Towards more foundational humanitarian Self-Sovereign Identity systems

A case study on nurturing support for more foundational humanitarian SSI systems in Kenya.

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ABSTRACT

Situation: A large portion of the beneficiaries of humanitarian aid have little to no proof of their identity, this is especially the case in African countries, in which humanitarian intervention is common. In order to facilitate aid to these individuals, humanitarian organizations (HOs) leverage their on-the-ground capacity to create identity profiles and risk assessments of these people. However, in-kind aid is being increasingly replaced by Cash Transfer Programs (CTPs). In CTPs, beneficiaries are provided with funding to self-procure their necessities.

Complication: For efficient CTPs, these humanitarian identities need to be accepted beyond the boundaries of humanitarian aid. However, by relying on traditional identity management systems, HOs expose the beneficiaries to security and function creep risks. In order to share beneficiary identity information in a more responsible way, HOs have started to leverage Self-Sovereign Identity (SSI) systems. These SSI systems need to be scaled up to a more foundational nature in order to facilitate private-sector services. For this a collaboration with national public- and private stakeholders is required. In order to realize that, there is a need for a process design. Which among other things ensures support from crucial stakeholders.

Approach: This study used a Design Science Research inspired approach, combined with a Systems Engineering perspective to explicate the problem, define support driving and constraining circumstances and conditions, generate principles for the humanitarian sector to create support driving circumstances and conditions in Kenya and validate these principles using the input of industry experts. This research approach had a focus of practical insights over theoretical insights.

Results: A set of five validated support nurturing principles were established with which humanitarian organizations can nurture support for a more foundational humanitarian SSI system in Kenya. Additionally, a framework has been composed with which local circumstances and conditions in a country can be assessed.

Next steps: Further research should focus on establishing a more complete process design for a collaboration process, which also deals with participation of stakeholders, structures commitment and defines process rules for different phases of the process. Additionally, further research should explore the capacity and willingness of beneficiaries to control their own identity. And finally, the effect of international innovation initiation on the willingness of national stakeholders should be explored.

Keywords: Self-Sovereign Identity, Design Science Research, Foundational Identity, Financial Inclusion, Social Inclusion, Humanitarian Development.

1. INTRODUCTION

African and Asian regions pose a big challenge for the UN sustainable development goal of providing a legal identity to everyone (UN, 2015). These regions host the majority of 1 billion people that lack the means of official identification (The World Bank, 2018). Under-documentation and complete lack of proof of identity create big obstacles for Humanitarian Organizations (HOs). This is especially a problem for the increasingly popular Cash Transfer Programs (CTPs), which now comprises 15% of global humanitarian aid and is expected to increase further (Stevens,

2018). CTPs, instead of delivering in-kind aid, enable beneficiaries to self-procure their necessities through direct funding. This has several advantages such as significant overhead cost reduction, restoration of dignity, timeliness of providing aid, stimulating the local market, and positively effecting health and reducing poverty (Lee, 2012).

A lack of identity proof among vulnerable people creates several problems for HOs. Firstly, it creates significant parallel targeting and registration costs for every HO (Stevens, 2018), which due to privacy concerns and competition is not shared with other HOs. Secondly, it complicates efficient payment facilitation for CTPs (UNHCR & GSMA, 2019) due to a lack of access to financial services for beneficiaries, such as the in Africa prevalent mobile money services (transactions through SMS texting). This lack of access to increasingly vital services also restricts the ability of beneficiaries to self-procure necessities efficiently and safely. Thirdly, in many countries, it prevents people of concern to get access to in-name (registered to an individual's identity) mobile network services (GSMA, 2017). This obstructs the ability of HOs to distribute life-saving information in the case of disaster or crisis. Finally, in light of the humanitarian-development nexus, a renewed approach of humanitarian aid that acknowledges the dramatic increase in prolonged humanitarian intervention, a new urgency has emerged for better connectivity between humanitarian and development efforts in order to reduce risk, vulnerability, and increase overall resiliency (OCHA, 2017). This broadens the problems of a lack of identity proof for HOs beyond the boundaries of humanitarian aid delivery, as it is limiting the quality of life, dignity, safety and the ability of un(der)documented to re-establish livelihood which eventually often leads to vulnerability, poverty and further pressure on humanitarian aid capacity.

