Desmet (experienced with interviewing people in India through her volunteering work at UCOS[[15]](#footnote-15)). Furthermore, each survey and interview guide were adapted according to new insights from a preceding case and these versions can be found attached to the research.

The interviewees and survey respondents were chosen and identified carefully. Interviewees were asked to pinpoint where they saw themselves in the organization and it was made sure that each case covers people from all levels (LL – lower level, ML – middle level, HL – higher level) (Myers & Newman, 2007). To make sure that there is enough data for credible analyses, data saturation was sought in each case and similar studies were assessed in the literature review (Marshall et. al, 2013). With each interviewee and respondent, a sense of reassurance, openness and anonymity was established to provide for the best results. They were filled in on the research goals through a presentation (see attached per case), given a consent form for privacy, an informal setting was sought, and social dissonance was minimized (e.g. through adapted clothing, talking about my family…). Translations or translators were provided for those who wanted, and questions were given beforehand.

*Analysis*

For this research, I have selected the within case and cross case guidelines of Miles et. al (2014) to be the most appropriate for my goals and the most tangible to work with. First, I produced a pre-structured case outline (which is the question scheme), then I analyzed each case separately to describe, understand and explain each single context. Then, I reached out to the interviewees for feedback and thereafter the within case analyses were re-done, and feedback was incorporated. A big advantage of studying across cases is that it increases generalizability and so understands processes and outcomes at a deeper level (Miles et. al, 2014).

1. Within case analysis

Given the triangulation and mixed methods, several sources of data were available per case. How I approached each of them is described below.

* 1. Interviews

The interviews were first transcribed and then uploaded to the program ‘NVivo[[16]](#footnote-16)’. It is important to note that for the labelling and coding of information, first the existing subjects from the question schemes were created and used, and throughout the process, new nodes and sub nodes emerged. But the basis thus goes back to the question schemes. New nodes from preceding cases were also transferred to cases that followed. This process was conducted twice, namely prior to an interim case summary (see further) and after the provision of feedback by the respondents. The files are also attached to the research.

* 1. Survey 1: challenges and most occurring problems, quantitative questions

Each respondent’s answers were copied into an Excel file. Questions without answers were labelled ‘fault’ and excluded from the analysis. The level of the respondent was added as information and thereafter, the questions were sorted according to their subject (label). Then, per level (LL[[17]](#footnote-17), ML[[18]](#footnote-18), HL[[19]](#footnote-19)), the median was taken for each answer. I have chosen the median instead of the mean as it is less sensitive to outliers. Thereafter, the median was taken over all answers weighted (per level) and unweighted (overall). Per subject, another median was taken to look at the overall number or ‘conclusion’. This process was done after the analysis of the interviews, and so the insights from survey 1 were combined with the insights from the interviews in a memo per subject. At the end of each case, a general remark about the feeling about the surveys per case was also added. The Excel analyses are also attached to this research.

* 1. Survey 2: environmental influences, qualitative questions

The answers from the second survey were first revised to see if they provided additional insights to survey 1 and the interviews. This information was labelled according to the nodes in NVivo. For India, they were also labeled in the NVivo file, but for Zambia and Benin, this was done manually on paper. This had no specific reason, other than practicality.

* 1. Additional documents

The additional documents per case (see appendix for an overview) were read and marked for general information and labelled according to the NVivo nodes for additional insights.

* 1. Interim case summary 1

All sources described above were then assessed and summarized in a first interim case summary. This described a short case summary, analogies with the literature (or not) according to the question scheme, and additional new insights. These summaries were shared with the respondents to ask for feedback.

* 1. *Interim case summary 2, outliers analysis*

The first interim case summaries were re-assessed into a second version for the final within case results. Feedback was incorporated, the same process for interim case summary 1 was repeated and an outliers file was created. In this outliers file I specifically assessed each answer that was standing out and explained the results, as to understand the case better.

1. Cross case analysis

The cross case analysis comprises a multi-case matrix with an explanation table and a similarities and contrast table. The multi-case matrix is based on the interim case summary 2 from each case and provides a short and generalized overview, easy for comparison purposes. To make sure all information is still consolidated, the explanation table is available to look up information on the statements in the matrix. This matrix confirms or denies the conclusions found in the literature, and where possible, proposes new insights. The similarities and contrast table are based on the multi-case matrix and put all cases across one another to find the similarities and/or discrepancies between the cases for an even deeper understanding.

Results

This research summarizes, analyzes and integrates the results of three different cases that were examined closely. Three organizations in India, Zambia and Benin lent their cooperation for this research and from the organization in Benin we also got the opportunity to talk to two persons working with the same system, in Mali. Although the source material is not sufficient to make additional conclusions, some insights will be used to nuance the findings from Benin, as it concerns the same system.

*The cases*

1. *India: Sundarban Social Development Centre*

The Sundarban Social Development Centre (SSDC) is an Indian non-governmental organization focusing on health care and social development in the Sundarban region of India. Their most important project constitutes of an eye clinic. In the summer of 2016, SSDC started a cooperation with Academics for Development (AFD), which is a student organization based in Belgium, that selects and pairs interdisciplinary student teams with social partners abroad. The student team of summer 2017 will further be referred to as the designers of the studied information system, and their aim was to develop a digitalized record keeping system for the management and analysis of patient records. For this, they worked (and cooperated) on an idea from September 2017 until June 2018, after which they travelled to SSDC in the summer period to implement their findings.

1. *Zambia: Kamutamba*

The Kamutamba non-profit was established to assist the local St-Theresa’s Mission Hospital in its search for financial independence. The non-profit now comprises several income generating activities: a kiosk, a guesthouse, a poultry project, a large vegetable garden and a restaurant. Kamutamba also started a cooperation with Academics for Development (AFD) in the summer of 2015. Since then, three student teams have been on site, whereof the final two cooperated with Kamutamba on the digitalization of the enterprise. They started off with a digitalized record keeping system for the kiosk and a small application for the construction of the new restaurant. For this, the students cooperated on an idea from September 2016 until June 2017, after which they travelled to Zambia in the summer period to implement their findings. The second team re-worked the existing kiosk application from September 2017 until June 2018 after which they also went on site in the summer.

1. *Benin: Bosco School Manager*

The Bosco School Manager (BSM) is an online software for the integrated management of school data from the Don Bosco Salesian Vocational Training Centers and Schools in the seven countries of West Francophone Africa (Senegal, Mali, Guinea-Conakry, Burkina Faso, Republic of Côte d'Ivoire, Benin and Togo). In 2014, the software was designed and implemented by a local one-person enterprise from Togo with the support of VIA Don Bosco in Belgium. This research primarily sheds a light on Benin but offers some small insights in Mali as well. The system was set up for a better management and integration of student- and school information within and across all centers. It was designed for three types of users: the directors for analysis, the superusers for parametric work and the users from secretariats, teachers, employment offices, pupils, parents…

*Results*

The results are summarized in a multi-case matrix per case, per research question and per researched subject. This matrix is added to the appendix and accompanied by an explanation table to shed light on each of the statements. Underneath, the most essential findings are listed, also ordered per research question and per subject. Each statement can receive a score:

|  |  |
| --- | --- |
| +-0[blanc] | The case scores positively on this problem, the statement is not true.The case encounters this problem, the statement is true.Nuance/clarification is needed for the statement. See discussion/explanation table.The case cannot conclude on this statement. Either because there is no data, or the data is inconclusive. |

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| *Results RQ1: What are the challenges and most occurring problems?* |
| Subject | Problem | L[[20]](#footnote-20) | I[[21]](#footnote-21) | Z[[22]](#footnote-22) | B[[23]](#footnote-23) |
| A: System quality | Not easy to use (analysis) | - | - | - | + |
| Poor system security | - | - | + | + |
| Reliability concerns | - | - | - | 0 |
| Information loss when crash |  | - | - | + |
| B: Information quality | Different standards and labels make for confusion | - | + | - | + |
| No / Bad determination SH[[24]](#footnote-24) information needs  | - | - | - | - |
| C: Service quality (EXT) | Lack of technical support staff and after-service | - | - | - | + |
| Lack of user training/poor introduction of IS | - | - | - | - |
| Little to no evaluation | - | - | 0 | + |
| Insufficient requirements analysis |  | - | - | + |
| Short implementation time |  | - | - | + |
| Problematic team/designer dynamics |  | - | - | - |
| No cooperation/communication during creation |  | - | - | + |
| D: Use | Poor attitude towards IS/limited faith | - | 0 | + | 0 |
| Overexcitement results in too fast IS deployment | - | - |  | + |
| E: User satisfaction | No satisfaction for the system |  | - | 0 | 0 |
| F: Net benefits | Productivity decrease |  | - | + | + |
| G: Perceived usefulness | No awareness of IS possibilities/importance | - | - | + | + |
| Different goals for different users |  | - | + | + |
| \*: Locality | IS project is not locally demand-driven | - | - | + | 0 |
| System is made by foreigners |  | - | - | + |
| IS does not correspond to organization’s culture | - | - |  | 0 |
| Little to no cooperation between host and executors |  | - | 0 | + |
| H: Social influence | Little support from parent/management | - | 0 | + | + |
| Failed similar projects break trust indefinitely | - | 0 | + | + |
| Concerns that donors misuse their influence | - | + | + | + |
| No one would recommend the IS |  | - | + | + |
| Unfavorable champion situation | - | - |  | + |
| I: Experience (INT) | Lack of literate/educated/general staff | - | - | 0 | 0 |
| No adequate IS management | - | - | + | + |
| No adequate change management | - | - | - | - |