Traditional identity management as a solution for this lack of identity proof falls short due to several reasons. Strauß (2011) describes that the primary focus point of traditional identity management systems has been on unique identification, while privacy is insufficiently designed for in these systems. These systems are prone to security risks and function creep. According to Strauß (2011), the major challenge is to compensate for the imbalanced control over personal information in these systems. Over the years, this fundamental shortcoming of systems with a single point of attack has become increasingly evident, with breaches such as the Equifax breach, leaking personal information of over 143 million people (Gressin, 2017), taking place more frequently. Relying on traditional identity management systems in a humanitarian context is known to create additional risks of government- or third-party coercion and harassment of marginalized populations (LeVan et al., 2018).

In order to facilitate targeting and registration of un(der)documented for humanitarian services such as CTPs, HOs have started to develop blockchain-enabled, user-controlled identity systems, also known as "Self-Sovereign Identity. SSI systems, for which Allen (2016) laid out the academic foundations, allow for a safer, more secure, and more function creep-resistant manner of facilitating identity. Currently, these systems only solve the first discussed problem created by a lack of identity, as they are designed for the functional purpose of humanitarian aid provision. In order to cover the three other identified problems, these systems have to

scale to a more foundational purpose, transcending the boundaries of humanitarian aid and facilitating access to private sector services. This introduces the technology to an existing and unruly identity ecosystem, with significant social complexity. Earlier humanitarian research by Stevens (2018) has explored flexible technical and institutional designs for SSI systems that allow for a more foundational purpose at a later stage and Meyling (2019) has explored the potential of these humanitarian SSI systems to facilitate a more foundational purpose such as financial inclusion. Based on this earlier work, a need for a process design has been established, which allows HOs to involve local public- and private sector stakeholders and prove SSI's advantages when compared to the incumbent systems. This study aims to contribute to such a process design, specifically for the case of Kenya, by focusing on the following question: *"How can humanitarian organizations nurture support for humanitarian SSI systems as a way to facilitate in-name SIM- and Mobile money registration for un(der)documented in Kenya?"*

The study employs a Design Science Research inspired approach and a Systems Engineering perspective to answer this question. In section 2 the methodology of the research is discussed. Subsequently, in section 3 the findings of the study are presented. Then, in section 4 the implications and limitations of the study are discussed. Section 5 concludes by answering the main question. Finally, in section 6 options for further research are discussed.

2. RESEARCH METHODS

The problem situation as described in chapter 1 is a classic example of a technical innovation in a complex socio-technical system. From the point of view of HOs, there is a desired system state (a more foundational humanitarian SSI system) and a gap between that and the current state of the system (functional humanitarian SSI systems). However, this problem is also a wicked problem as it is difficult or impossible to solve due to incomplete knowledge, contradictory and changing requirements, and the complex interplay between related problems. To deal with the embeddedness in a complex socio-technical system, a Systems Engineering perspective will be used throughout the research. Furthermore, to deal with the wickedness of this problem, the study employs a Design Science Research (DSR) approach to structure the different phases of the study. DSR provides flexibility during the research process and allows for changing requirements, making it a suitable method to approach this problem (Johannesson & Perjons, 2014). A DSR project is distinguished from a regular design project by offering relevant results for both local practices, in the form of an artefact, and for the research community. It attempts to solve a specific problem in the local practice by designing an artefact in that specific context and, from that experience, distills prescriptive knowledge that can inform a general solution (Iivari, 2015). This means most of the project remains situated within the context of the local practice and generalization to a global practice occurs in later stages. Whereas regular design projects often only contribute to a local practice (Johannesson & Perjons, 2014).

A research design has been established by applying the structure of DSR. Figure 1 displays this research design, including the flows, inputs and outputs between research steps.

The first step of the research is aimed at explicating the problem. This was accomplished by performing a system analysis. This system analysis, performed using desk research and a literature review, explicates the problem by exploring technical systems, the institutional environment and the stakeholder landscape in the broader Kenyan identity ecosystem. This resulted in an explication of the problem.

The second step is aimed at defining requirements of an artefact that can be used to alleviate or solve the explicated problem. This was done using desk research on Technology Acceptance Factors and by performing semi-structured interviews with six respondents that have a professional affiliation to (humanitarian) SSI initiatives. This resulted in a set of required changes to local support-constraining circumstances and conditions in Kenya.

The third step is aimed at designing an artefact. This was accomplished using semi-structured interviews with the same six respondents. The respondents were challenged to generate possibilities for the humanitarian sector to influence the identified local circumstances and conditions. In this way tacit knowledge was extracted from the respondents, which was combined and aggregated, and finally resulted in an artefact consisting of 5 support nurturing principles.

In DSR traditionally the next step is aimed at demonstrating the value of an artefact. Due to the nature of the process orientated artefact,

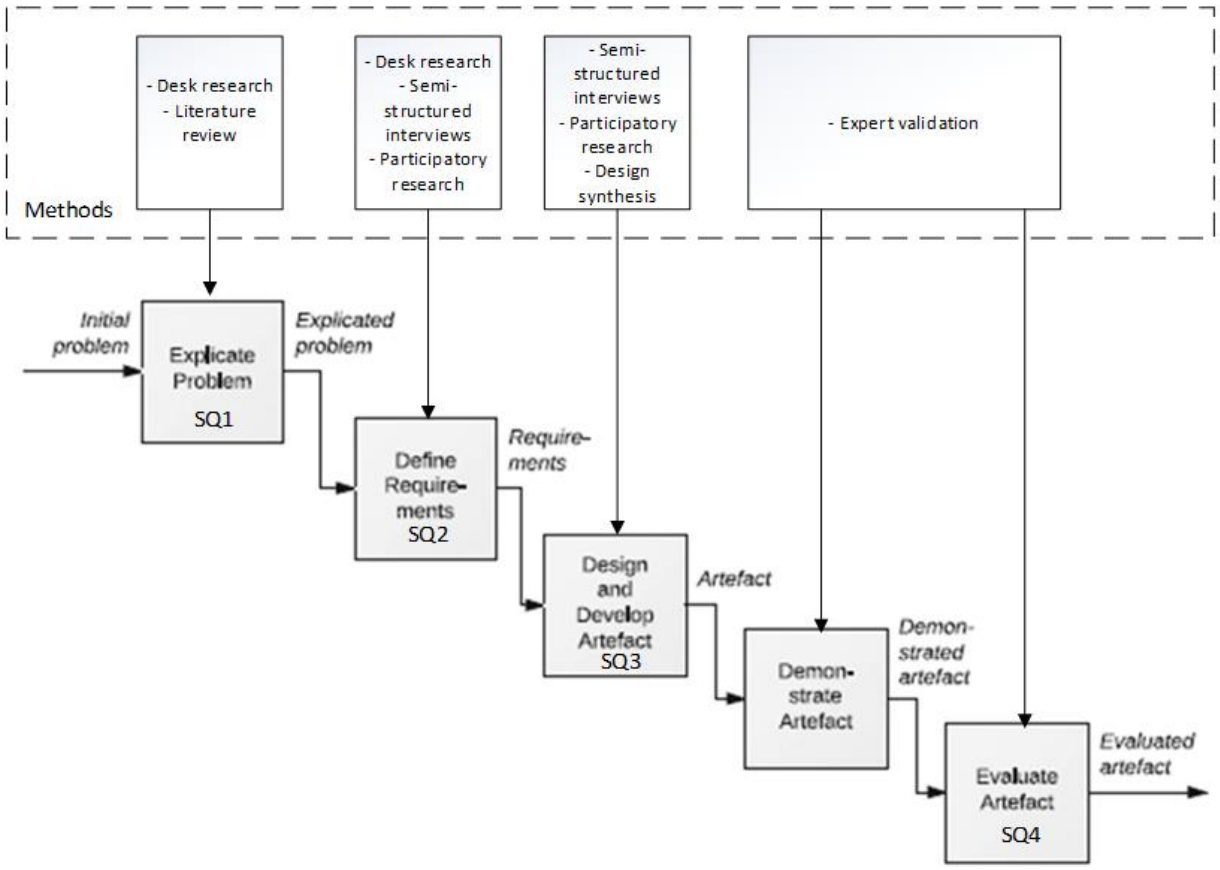


Figure 1: Research Design

and limited time and resources of this study, demonstration of the artefact in a real-world scenario is difficult and was left out of scope. Thus, the fourth step in this study was aimed at evaluating the artefact. This was accomplished through expert validation interviews. Two experts were consulted, one anonymous respondent from a high-profile HO and one respondent from ID2020, a high-profile digital identity public-private partnership. The experts assessed the five support nurturing principles on usefulness, usability and related risks. This led to the refinement of two of the principles, resulting in a set of five validated support nurturing principles as an evaluated artefact.

3. FINDINGS

3.1 System Analysis: Circumstances and conditions in Kenya

The performed system analysis provides a birds-eye-view of the Kenyan identity ecosystem. It describes the socio-technical system in which the proposed humanitarian SSI system would have to be integrated in. Including the established and anticipated systems of identity provision in the country, related institutional context, and an analysis of involved stakeholders.

The system analysis concluded in three lists of bullet points which describe the technical-, institutional- and stakeholder environments of the Kenyan identity ecosystem. These were used as a basis to further shape the requirements and design.

Based on the state and developments within the Kenyan identity ecosystem, and discussions with HO representatives about the engagement with public- and private stakeholders two things were concluded. Firstly, national authorities, financial service providers, and mobile network operators inevitably have to be involved in the scaling towards a more foundational purpose such as SIM and mobile money registration due to their essential resources, responsibilities and blocking power. Secondly, there is currently not enough sense of urgency for these stakeholders to support developments for a humanitarian SSI system.