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| *Results RQ2: How does the environment influence the information system’s success?* |
| Subject | Problem | L[[25]](#footnote-25) | I[[26]](#footnote-26) | Z[[27]](#footnote-27) | B[[28]](#footnote-28) |
| 1: TIR | Poor initial design | - | - | + | + |
| Hardware not present/too expensive | - | + | + | 0 |
| Online/Offline IS problems |  | - | - | - |
| 1b: Complementary resources | Financing is insufficient over time | - | - | - | - |
| Unstable parent organization | - | - | - | + |
| 2: Former and new business processes | The business process remained unchanged |  | - | + | + |
| Unfavorable job content creation |  | - |  | - |
| 3: Industry characteristics | Digital latecomer |  | - | + | + |
| 4: Trade/Partnering | Not knowing of existing similar projects | - | 0 | - | 0 |
| 5: Country/Region specifics | IS initiative competing with more basic needs | - | - | - |  |
| Legal uncertainty | - | - | - |  |
| Government does not value ‘information’ | - | + | + | - |
| Government support/funding is low/non-existent | - | - |  | - |
| Unfavorable political attitudes | - | - | - | - |
| Unstable power supply | - | - | - | + |
| Low quality or expensive Internet access | - | - | - | - |
| Language barriers |  | - | + | + |
| Illiteracy and low-quality education | - | - | - | - |
| Imperturbability/lack of initiative |  | - | - |  |

Discussion

*Research validation and control*

Please note that each case was examined with utmost care, though I do wish to share two possible areas of uncertainty. First, I was unfortunately not able to go to Benin and had to conduct the interviews and surveys online. As a result, I feel more confident about the results from India and Zambia, and was more careful when generalizing for Benin. I received two surveys for Mali as well, which do not give enough ground for separate statements, but they are usable to nuance a few statements from Benin. Second, I have no personal connection with the India and Benin case, but I was part of the second student team in Zambia. I am well aware of the possible bias this might give, though I tried to avoid this as much as possible. Based on the guidelines by Hancock & Algozine (2011) and Miles et. al (2014) for case study research, several measures were taken to assess the following elements:**Druk <Ctrl + Alt + Shift + S> om het taakvenster met stijlen weer te geven**

|  |
| --- |
| Representativeness:-Number of cases as high as possible: 3 (4)-Randomly sampled people: random per level-Look for contrasting cases: contrast table-Order the cases in various ways: the diff. tables |
| Researcher effects:-People are granted anonymity: consent form-Make intentions clear: presentation slides-Cozy interview space: specified per interview-Include all levels of the organization: LL, ML, HL-Triangulation: on all levels-Stay on site as long as possible: 31 days India, 21 days Zambia |
| Contradicting events:-Weigh evidence appropriately: according to level of organization-Check meaning of outliers: outliers table |
| Objectivity/Confirmability:-Methods in detail explained: see methodology-Sequence of collections, processing well explained: see methodology-Conclusions linked to data: see labelling-Researcher points out personal assumptions: see discussion-Researcher acknowledges own biases: see discussion-The report should contain: Event/situation under investigation: see transcripts, Time: see transcripts, Space/location: see transcripts, Relationship of researcher to case: see discussion, Strategies of analysis: see methodology |
| Utilizability:-Findings actually help solve a local problem: checklist for future designers -Theoretical additions to the literature: building on Agha (1992), Moucheraud et. al (2017) |
| Internal validity:-Descriptions are context-rich: see discussion-Triangulation: on all levels-Uncertainties are defined: see discussion-Conclusions are confirmed by participants: feedback was asked |
| External validity:-Characteristics of sampling are clearly explained: see methodology-Report specifies limits for generalization: see discussion-Findings are well explained: see discussion-Report suggest further areas of research and testing: see discussion and conclusion |
| Reliability:-Research questions are clear: see introduction and literature study-Researcher role and status are clear: see discussion-Data collected across range of appropriate times, settings, respondents: data triangulation-Data quality checks were made: this table |

*Confirmations of the literature*

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| *Results RQ1: What are the challenges and most occurring problems?* |
| Subject | Problem | L[[29]](#footnote-29) | I[[30]](#footnote-30) | Z[[31]](#footnote-31) | B[[32]](#footnote-32) |
| A: System quality | Reliability concerns | - | - | - | 0 |
| B: Information quality | No / Bad determination SH[[33]](#footnote-33) information needs  | - | - | - | - |
| C: Service quality (EXT) | Lack of user training/poor introduction of IS | - | - | - | - |
| I: Experience (INT) | Lack of literate/educated/general staff | - | - | 0 | 0 |
| No adequate change management | - | - | - | - |
| *Results RQ2: How does the environment influence the information system’s success?* |
| Subject | Problem | L | I | Z | B |
| 1b: Complementary resourc. | Financing is insufficient over time | - | - | - | - |
| 4: Trade/Partnering | Not knowing of existing similar projects | - | 0 | - | 0 |
| 5: Country/Region specifics | Unfavorable political attitudes | - | - | - | - |
| Low quality or expensive Internet access | - | - | - | - |
| Illiteracy and low-quality education | - | - | - | - |
|  |  |  |  |  |  |

Throughout all cases, five statements for RQ1 correspond entirely with the findings in the literature. There were doubts about the software’s reliability across all cases. India’s IS being the most extreme, since their system just stopped working after three days. In Zambia, the IS freezes sometimes and in Benin, people do thrust their software, but the IS is an online system, and stable Internet connectivity is a real problem.

What further stands out is that every respondent has pointed out that not everything they wished for is present in the IS. In Benin, we are talking about details, such as a picture to add to a student’s profile, but respondents from Mali do state major shortcomings in what they need. In India, the entire system does not correspond to the information needs and in Zambia, some functionalities are lacking as well.

Next, all cases report a poor introduction and insufficient user training. In Zambia, the closing team left the IS with no explanation. In India, the team introduced the IS quickly on their final day before departure to the local IT person. In Benin, the local IT people were given a one-week training, which they state is not sufficient, and the users got a manual.

Finally, none of the organizations implemented specific strategies to deal with the change. The level of IT and other expertise in every organization is insufficient. All respondents feel that they could benefit from more training and/or IT training. If a problem would occur with the IS, no organization can say with full confidence that they can solve it on their own; Zambia’s organization does not even have an IT employee. All organizations are dependent on outside support.

Further, five statements for RQ2 correspond entirely with the findings in the literature. All organizations are dependent on external donor support and have no financial independence plan for the IS in the long term. Long story short, if the donors are out, the IS is done.

In Zambia, there is no other organization nearby that operates with a similar system and in Benin there are some, but the software is much less innovative. Benin’s BSM is leading in terms of technology and is an example for the surroundings. Further, in India, there are quite some similar projects nearby, though these projects have the resources and expertise to work with state of the art IS’s. SSDC is the only organization who has this minimal level of resources to start off such a project.

Although some of the respondents prefer not to speak about their country’s government and politics, it was soon clear that they are not favorable. I would further like to refrain from sharing more details on this matter so to protect the organization’s positions in their countries, but I would like to thank them for their cooperation. Internet access is expensive for the organizations and even forced SSDC India to settle for a lower quality level. In Benin, it is more a matter of being able to connect, expensive or not, Internet connectivity is not at all evident. Finally, all cases state problems of illiteracy and/or low-quality education. In Mali, a respondent pointed out that some users are impairing the system because they have no idea how to use it and although India as a country is known for excellent universities and enormous intellectual capacities, Sundarban does not benefit from these school systems, and if it would, the supply would be too low.

*Questionable statements of the literature*

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| --- |
| *Results RQ1: What are the challenges and most occurring problems?* |
| Subject | Problem | L[[34]](#footnote-34) | I[[35]](#footnote-35) | Z[[36]](#footnote-36) | B[[37]](#footnote-37) |
| H: Social influence | Concerns that donors misuse their influence | - | + | + | + |
| *Results RQ2: How does the environment influence the information system’s success?* |
| Subject | Problem | L | I | Z | B |
| 1: TIR | Hardware not present/too expensive | - | + | + | 0 |
|  |  |  |  |  |  |

The literature mentions that organizations often fear that financial donors will misuse their influences, yet no respondent in any case feels that way. In SSDC India they welcome partner’s ideas and suggestions very much. In Zambia and Benin as well, the cooperation is peaceful and fruitful. Furthermore, the literature states that hardware is often a problematic issue, because it is expensive to buy, install and maintain. However, in none of the cases was this pointed out as a problem. Although I must nuance that each of the hardware pieces was donated and furthermore, in Benin there was one person claiming that the hardware is wearing down.