3.2 Requirements

During the semi-structured interviews, local circumstances and conditions were identified that drive or limit the support for a (humanitarian) SSI system, independently of the Kenya case. These insights were categorized, as displayed in table 1.

Table 1: Categories of local circumstances and conditions assessment framework.

#	Local circumstances and conditions assessment categories:
1	Privacy legislation pressure
2	Information privacy awareness
3	Online accessibility
4	Identity exclusion motive
5	Financial service onboarding obstacles
6	SIM card onboarding obstacles
7	Degree of information and knowledge of SSI
8	Humanitarian involvement in refugee and asylum seeker registration
9	Identity information asymmetry

In order to validate these aspects, they were placed in the theoretical context of Technology Acceptance Modelling (TAM), which conceptual model is displayed in figure 2, as external variables that can influence the “Attitude towards using”. This research assumes that creating support among stakeholders for (humanitarian) SII systems goes hand in hand with establishing a positive attitude towards using a technology or system. Perceived usefulness and

perceived Ease of Use are however not the only options to increase the attitude toward using. TAM research on the acceptance of similar technologies, such as Privacy Enhancing Technologies and privacy-preserving online authentication technologies has been performed by Gu, Lee, & Suh (2009), Benenson et al. (2014), Harbach, Fahl, Rieger, & Smith (2013). This adds aspects such as trust, understanding of the technology, regulatory support, and perception of control to the list of things that can impact the attitude towards using. The Support driving or constraining circumstances and conditions as displayed in table 1 were all linked to one or more of these identified TAM aspects, and can therefore be seen as suitable external variables.

By establishing scales of suitability for each category, an assessment framework was composed that can be used to assess the suitability of local circumstances and conditions in a country, this framework is displayed in Appendix A.

By applying this framework to the state of the Kenyan identity ecosystem, as explored by the System Analysis, several circumstances and conditions in Kenya were found to be unfavorable for the emergence of support for a humanitarian SSI system.

In order to allow for more support for the proposed system the following things were found to be required:

Firstly, Privacy legislation pressure in the country needs to be driven up. Secondly, Information privacy awareness in the country needs to be improved. Thirdly, intentional identity exclusion needs to be discouraged. Fourthly, onboarding obstacles for both SIM and financial services need to be alleviated. Fifthly, the degree of information and knowledge of SSI needs to be improved. Sixthly, scaling up the humanitarian involvement in refugee and asylum seeker registration would be favorable.

3.3 Support nurturing principles

During the semi-structured interviews, the respondents were challenged to identify options for the humanitarian sector to create more favorable circumstances and conditions in order to allow for support to emerge. These ideas were aggregated and combined into five support nurturing principles.

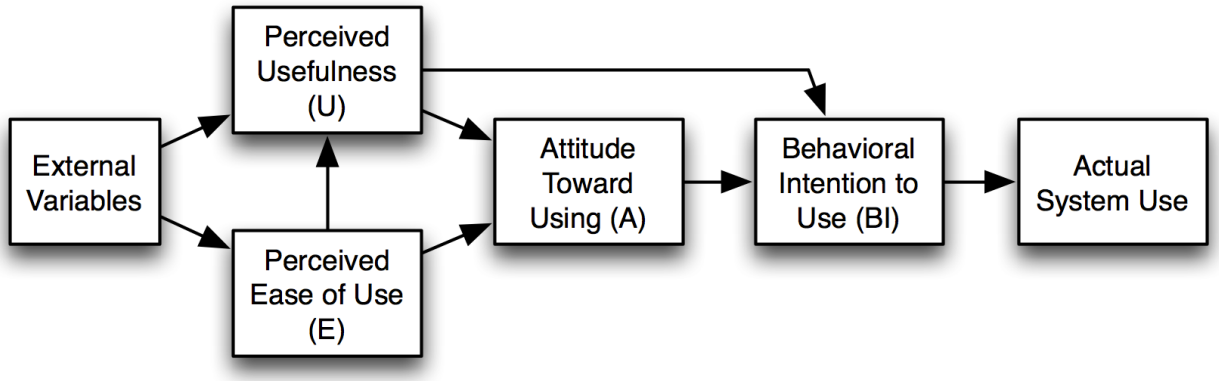


Figure 2: Technology Acceptance Model by Davis, Bagozzi, & Warshaw (1989)

Principle #1: Advocate for flexible KYC and financial/social inclusion of un(der)documented.

Multiple respondents identified that strict onboarding restrictions for private service providers and intentional identity exclusion form major obstacles for support in the country. Several respondents describe that HOs are a complementary unit to the government and they have the ability to lobby for things. From what we have already seen in functional humanitarian SSI systems, there is room for HOs to advocate for more flexible KYC regulations. For example, several SSI pilots have managed to get limited functionality and temporary access to SIM cards for beneficiaries. Under the current circumstances in Kenya, HOs must focus on lobbying for flexible KYC and (limited) inclusion specifically for the purpose of humanitarian aid services in order to nurture support for a more foundational purpose.

Principle #2: Create intrinsic motivation by stimulating privacy.

During the interviews with the respondents, it became evident that extrinsic motivation for more private identity solutions, such as SSI, is most likely not enough for public sector stakeholders in Kenya to support SSI over traditional centralized identity systems. In some way or another, intrinsic motivation for more private solutions has to be created in the country. In the current circumstances and conditions, privacy issues are not fully established on the national, political, and organizational agendas. Respondents agree that there needs to be a change in thinking to drive up the information privacy awareness and privacy legislation pressure in Kenya and they feel like HOs can play a role in this through lobbying. However, respondents also see a role for national civil society organizations (CSOs) in this. CSOs, while limited in technical capabilities are capable of influencing the political agenda in the democratic Kenya. Their nationally established CSO networks can also be leveraged for this purpose. HOs should involve these CSOs in the process and complement them with technical know-how and information. The same goes for unelected-parties.

Principle #3: Protect core values by sticking to mandates in humanitarian demonstration.