*Possible additions to the literature*

|  |
| --- |
| *Results RQ1: What are the challenges and most occurring problems?* |
| Subject | Problem | L | I | Z | B |
| C: Service quality | Problematic team/designer dynamics |  | - | - | - |
| *Results RQ2: How does the environment influence the information system’s success?* |
| Subject | Problem | L | I | Z | B |
| 1: TIR | Online/Offline IS problems |  | - | - | - |
|  |  |  |  |  |  |

The literature I went through has not pointed out possible problems with the team or designer yet. For India and Zambia, this means that the teams on site did not always see eye to eye on how to create or implement the IS, giving rise to conflicts, further slowing down the IS process. In Benin, it means something different. There was one person responsible for the IS creation and implementation, and this persons did a good job and is up until today also still reachable for problems with or modifications to the system. Though one may ask the question whether this contact is sustainable in the long term. What happens if this one person disappears or quits?

I did not find information on the question of an online or offline system yet. The cases in India and Zambia both had offline systems, which raises the problem of back-up, since all information goes lost when the system would crash. On the other hand, Benin BSM chose an online system, which resolves that problem, but leads to another, namely that when Internet is inaccessible, they are not able to enter the software.

*Interrelations in the cases*

**

Figure 1: Interrelations of question scheme 1

The figure above displays the interrelations of question scheme 1, which I will now apply to each of the cases. These interrelations are based on the theoretical models as explained in the methodology. Throughout the process I decided to add a new subject to the scheme, namely that of ‘locality’, which assesses whether the IS project was locally demand-driven, whether the system was created and implemented locally and/or with local cooperation and whether it fits in the culture of the organization. For this, I extracted two statements from question scheme 1 from the subjects ‘G’ and ‘H’ (these were given a ‘\*\*’ in the question scheme). I did this because the literature points out how important it is to adapt your work to each situation separately, as well as because I found that this subject plays quite a role in the success of each IS initiative.

*The case of India*

India’s IS scores low on each of the subjects that lead to use and satisfaction. The system was not easy to use to analyze data, it was not trusted and also stopped working after three days, and although the IS looked exactly as the known registration form, it lacked all functionalities for easy reporting and analyses. The system was made by a Belgian team, with which they had no face-to-face contact until they came on site. But even then, the team primarily kept to themselves, which may have caused an insufficient requirements analysis and bad determination of the information needs. Given the short implementation time, and the limited expertise both in the team itself as in the organization, the desirable IS was never created, but replaced with an Excel system. There has been no initiative for evaluation since then and when the organization tried to contact the team to help them solve the crashing problem, none of them ever responded.

*The case of Zambia*

Zambia’s IS also scores low on system-, information- and service quality, as well as experience. The system is not easy to use for analysis, freezes sometimes,

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A: System quality | - |  |  |  |  |
| B: Information quality | - |  |
| C: Service quality | - | D: Intention to use, Use | + |  |
| I: Experience | - | Pijl: recht |  | Pijl: recht | F: Net benefits | + |
| G: Perceived usefulness | + |  | E: User satisfaction | 0 |  |  |
| H: Social influence | + |  |  |
| \*: Locality | 0 |  |
| *Interrelations Zambia case* |  |  |  |

generating some doubts about its reliability, and would lose all information if it would crash. Furthermore, the

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A: System quality | - |  |  |  |  |
| B: Information quality | 0 |  |
| C: Service quality | - | D: Intention to use, Use | - |  |
| I: Experience | - | Pijl: recht |  | Pijl: recht | F: Net benefits | - |
| G: Perceived usefulness | - |  | E: User satisfaction | - |  |  |
| H: Social influence | - |  |  |
| \*: Locality | - |  |
| *Interrelations India case* |  |  |  |  |  |
|  |  |  |  |  |  |

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| --- |
|  |

terminology in the IS is not always easy to understand for Zambians. The organization would have benefited from more analysis options and a shopping list, as well as further digitalization of the entire premises, but these needs were never granted. The teams that came on site were there for only five or seven weeks, often lacked the needed expertise, and in a later stage stopped cooperating with the organization. These teams are also not reachable for modifications to the system anymore, and with the organization itself having no IT expertise, the IS thus has no technical support left.

*The difference between the cases of India and Zambia*

I have shown that the system-, information- and service quality for both cases are questionable to low. Yet, the actual usage, user satisfaction and net benefits are quite different for both. How come India’s IS was abandoned and Zambia’s IS was embraced and used daily? For this, the subjects of perceived usefulness, social influence and locality deserve a closer look. In India, the management knew quite well what was possible with the IS, but further, many people had no idea why this change was needed and/or named project goals that did not correspond with those of the management. In Zambia, everyone knew exactly why the system was there.

Additionally, there are the major differences in social influence: in India, the management’s support diminished when they felt excluded of the IS process, and they further never thought of an IS management strategy. In Zambia, the system was supported by the management and users felt that. The IS is up until today used, managed closely and controlled daily.

Further, the IS was initially demanded by the management in Zambia, while in India, the management was convinced by an outer source to implement the IS. Lastly, given that at least the first team of designers in Zambia did consider the wishes of the management, we can conclude an entirely different IS starting point.

*The case of Benin*

In Benin, we find an entirely different, more positive image. It scores excellent on system- and service quality, perceived usefulness, social influence and locality. There are some functionalities lacking in the subject of information quality, though these are minor. Some people doubt the experience level of the IT staff, though I found them to be more experienced than the cases of India and Zambia together.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A: System quality | + |  |  |  |  |
| B: Information quality | 0 |  |
| C: Service quality | + | D: Intention to use, Use | + |  |
| I: Experience | 0 | Pijl: recht |  | Pijl: recht | F: Net benefits | + |
| G: Perceived usefulness | + |  | E: User satisfaction | 0 |  |  |
| H: Social influence | + |  |  |
| \*: Locality | + |  |
| *Interrelations Benin case* |  |  |  |  |  |

*Surroundings*

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| *Results RQ2: How does the environment influence the information system’s success?* |
| Subject | Problem | L | I | Z | B |
| 1: TIR | Poor initial design | - | - | + | + |
| 2: Former and new BP[[38]](#footnote-38) | The business process remained unchanged |  | - | + | + |
| 3: Industry characteristics | Digital latecomer |  | - | + | + |
| 5: Country/Region specifics | Language barriers |  | - | + | + |
|  |  |  |  |  |  |

Given our knowledge about the IGB[[39]](#footnote-39) model, we can apply this information to one of our cases. For example, in India: SSDC has quite some organizations in the neighborhood that went through a digitalization process already, which may trigger the want to follow these footsteps. But, 415 languages are spoken in India, which complicates communication in any part of the country. Not to mention that the designers spoke Dutch (English as second language), while the organization is Bengali-speaking (with four people who know English). These two factors might have given rise to an inefficient design, and then as the IS was not adding value, it was abandoned, and no processes changed.

General Conclusion

When I returned from Zambia, there was one question that got stuck in my head: ‘Did we actually do a good job?’.

But what does that mean? A ‘good job’?

I was wondering whether the implemented information system would last, whether the users would be satisfied with it, whether they would use it, and keep using it.

IS[[40]](#footnote-40) failure is no desirable outcome, but what can you do to avoid it? Numerous studies have researched IS failure and proposed strategies to deal with it. We could have researched that topic and made sure we checked all the boxes for that IS in Zambia. Yet, that is the heart of the matter. We cannot readily transfer IS literature from industrialized countries to developing areas. This research has shown why and has given an alternative approach to how it could be done instead. With this study, I assessed how to assure the sustainability of information systems in developing contexts and looked at the most occurring problems and challenges, as well as possible effects from their surroundings. In the study I summarized four theoretical models: DeLone & McLean[[41]](#footnote-41), TAM[[42]](#footnote-42), UTAUT[[43]](#footnote-43) and IGB[[44]](#footnote-44). The sustainability of information systems in developing contexts is an under-researched domain, and often the research is conducted using singular case studies (Heeks, 2002; Moucheraud et. al, 2017). This research gives an answer to that by using, summarizing and integrating conclusions from three different cases.

I explicitly chose cases in different domains, namely health, business and education, to assess the most occurring challenges in general. Most statements found in the current literature originate from health information research, so next to answering the sustainability question, I also wanted to see whether these statements can be generalized to the other domains.

Now, how can you ensure sustainability? I created a question scheme per research question, a multi-case matrix as an answer and a results table to discuss my findings. These results can be found on pages 16 and 17 of this paper. Each of the statements in these tables was a prominent issue or success element in at least three out of four sources studied (the literature, the India case, the Zambia case, the Benin case) and I feel they are therefore important to consider when thinking about sustainability. For future designers and/or researchers, I feel that this might give considerable insight and focus points and therefore, I have created a checklist, which was added in the appendix, based on these result tables. The multi-case matrix and explanation tables give even more insight for those who are interested.

There were ten statements in total that received a consistent rate throughout the literature and throughout all the cases, and in my opinion may thus be considered for generalization towards other domains (such as health, business and education): (1) reliability concerns, (2) no/bad determination of stakeholder needs, (3) lack of user training/poor introduction of the system, (4) lack of literate/educated/general staff, (5) no adequate change management, (6) insufficient financing over time, (7) not knowing of existing similar projects, (8) unfavorable political attitudes, (9) low quality or expensive Internet access, and (10) illiteracy and/or low-quality education. Furthermore, I found two statements that did not occur in any of the cases and might thus be deemed questionable towards the future: (1) concerns that donors misuse their influence and (2) that hardware is not present/too expensive. Finally, I also came across two findings that were not yet cited in the literature, but were present in each of the three cases, namely: (1) problematic team/designer dynamics and (2) online/offline IS problems.

IS success depends on many factors, which may stand alone or be interrelated. What attracted attention during my research is the importance of an IS’ perceived usefulness, the social influences from management or colleagues and the level of locality (which assesses whether the IS project was locally demand-driven, whether the system was created and implemented locally and/or with local cooperation and whether it fits in the culture of the organization). Even though both the India and Zambia case got hindered by a questionable or low level of system-, information- and service quality as well as experience, their use and net benefits were still very different. India’s IS was abandoned and registered no accompanying benefits, while Zambia’s IS is now in daily use, giving rise to a productivity increase. The major differences being that their perceived usefulness, social influence and locality were low in the India case, while medium to high in the Zambia case.

I understand that three cases form no sufficient ground to generate new theories, but they can produce new insight and raise new hypotheses. This study was conducted in both a quantitative as well as a qualitative manner and has produced additional information for the under-researched domain of sustainability. It has done this by summarizing and integrating multiple complex situations to completely understand what the grounds were for every conclusion. This multi-case research has not only added to the literature but has also raised new questions and thus new areas for further research.

Finally, I would like to stress that none of these cases benefit from a favorable micro-, meso- or macro environment. Language barriers (India), unstable power supply (India, Zambia), uncertain Internet access (Benin) … we may often forget to think about them.

How does the environment look? Will we establish digital innovation (Zambia, Benin) or do we need to catch up (India)? Are there any existing similar projects? Maybe there are and we can learn from them (India), maybe the project is new (Zambia, Benin). And what about the business processes, the human and technical resources, the infrastructure and the (financial) stability of the organization?

It is not possible, and in my own opinion not necessary, to create a favorable environment.

*The key is to work with what you have.*

One team is not able to change an entire political or governmental situation, to financially support the IS for a lifetime, or alter the entire electrical infrastructure. What I have seen and what I find beautiful about each of these cases is how creative people can be with the resources they have. They make the best with what they got. I feel that that is the best advice anyone can receive when creating an IS, but also in any other situation. Brainstorm and at least consider the possible problems and pitfalls. Work around them in a sustainable way. Find solutions that can work with an unstable power supply or with an unreliable Internet connection. Take the possibilities into account and weigh the pros with the cons of each of them. You can use the checklist as a starting point.

Good luck!

Appendices

*Overview:*

Multi-case matrix

Explanation tables

Future designer’s checklist

Document overview of attachments

Documents under anonymity

Respondents list

Multi-case matrix

The results were summarized in a multi-case matrix per case, per research question and per researched subject.

All is listed underneath in short, but there is an explanation table further in the appendix to shed light on each of these statements.

|  |
| --- |
| *RQ1: What are the challenges and most occurring problems?* |
| INDIA | ZAMBIA | BENIN |
| A: System quality |
| Easy to use for registration | Easy to use for stock, control | Easy to use |
| Tiresome to use for analysis | Tiresome to use for analysis | Efficient to use for analysis |
| Poor system security | Good system security | Good system security |
| Reliability concerns | Reliability concerns | No reliability concerns for softwareReliability concerns for the Internet |
| Information loss when crash | Information loss when crash | No information loss when crash |
| Easy to learn | Easy to learn | Easy to learn |
| System corrupted: does not work | The system works | The system works |
| Password/access problems |  | Some final details to be modified |
|  | Enjoyed access strategy |
| B: Information quality |
| No problems with standards/labels | Problems with standards/labels | No problems with standards/labels |
| Shortfall of stakeholder requirements | Shortfall of stakeholder requirements | Shortfall of stakeholder requirements |
| Good information for registration | Good information for registration | Good information for registration |
| Bad information for analysis | Bad information for analysis | Good information for analysis |
| C: Service quality (EXT):  |
| Lack of technical support staffNo after-service | Lack of technical support staffNo after-service | No lack of technical support staffAfter-service |
| Lack of user trainingPoor introduction of the system | Lack of user trainingPoor introduction of the system | Lack of user trainingPoor introduction of the system |
| No evaluation | Evaluation | Evaluation |
| Insufficient requirements analysis | Insufficient requirements analysis | Sufficient requirements analysis |
| Short implementation time | Short implementation time | Reasonable implementation time |
|  | Gradual improvement of the system | Gradual improvement of the system |
| Problematic team dynamics | Problematic team dynamics | One single (external) designer |
| Creation software: no cooperative process | Creation software: no cooperative process | Creation software: cooperative process |
| Bad communication with SSDC | Bad communication with Kamutamba | Good communication with other centers and designer |
|  | Unfulfilled promises |  |

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| D: Use |
| Good attitude towards IS[[45]](#footnote-45), faith | Good attitude towards IS, faith | Poor LL[[46]](#footnote-46) attitude towards IS, faith Good HL[[47]](#footnote-47) attitude towards IS, faith |
| Supposed to be usedEvery day for registrationLess frequent for analysis | Supposed to be usedEvery day for stock & controlLess frequent for analysis | Different frequencies of useDirectors: monthly, teachers: trimesterly, informaticians: daily |
| Overexcitement follows into IS deployment at too high pace |  | Overexcitement resulting in IS deployment at a too high pace |
| E: User satisfaction |
| No one was satisfied with the system | Partial satisfaction with the system | Satisfaction with the system |
|  |  | The system was marketed at big events |
| F: Net benefits |
| Productivity decrease | Productivity increase | Productivity increase, time saving |
| Good for moral at first  |  |  |
| G: Perceived usefulness |
| No awareness of systems possibilitiesDifferent goals for different users | Awareness of systems possibilitiesSame goals for different users | Awareness of systems possibilitiesSame goals for most users  |
| IS project is not locally demand-driven | IS project is locally demand-driven | IS project is locally demand-driven |
|  |  | Hesitancy of certain users |
| Non-use of certain people |
| \*: Locality |
| System made by foreigners | System made by foreignersPartial cooperation between host and executors | System made by local informatician |
| IS does not correspond to the organization’s culture | Questionable suitability in culture |
| Little to no cooperation between host and executors |  |
| H: Social influence |
| Diminished support from management | Support from managementIntroduction IS to users by HL | Support from managementIntroduction IS to users by HL |
| Knowledge of succeeding similar projects | No knowledge of similar projects | No knowledge of similar projects |
| No concerns for donor (mis)influence | No concerns for donor (mis)influence | No concerns for donor (mis)influence |
| No one would recommend the IS | They would recommend the IS | They would recommend the IS |
| There was a responsible | There was a responsible | There was a responsible |
| Users blindly follow instructions | Medium freedom of speech |  |
| Dependence on one champion |  | Well-championed organization |
| Users were not informed about the system’s goals | Users are informed on the IS’s goals |  |
| I: Experience (INT) |
| Lack of literate/educated staff | No IT staffSufficient other staff | Questionable whether there are sufficient IT and other staff |
| IS management: none | IS management: present | IS management: present |
| Change management: none | Change management: none | Change management: none |
| External partner has management experience |  | Communication initiatives |
| Need for additional training or education on all levels | Some doubts on IT’s capabilities |

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| *RQ2: How does the environment influence the information system’s success?* |
| INDIA | ZAMBIA | BENIN |
| 1: TIR |
| Poor initial design: no database | No poor initial design | No poor initial design |
| Hardware is present | Hardware is present | Hardware is questionable |
| Offline system | Offline system | Online system |
|  | Promised hardware that never came |  |
| 1b: Complementary resources |
| Financing is insufficient over time | Financing is insufficient over time | Financing is insufficient over time |
| Unstable parent organization | Unstable parent organization | Stable parent organization |
| No mentions of any other support | No mentions of any other support | No mentions of any other support |
| 2: Former and new business processes |
| Registration process unchanged | The process changed | The process changed: both Information gathering as analysis |
| Extra job was created for copying |  | Informatician job content changed |
| 3: Industry characteristics |
| Latecomer in its environment | Digital leader in its environment | Digital leader in its environment |
| Low support/funding by government |  | Low support/funding by government |
| Low human resources | Low human resources |  |
| Social security is non-supporting | Information going lost | Well-connected |
| No health insurance |  |  |
| Healthcare over finances |
| 4: Trade/Partnering |
| No cooperation with similar projects | No cooperation with similar projects | No cooperation with similar projects |
|  |  | Knowledge of similar systems |
| 5: Country/Region specific |
| Language barriers | No language barriers | No language barriers |
| Unfavorable political attitudes | Unfavorable political attitudes | Unfavorable political attitudes |
| Government values information very much | Government values information  | Government does not value information |
| Internet is expensive, but present | Internet is expensive, but present | Internet connectivity issues |
| Unstable power supply | Unstable power supply | Stable power supply |
| Illiteracy and low-quality education | Illiteracy and low-quality education | Illiteracy |
| Legal uncertainty | Legal uncertainty |  |
| IS initiative is competing with more basic needs | IS initiative is competing with more basic needs |
| Imperturbability | Imperturbability |
| Bad transporting possibilities. |  | A clear want to advance |
| Influence on system is questionable: |
| Explicit patriotism: there is not one Indian person who has spoken badly of the government, the legal system or the country itself; Still growing dissertation between rich and poor; High levels of unemployment; Woman rights less than men’s rights; Many religions, and conflicts | Patriotism: a great love for the country; High levels of unemployment; Woman rights less than men’s rights; Many religions | Less patriotism: a great love for the country, but not at all for the government and its politics and people are not afraid to say so; Many religions; Many ethnicities |

Explanation tables

These tables give additional insights on the statements in the multi-matrix.

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| INDIA |
| A: System quality  |
| Easy to use for registration | The Excel looked the same as the used registration form in SSDC. |
| Tiresome to use for analysis | Because each patient had a different Excel form, information was not integrated.  |
| Poor system security | Surveys point this out. |
| Reliability concerns | Mainly by those who actually worked with the system. |
| System corrupted: does not work | System gave a fault and could not continue afterwards. |
| Password/access problems | Designers had forgotten to share a password before they left (service quality). |
| Information loss when crash | The offline application makes for information loss when it would crash. |
| Easy to learn | Because they knew Excel and the registration format. |
| B: Information quality |
| No problems with standards/labels | Was the same as in the known registration form. |
| Shortfall of stakeholder requirements | System was okay for registration, not for analysis. |
| Good information for registration | Surveys point this out.  |
| Bad information for analysis | Interviews point this out (see system quality). |
| C: Service quality (EXT) |
| Lack of technical support staffNo after-service | Designer’s team had one IT guy on site for two weeks. The team did not respond to any questions for help by SSDC afterwards.  |
| Lack of user trainingPoor introduction of the system | Introduction was made to one internal IT worker on the last day before the team left. It was expected that this IT worker further informed the other users.  |
| No evaluation | No team member has reached out to SSDC so far for an evaluation. |
| Problematic team dynamics | The designer’s team had quite some disagreements. |
| Short implementation time | Shortest person on site: two weeks. Longest person on site: four weeks. |
| Insufficient requirements analysis | Many functionalities not present.  |
| Creation software: no cooperative process | The students worked on their own for the creation of the system. |
| Bad communication with SSDC | Before the implementation period, there was minimal contact, only exchanging the currently used registration forms. During the implementation, the team kept to their own, not cooperating with SSDC.  |

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| D: Use |
| Good attitude towards IS[[48]](#footnote-48), faith | Though it diminished throughout the process of creation and implementation as the team did not communicate enough. |
| Overexcitement follows into IS deployment at too high pace | First there was an excitement for a more complex, yet more suitable program. This was however too ambitious for the amount of time the team had on site. After numerous attempts, they resorted back to an Excel format in the final moments on site and deployed it with minor introduction. |
| Supposed to be usedEvery day for registrationLess frequent for analysis | Different uses for different stakeholders, though the system is not in use at all momentarily.  |
| E: User satisfaction |
| No one was satisfied with the system | People liked the idea of a good system, but the current one was not liked by anyone.  |
| F: Net benefits |
| Productivity decrease | Registration: there was double work as the normal process on paper continued and one person had to type over these paper forms into the Excel format.Analysis: as each patient had a separate file, the information was not integrated and tiresome to analyze or report.  |
| Good for moral at first  | People were excited to advance as an organization, this unfortunately did not last and transformed into disappointment. |
| G: Perceived usefulness |
| No awareness of systems possibilitiesDifferent goals for different users | HL: the idea was very broad and general, but they did know the possibilities. The ultimate goals were analysis and reporting.ML[[49]](#footnote-49): mentions different goals, namely reporting and a more efficient registration process.LL[[50]](#footnote-50): surveys show that they have no idea what the goal is, one interviewee suggests increased efficiency. |
| IS project is not locally demand-driven | It was proposed by a former student team, picked up by the partner and then transferred to SSDC. Although they were a big fan of it.  |
| \*: Locality |
| Little to no cooperation between host and executors | Prior to the visit, the registration formats were sent to the students for information. On site, cooperation was limited to a presentation of what would be implemented in the organization.  |
| IS does not correspond to the organization’s culture | The IS was slower, less productive, more work, SSDC’s environment does not need that.  |
| System made by foreigners | System was made by a Belgian student team. |

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| H: Social influence |
| Diminished support from management | The management was left out of the creation process, which led to some suspicion. On the moment of implementation, the director was not on site. |
| Knowledge of succeeding similar projects | SSDC knows many successful similar projects and wants to follow that lead.  |
| No concerns for donor (mis)influence | Donors get to share their ideas and are taken seriously. |
| Dependence on one champion | Funding and support currently comes from one big partner. |
| Users were not informed about the system’s goals | See surveys. |
| Users blindly follow instructions | There is little possibility for feedback towards the management because few ask questions or give remarks. |
| No one would recommend the IS | Not in this state and not with this support (see service quality). |
| There was a responsible | This was the IT worker who got introduced to the system last-minute. People knew that he was the responsible. |
| I: Experience (INT) |
| Lack of literate/educated staff | For SSDC’s desired system, IT workers will need more capacity than Excel management. The currently tried Excel format also gave problems the IT staff could not resolve.  |
| IS management: none | There was no plan or thought process set up to manage the IS. |
| Change management: none | This is something that SSDC strives towards but is not in place yet. |
| External partner has management experience | The external partner can advise SSDC, though it takes time for the SSDC management to be convinced to put into action some of the ideas. |
| Need for additional training or education on all levels | This was a clear thread throughout all the interviews, surveys and additional documents.  |
| 1: TIR |
| Poor initial design: no database | Excel was too simple for what SSDC wanted, which was an integrated system across all layers with a database. |
| Hardware is present | It was donated by the student team. |
| Offline system | The Excel works offline.  |
| 1b: Complementary resources |
| Financing is insufficient over time | There was and is no plan for IS financing.The organization is ever depending on donor support and has no plan for financial independence from their champion and other organizations. The team was limited in their IS efforts because the system could not be financed after their leave. They were obliged to choose an offline system or system without subscription because SSDC does not have the means and stability to afford any financials.  |
| Unstable parent organization | In terms of financial stability. |
| No mentions of any other support | Not in the interviews, surveys, additional documents. |

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| 2: Former and new business processes |
| Registration process unchanged | It was still done on the same paper. |
| Extra job was created for copying | One person had to copy the information from the paper version into the computer. |
| 3: Industry characteristics |
| Healthcare over finances | Investments and further costs are made continuously as health is a primary need.  |
| Latecomer in its environment | Many hospitals in the neighborhood are up and running with custom-made software. SSDC is falling a bit behind. |
| Low support/funding by government | Health benefits are paid after due date, leaving SSDC with serious deficits. There is much red tape, adding to the costs. If SSDC does not follow the rules meticulously, the government is able to withdraw the (already low) support they have. |
| Social security is non-supporting | The general system for society is weak. |
| Low human resources | Education is low quality. |
| No health insurance | Unless private and/or expensive. |
| 4: Trade/Partnering |
| No cooperation with similar projects | Although they exist, SSDC remains to stand alone for IT. For health, there might be joint trainings sometimes. |
| 5: Country/Region specific |
| IS initiative is competing with more basic needs | Healthcare comes first. |
| Legal uncertainty | There is much red tape and risk of being manipulated. |
| Government values information very much | Government needs a lot of information; this hangs together with the red tape. |
| Unfavorable political attitudes | There is not much trust in the government and the politics. |
| Unstable power supply | Extreme climate (droughts and rainy season) add to an already problematic structural energy supply. |
| Internet is expensive, but present | SSDC finds it costly to pay for it, causing that they can only afford medium-speed Internet.  |
| Bad transporting possibilities. | Which may be a problem when hardware needs to be repaired/bought or for the establishment of partnerships …  |
| Language barriers | India has 415 living languages, of which 21 have been officially recognized. This renders communication more difficult.Few people spoke English in SSDC, while the team could only speak English, this was problematic for communication and cooperation. |
| Imperturbability | People rest in their situation and rarely get angry, sometimes do not take initiative to do something about it. |
| Illiteracy and low-quality education | Illiteracy is still very high, and low-quality education gives further rise to underdeveloped human resources. |
| Extra (influence on system is questionable) | Explicit patriotism: there is not one Indian person who has spoken badly of the government, the legal system or the country itself; Still growing dissertation between rich and poor; High levels of unemployment; Woman rights less than men’s rights; Many religions, and conflicts. |

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| ZAMBIA |
| A: System quality  |
| Easy to use for stock, control | Surveys and interviews both agree on this. |
| Tiresome to use for analysis | Some functionalities are lacking to provide for a thorough analysis. |
| Good system security | Surveys agree on this.  |
| Reliability concerns | Sometimes the system freezes, or does some weird photo assigning, causing some doubts. |
| Information loss when crash | The offline application makes for information loss when it would crash. |
| Easy to learn | Surveys and interviews both agree on this. |
| The system works | Overall, the system works. |
| B: Information quality |
| Problems with standards/labels | Some terminologies in the system are not easy for the users. |
| Shortfall of stakeholder requirements | System was okay for registration, stock counting and control, but not for analysis. |
| Good information for registration | Registering the products and following up on the stock is an easy task with the system.  |
| Bad information for analysis | Making an analysis of the best sellers, making a shopping list… is more difficult. |
| C: Service quality (EXT) |
| Lack of technical support staffNo after-service | Designer’s teams are no reliable channel anymore to ask for modifications to or repair of the system.  |
| Lack of user trainingPoor introduction of the system | Introduction of the final system was never made. It was expected that they would know how to use it.  |
| Evaluation | One team member of the first team has reached out to Kamutamba for an evaluation, but that is me… |
| Gradual improvement of the system | Given that there were two teams, the second team was able to build on feedback from the first team’s work. |
| Problematic team dynamics | One of the designer’s teams had quite some disagreements. |
| Short implementation time | Both teams were never longer on site than 5 or 7 weeks. |
| Insufficient requirements analysis | Many functionalities not present.  |
| Creation software: no cooperative process | The first system was made blanc and then adjusted to the user’s needs. However, the final student team worked on its own for the adaptation of the former system.  |
| Bad communication with Kamutamba | Before the implementation period, there was minimal contact. During the implementation, the final team did talk, but had a hard time listening to the local demands, giving rise to some fiery discussions. |
| Unfulfilled promises | The team promised functionalities and hardware but did not deliver on that. |

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| D: Use |
| Good attitude towards IS[[51]](#footnote-51), faith | The system is used daily and people really want to use it. |
| Supposed to be usedEvery day for stock & controlLess frequent for analysis | LL[[52]](#footnote-52) uses it daily to register products. HL[[53]](#footnote-53)  uses it daily, weekly or monthly depending on stock counting, control or analysis. |
| E: User satisfaction |
| Partial satisfaction with the system | For what the system can currently do, Kamutamba is very satisfied. They are less satisfied for what the system could have had of extra functionalities.  |
| F: Net benefits |
| Productivity increase | More information is captured, management has a clearer sight on profitability and stock.  |
| G: Perceived usefulness |
| Awareness of systems possibilitiesSame goals for different users | LL, ML[[54]](#footnote-54) and HL all know why the system is there (registration, stock counting and control) and what the possibilities are (analysis).  |
| IS project is locally demand-driven | It was the HL itself that came up with the idea/request.  |
| \*: Locality |
| Partial cooperation between host and executors | The two teams had a different approach to the project. One team did take the local wants into account, the other team preferred to work more on their own ideas. |
| System made by foreigners | The system was made by two Belgian student teams. |
| H: Social influence |
| Support from managementIntroduction IS to users by HL | The management came up with the idea and has been a supporter ever since. |
| No knowledge of similar projects | Kamutamba is leading in terms of technology for point of sale.  |
| No concerns for donor (mis)influence | Donors are welcomed heartily. |
| Users are informed on the IS’s goals | See surveys. |
| They would recommend the IS | All, but one, that were asked would recommend the IS. Reason not to is shortage of some functionalities. |
| There was a responsible | This is the person from HL that follows up. People know that he/she is the responsible. |
| Medium freedom of speech | As the Indian case, users are very proud of the organization and will not easily criticize it.  |

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| I: Experience (INT) |
| No IT staffSufficient other staff | Kamutamba has no IT staff, making them fully dependent on outside support (which is not present, see service quality). There are sufficient other staff present, who were carefully selected and thus literate and/or educated. |
| IS management: present | The IS is managed by the HL, in a structured and transparent manner. |
| Change management: none | As there was no proper introduction, there was also no change management. |
| 1: TIR |
| No poor initial design | Some functionalities might be missing, but in the end the basis of what they wanted is present. |
| Hardware is present | It was donated by the student team. |
| Offline system | It can run without Internet, yet, when the system would crash, all information is lost. |
| Promised hardware that never came | A computer was promised but never delivered. |
| 1b: Complementary resources |
| Financing is insufficient over time | There is a want to invest in a new system if it would break, the question is if it can be financed as Kamutamba is dependent on donor support.  |
| Unstable parent organization | In terms of financial stability, Kamutamba is meant to be an income generating activity for a loss-leading hospital.  |
| No mentions of any other support | Not in the interviews, surveys, additional documents. |
| 2: Former and new business processes |
| The process changed | It went from paper to digital and served customers in a more efficient way, facilitated control and stock counting, and gave a first form of analysis to the HL.  |
| 3: Industry characteristics |
| Digital leader in its environment | All shops nearby are currently run with paper and pen.  |
| Low human resources | Education is low quality. |
| Information going lost | Much information goes lost and people have little view on their profitability. |
| 4: Trade/Partnering |
| No cooperation with similar projects | There are no similar projects in the close neighborhood. |

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| 5: Country/Region specific |
| IS initiative is competing with more basic needs | Healthcare comes first. |
| Legal uncertainty | Administrations go very slow.  |
| Government values information  | The government wants to earn more from taxes, so information on record keeping is actually becoming increasingly valuable. |
| Unfavorable political attitudes | The situation is stable, but not favorable. |
| Unstable power supply | Power cuts are well-present. Sometimes lasting up to a day or longer.  |
| Internet is expensive, but present | Internet is found expensive. |
| No language barriers | Zambia’s second language is English, the teams who came on site spoke English. |
| Imperturbability | People rest in their situation and rarely get angry, sometimes do not take initiative to do something about it. |
| Illiteracy and low-quality education | Illiteracy is still very high, and low-quality education gives further rise to underdeveloped human resources. |
| Extra (influence on system is questionable) | Patriotism: a great love for the country; High levels of unemployment; Woman rights less than men’s rights; Many religions. |

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| BENIN |
| A: System quality  |
| Easy to use | Surveys and interviews agree on this. |
| Efficient to use for analysis | Interviewees state that they can analyze more and quicker |
| Good system security | Surveys and interviews agree on this.  |
| No reliability concerns for softwareReliability concerns for the Internet | Surveys and interviews agree that the software itself is reliable. Though you always need Internet access and that is not always evident.  |
| No information loss when crash | The online application makes that all data is always stored and accessible online. |
| Easy to learn | Surveys and interviews agree on this. |
| Some final details to be modified | Some modification ideas that came up through using still need to be incorporated. |
| Enjoyed access strategy | Interviewees liked very much that you should access the system with a personalized code and that every person has differentiated access to different parts of the system.  |
| The system works | Overall, the system works. |
| B: Information quality |
| No problems with standards/labels | Surveys point out that everyone understands the information in the system.  |
| Shortfall of stakeholder requirements | Some people mention that they could have used extra functionalities.  |
| Good information for registration | People liked what the system can do, and which information can be held for every student. They are still working on a functionality to include a personal picture per student, but overall, they are satisfied. |
| Good information for analysis | Interviewees pointed out that they like the information to use for analysis. They would have liked some more information on the financials though, but overall, they are satisfied.  |

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| C: Service quality (EXT) |
| No lack of technical support staffAfter-service | The external support was and still is sufficient to deal with problems and major modifications. A WhatsApp group was created to smoothen communication in this regard.  |
| Lack of user trainingPoor introduction of the system | People point out that additional training, especially for the informaticians could have been very useful. They were given a one-week training. Solely a manual was made for less frequent users.  |
| Evaluation | An evaluation was made after one year.  |
| Gradual improvement of the system | After the evaluation, modifications were made, and new modification ideas still come up.  |
| Reasonable implementation time | The entire process took about six months.  |
| Sufficient requirements analysis | Though some functionalities are not present, surveys were sent out in advance to gather all’s ideas and opinions.  |
| One single (external) designer | The system was made by one person from Togo. This could be a risk if this person is no longer available.  |
| Creation software: cooperative process | The designer and the different centers worked together to agree on one single system that would fit them all. Surveys were sent out to ask for everyone’s opinion and ideas. |
| Good communication with other centers and designer | Communication is still facilitated through calls, WhatsApp groups and Messenger chats. The designer is part of these communication channels. |
| D: Use |
| Poor LL[[55]](#footnote-55) attitude towards IS[[56]](#footnote-56), faith Good HL[[57]](#footnote-57) attitude towards IS, faith | Some LL users are hesitant towards using the system, but the HL love it because it makes their job a lot easier.  |
| Overexcitement resulting in IS deployment at a too high pace | The actual creation and implementation took three months, giving rise to quite some problems in the first year after introduction. Informaticians were not too sure what to do and users did not really use it. In year two everything already went much better.  |
| Different frequencies of use | Directors: monthly, teachers: trimesterly, informaticians: daily, other users: depends on the function.  |
| E: User satisfaction |
| Satisfaction with the system | People are generally satisfied and happy with the system in Benin. The respondents from Mali give an entirely different picture where they are dissatisfied with the functionalities. |
| The system was marketed at big events in Belgium | The organization and funders were satisfied enough to present the system at the ministry of digital affairs, the king’s museum and a one-week seminar in the capital.  |
| F: Net benefits |
| Productivity increase, time saving | More information is captured, management has a clearer sight on student and school information.  |

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| G: Perceived usefulness |
| Awareness of systems possibilitiesSame goals for most users  | The management knows very well what is possible with the system. Quite some users also know the system is there for information management, but some do have some vague answers that do not really say much.  |
| IS project is locally demand-driven | It was the HL[[58]](#footnote-58) itself that came up with the idea/request.  |
| Hesitancy of certain users | Certain users were/are hesitant to use the system. This digitalization was a big step for them. They may be scared. |
| Non-use of certain people | Some people do not fill out the digital pages and so transfer their work to the informatician on site.  |
| \*: Locality |
| System made by local informatician | The system was made by an informatician from Togo, well connected with Benin as it is part of the BSM network.  |
| Questionable suitability in culture | Some people (LL[[59]](#footnote-59)) question whether the system fits in their local culture.  |
| H: Social influence |
| Support from managementIntroduction IS to users by HL | The management came up with the idea and has been a supporter ever since. |
| No knowledge of similar projects | BSM is leading in terms of technology and is an example for other organizations.  |
| No concerns for donor (mis)influence | There is no fear for that (see surveys). |
| They would recommend the IS | People would definitely recommend the system.  |
| There was a responsible | The informatician on site and the director are responsible and people know that. |
| Well-championed organization | The organization is well-championed with several overarching organizations worldwide.  |
| I: Experience (INT) |
| Questionable whether there are sufficient (IT) staff | One person spoke about illiteracy amongst teachers, and two spoke of too little staff in general. But the results of the surveys and interviews give not sufficient insight to conclude with certainty that there is a shortage.  |
| Some doubts on IT’s capabilities | The internal IT can fix minor problems and straight-forward modifications. For larger work and complexity, they depend on the designer of the system.  |
| IS management: present | The IS is followed up on with care.  |
| Change management: none | There was no change management.  |
| Communication initiatives | Quite some initiatives were taken to facilitate communication for both the system and the finances through WhatsApp and Messenger.  |

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| 1: TIR |
| No poor initial design | Some functionalities might be missing, but generally the basis of what they wanted is present. |
| Hardware is questionable | One person specifically held the argument of hardware shortage and tear. This could become a problem when the overarching organizations would retract their support.  |
| Online system | It was well thought-out whether they wanted an online or offline system.  |
| 1b: Complementary resources |
| Financing is insufficient over time | Few people have concerns about financing because the supporting organizations seem stable, however, they are dependent on those organizations.  |
| Stable parent organization | The funding comes from a stable organization abroad and was readily available for the project.  |
| No mentions of any other support | No other support channels were mentioned or shared. |
| 2: Former and new business processes |
| Information gathering changed | They used to call each school to acquire records and lost a lot of time. Now all of it is centralized and in real-time.  |
| Analysis changed | Management and integration of information is now more efficient and easier to do. They used to work on Excel. |
| Informatician job content changed | Although it is not his job to enter data, sometimes (often) the informatician has to do the work from the teachers because they did not enter the required information.  |
| 3: Industry characteristics |
| Digital leader in its environment | This is the most modern system in the proximities.  |
| Well-connected | The organization and its supports give an international and connected impression with social media channels and groups, and cooperation between centers over multiple continents…  |
| Low support/funding by government | The government does not support or mingle in BSM’s businesses. |
| 4: Trade/Partnering |
| No cooperation with similar projects | Nearby schools are not using BSM (and BSM is most modern) so cooperation is low to non-present. |
| Knowledge of similar systems | The organization does know some projects nearby, but BSM is the most modern. BSM was custom-made and based on another already existing system.  |
| 5: Country/Region specific |
| Gvt. does not value information  | Support from and by the government is low.  |
| Unfavorable political attitudes | Support from and by the politics is low.  |
| Stable power supply | Electricity does not seem to be a problem.  |
| Internet connectivity issues | Connection to the Internet is critical to use the system, though there are often problems with it.  |
| No language barriers | All communication is French. |
| A clear want to advance | This feeling was established with numerous respondents/interviewees.  |
| Illiteracy | Illiteracy was mentioned in the surveys.  |
| Extra (influence on system is questionable) | Less patriotism: a great love for the country, but not at all for the government and its politics and people are not afraid to say so; Many religions; Many ethnicities. |

Future designer’s checklist

*[Please note that the checklist is currently under review – 6/10/19 – and that a new version will be with your shortly.]*

This checklist can be used as a help or guiding tool for anyone who has ambition to design an IS in a developing context.

|  |  |  |
| --- | --- | --- |
| Subject | Requirement | Check |
| A: System quality | The IS is easy to use. |  |
| The IS is secure. |  |
| The IS is reliable. |  |
| The IS provides back-ups in case of information loss. |  |
| B: Information quality | The IS is easily understood with known terminology. |  |
| My SH[[60]](#footnote-60) information needs were determined thoroughly. |  |
| C: Service quality (EXT) | My team has enough expertise for the IS project. |  |
| After-service is available for IS modifications/problems. |  |
| IS introduction and user training are well prepared. |  |
| There is/are evaluation moment(s) scheduled. |  |
| A thorough requirements analysis was conducted. |  |
| The IS implementation time is sufficient for the plans.  |  |
| There are no internal team conflicts that slow us down. |  |
| The IS is not dependent on one person.  |  |
| There is client-team cooperation during the IS creation. |  |
| D: Use | The client and its users have faith in the IS project. |  |
| The IS deployment is done carefully and gradually. |  |
| E: User satisfaction | The client will be satisfied with this IS.  |  |
| F: Net benefits | There will be a productivity increase in the organization. |  |
| G: Perceived usefulness | The client and its users know the IS’s importance. |  |
| Every user is informed of the IS’s goals. |  |
| \*: Locality | The IS project is locally demand-driven. |  |
| The system is made by locals. |  |
| The IS corresponds to the organization’s culture. |  |
| Sufficient cooperation between client and executors. |  |
| H: Social influence | There is support from parent/management. |  |
| There is thrust in the system’s capabilities. |  |
| No concerns that donors will misuse their influence. |  |
| Users want to recommend the IS. |  |
| Favorable champion situation. |  |
| I: Experience (INT) | Sufficient literate/educated/general staff with the client. |  |
| Adequate IS management. |  |
| Adequate change management. |  |

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| Subject | Requirement | Check |
| 1: TIR | Well-thought-out initial design (Database/Architecture). |  |
| Hardware is cared for. |  |
| Well-thought-out whether online or offline system. |  |
| 1b: Complementary resources | Financing is sufficient over time. |  |
| Stable parent organization. |  |
| 2: Former and new business processes | The business processes will change. |  |
| No unfavorable job content creations. |  |
| 3: Industry characteristics | Assess organization and its technology position. |  |
| 4: Trade/Partnering | Screen for existing similar projects. |  |
| 5: Country/Region specifics | Assess whether IS is competing with more basic needs. |  |
| Assess legal uncertainty. |  |
| Assess position of government against the IS project. |  |
| Government funding possibility? |  |
| Assess the political attitudes. |  |
| Assess the stability of power supply. |  |
| Assess the quality of Internet. |  |
| Assess possible language barriers. |  |
| Assess literacy and education level in organization.  |  |
| Assess level of initiative in organization. |  |

Document overview of attachments

In the attachments you will find two folders: within case (for the within case analysis) and cross case (for the cross case analysis). These folders are divided in the following manner and contain the following documents:

|  |
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| WITHIN CASE |
| India | Sources |
| Interviews (English & Dutch) | Surveys (English & Bengali) | Other (English) |
| Preparation | Results | Preparation | Results | AFD closing report 16/17AFD final report 17/18 |
| Consent formInterview guidePresentation | Transcripts | Blanco survey 1Blanco survey 2Bengali survey  | Survey1Survey2 |
| Analysis |
| Interim cases (English) | Other (English) |
| Interim case summary 1Interim case summary 2 | NVivo documentOutliers table |
| Zambia | Sources |
| Interviews (English & Dutch) | Surveys (English) | Other (English) |
| Preparation | Results | Preparation | Results | AFD kiosk application ‘17AFD social business plan‘17AFD may report 17/18 |
| Consent formInterview guidePresentation | Transcripts | Blanco survey 1Blanco survey 2 | Survey1Survey2 |
| Analysis |
| Interim cases (English) | Other (English) |
| Interim case summary 1Interim case summary 2 | NVivo documentOutliers table |
| Benin (Mali) | Sources |
| Interviews (French) | Surveys (French) | Other (French) |
| Preparation | Results | Preparation | Results | BSM ManualBSM respondents list |
| Consent formInterview guidePresentation | Transcripts | Blanco survey 1Blanco survey 2 | Survey1Survey2 |
| Analysis |
| Interim cases (French & English) | Other (English) |
| Interim case summary 1Interim case summary 2 | NVivo documentOutliers table |
| CROSS CASE |
| Sources |
| Question scheme (also see main text)Document overview (also see appendix)Respondents list (also see appendix) |
| Analysis |
| Multi-case table (also see appendix)Explanation table (also see appendix)Similarities Contrast table  |

Documents under anonymity

These documents are sealed for anonymity purposes, but are available on demand:

* India: AFD closing report 16/17
* India: AFD final report 17/18
* India: NVivo document
* India: filled out consent forms
* India: results survey 1 and 2 on paper per respondent (some in Bengali)
* India: audio files interviews (some in Dutch)
* India: feedback from respondents
* Zambia: AFD kiosk application ‘17
* Zambia: AFD social business plan ‘17
* Zambia: AFD May report 17/18
* Zambia: NVivo document
* Zambia: filled out consent forms
* Zambia: results survey 1 and 2 on paper per respondent
* Zambia: audio files interviews (some in Dutch)
* Zambia: feedback from respondents (in Dutch)
* Benin: BSM Manual (French)
* Benin: BSM respondents list (French)
* Benin: NVivo document
* Benin: filled out consent forms (French)
* Benin: results survey 1 and 2 in Excel per respondent (French)
* Benin: audio files interviews (French)

Respondents list

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Country | Function | Level[[61]](#footnote-61) | S1[[62]](#footnote-62) | S2[[63]](#footnote-63) | Int.[[64]](#footnote-64) | Modus operandi | Language |
| India | Computer operator 1 | LL | X |  | X | On site, on paper | English |
| Computer operator 2 | LL | X | X | X | On site, on paper | English |
| Optometry assistant | LL | X | X |  | On paper | Bengali |
| Nurse 1 | LL | X |  |  | On paper | Bengali |
| Nurse 2 | LL | X |  |  | On paper | Bengali |
| Nurse 3 | LL | X |  |  | On paper | Bengali |
| Informatician | LL |  | X |  | On paper | English |
| Advisor | ML | X |  | X | On site, on paper | Dutch, English |
| HR manager | ML |  |  | X | On site, on paper | English |
| Secretary 1 | HL | X |  | X | On site, on paper | English |
| Secretary 2 | HL |  | X |  | On paper | Bengali |
| *Numbers* | 8 | 4 | 5 |  |
| Zambia | Shop worker 1 | LL | X |  | X | On site, on paper | English |
|  | Shop worker 2 | LL | X | X |  | On paper | English |
|  | Committee  | ML | X | X |  | On paper | English |
|  | Management 1 | HL | X |  | X | On site, on paper | Dutch, English |
|  | Management 2 | HL | X |  | X | On site, on paper | Dutch, English |
| *Numbers* | 5 | 2 | 3 |  |
| Benin | Assistant (Mali) | LL | X | X |  | Online | French |
|  | Coordinator 1 | LL | X | X |  | Online | French |
|  | Director 1 | LL | X | X |  | Online | French |
|  | Director 2 | LL | X | X |  | Online | French |
|  | Informatician 1 | ML | X | X | X | Online, video-call | French |
|  | Informatician 2 (Mali) | ML | X | X |  | Online | French |
|  | Coordinator 2 | HL | X |  | X | Online, video-call | French |
| *Numbers (Benin)* | 5 | 4 | 2 |  |
| *Numbers (Mali)* | 2 | 2 | 0 |

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1. IS: Information system [↑](#footnote-ref-1)
2. The ‘North’ refers to developed economies, while the ‘South’ refers to developing economies. [↑](#footnote-ref-2)
3. ICT4D: ICT 4 (for) Development is a similar term for information systems research in developing countries [↑](#footnote-ref-3)
4. Snowballing: reading the papers that the author(s) I am currently reading reference(s) to [↑](#footnote-ref-4)
5. ISDC research: Information Systems in Developing Countries research [↑](#footnote-ref-5)
6. SME: Small and Medium Enterprises [↑](#footnote-ref-6)
7. Intercultural use: the model can withstand translation and can be used outside of its original country [↑](#footnote-ref-7)
8. DeLone & McLean, 2003, Information System Success Model [↑](#footnote-ref-8)
9. Venkatesh & Davis, 2000, Technology Acceptance Model [↑](#footnote-ref-9)
10. Venkatesh et al., 2003, Unified Theory of Acceptance and Use of Technology [↑](#footnote-ref-10)
11. IS: information system [↑](#footnote-ref-11)
12. Melville, Kraemer & Gurbuxani, 2004, Integrative model of Business Value [↑](#footnote-ref-12)
13. Melville, Kraemer & Gurbuxani, 2004, Integrative model of Business Value [↑](#footnote-ref-13)
14. “A replication strategy: A theoretical framework is used to study one case in depth, and then successive cases are examined to see whether the pattern found matches that in previous cases.” (Miles et. al, 2014, p. 103) [↑](#footnote-ref-14)
15. UCOS: Universitair Centrum voor Ontwikkelingssamenwerking (Centre at the university for development cooperation) Basis: KU Leuven University [↑](#footnote-ref-15)
16. NVivo is a known computer program to facilitate qualitative analysis [↑](#footnote-ref-16)
17. LL: Lower level of the organization [↑](#footnote-ref-17)
18. ML: Middle level of the organization [↑](#footnote-ref-18)
19. HL: Higher level of the organization [↑](#footnote-ref-19)
20. Information found in the literature [↑](#footnote-ref-20)
21. Information found in the India case [↑](#footnote-ref-21)
22. Information found in the Zambia case [↑](#footnote-ref-22)
23. Information found in the Benin case [↑](#footnote-ref-23)
24. SH: Stakeholder [↑](#footnote-ref-24)
25. Information found in the literature [↑](#footnote-ref-25)
26. Information found in the India case [↑](#footnote-ref-26)
27. Information found in the Zambia case [↑](#footnote-ref-27)
28. Information found in the Benin case [↑](#footnote-ref-28)
29. Information found in the literature [↑](#footnote-ref-29)
30. Information found in the India case [↑](#footnote-ref-30)
31. Information found in the Zambia case [↑](#footnote-ref-31)
32. Information found in the Benin case [↑](#footnote-ref-32)
33. SH: Stakeholder [↑](#footnote-ref-33)
34. Information found in the literature [↑](#footnote-ref-34)
35. Information found in the India case [↑](#footnote-ref-35)
36. Information found in the Zambia case [↑](#footnote-ref-36)
37. Information found in the Benin case [↑](#footnote-ref-37)
38. BP: Business processes [↑](#footnote-ref-38)
39. IGB: Integrative Model of Business Value [↑](#footnote-ref-39)
40. IS: Information system [↑](#footnote-ref-40)
41. The updated DeLone & McLean model of IS success (DLM) by DeLone & McLean (2003) [↑](#footnote-ref-41)
42. Technology Acceptance Model (TAM) by Venkatesh & Davis (2000) [↑](#footnote-ref-42)
43. Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et. al (2003) [↑](#footnote-ref-43)
44. The Integrated Model of Business value (IGB) by Melville, Kramer & Gurbuxani (2004) [↑](#footnote-ref-44)
45. IS: information system [↑](#footnote-ref-45)
46. Lower level of the organization [↑](#footnote-ref-46)
47. Higher level of the organization [↑](#footnote-ref-47)
48. IS: information system [↑](#footnote-ref-48)
49. Middle level in the organization [↑](#footnote-ref-49)
50. Lower level in the organization [↑](#footnote-ref-50)
51. IS: information system [↑](#footnote-ref-51)
52. Lower level of the organization [↑](#footnote-ref-52)
53. Higher level of the organization [↑](#footnote-ref-53)
54. Middle level of the organization [↑](#footnote-ref-54)
55. Lower level of the organization [↑](#footnote-ref-55)
56. IS: information system [↑](#footnote-ref-56)
57. Higher level of the organization [↑](#footnote-ref-57)
58. HL: higher level of the organization [↑](#footnote-ref-58)
59. LL: lower level of the organization [↑](#footnote-ref-59)
60. SH: Stakeholder [↑](#footnote-ref-60)
61. Level: LL (lower level), ML (middle level), HL (higher level) of the organization [↑](#footnote-ref-61)
62. S1: Survey 1 [↑](#footnote-ref-62)
63. S2: Survey 2 [↑](#footnote-ref-63)
64. Int.: Interview [↑](#footnote-ref-64)