During the semi-structured interviews, most of the respondents indicated the necessity for proofs of concept or demonstration of SSI as a technological solution to improve trust, available information and knowledge with SSI technology. This is best done by allowing for direct experience with the technology, however perception of loss of control should be avoided, especially when it concerns mandated responsibilities. By sticking to use-cases at least adjacent to aid services in humanitarian demonstration of SSI, core values of both HOs and the government can be protected. HOs keep operating within their mandate of providing lifesaving assistance and the governments' mandate of legal identity provision is not directly put under pressure. In order to do this, HOs can demonstrate by further scaling the functional SSI systems, which focus on targeting and registration for humanitarian services. This is especially valuable when they can proof that a big group of undocumented nationals can be reached with the proposed system. As this would partially disarm the disincentive of intentional identity exclusion. A second way to demonstrate is by developing SSI solutions for lateral services, such as the distributing and managing of (humanitarian) educational credentials. This is a low barrier-to-entry SSI

system, which creates less friction with humanitarian and government mandates.

Principle #4: Broaden the agenda to leverage interest of the private sector.
Several respondents have identified possibilities to extend the functionality of a humanitarian SSI system in order to provide more usefulness, especially for private sector stakeholders. Putting this on the agenda doesn't necessarily mean HOs have to develop it. They can outsource it to partnering organizations.

Certainly, the entanglement of public- and private sector interests in the country and the close engagement between public- and private stakeholders in the Kenya could allow for significant pressure on- and interest for public sector stakeholders when stakes get high enough for the private sector.

During the interviews, it became clear that due to the open and interoperable nature of SSI systems, there are plenty of opportunities to expand on the commercial interest for the private sector. This can for example be done through adding direct commercial interest, by broadening the agenda to an SSI use-case of remote KYC eligibility sharing. This would allow FSPs and MNOs in the country to share the cost of customer due diligence across the whole ecosystem. Or this can be done through additional alleviation of onboarding obstacles by extending current humanitarian SSI systems with the capability to log transaction history of beneficiaries, which they build up during the period of a CTP, in a verifiable way.

Principle #5: Delay government commitment by initiating network effect through identity provision mandated stakeholders.
With the high barrier to getting identity, the strict KYC regulations, and the seemingly low sense of urgency due to questionable identity exclusion motives in Kenya, acceptance and support among national authorities can take a substantial amount of time to develop. The respondents do however express the need for a network effect to take control. For this, many users need to be onboarded on to SSI systems. However, the respondents describe that without a fitting mandate, it is hard to implement these systems, let alone establish a significant userbase. Several respondents introduce the idea of relying upon the mandate of stakeholders that are already mandated for a form of identity provision. In Kenya the most logical fit for this would be the integration of the UNHCR refugee and asylum seeker credential. By integrating the UNHCR certificate, commitment of the government to accept a new form of identity can be delayed, while demonstration and proving of the technology through a network effect can be realized. This can also be done by establishing a network effect in neighboring countries. This would especially be interesting in countries where the UNHCR certificate is already accepted for access to private services, which is the case in for example Cameroon and Egypt.

3.4 Evaluated principles

During the validation interviews with two industry experts the five process principles were assessed based on usefulness, usability by the humanitarian sector, and related risks. Based on the input of the experts, refinements were made to two of the support nurturing

principles. The two refinements that have been implemented are described as follows.

Firstly, with regard to the first support nurturing principle, the two experts emphasized that less strict KYC regulations should not be the goal of humanitarian advocacy. Flexible KYC should only be a temporary solution for humanitarian aid delivery. Focusing too much on this would stimulate less rigorous systems. Instead the emphasis of this process principle should be on further defining KYC regulations. This means HOs should engage with the Kenyan government to establish how the current regulations can be met with novel

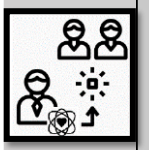
	Humanitarian support nurturing approach			
	#	**Process principle**	**Implications**	**Risks**
	**1***	**Advocate for further defining of KYC, flexible KYC and financial/social inclusion of un(der)documented***	• Allow for existing **onboarding obstacles** to be met by innovative solutions. • Allow for further KYC exemptions for humanitarian purposes, enabling further demonstration oppertunities. • Discourage intentional exclusion and thus improves the **identity exclusion motive** in the country.	• Changing regulation does require long term commitment. • Flexibility in KYC could lead to encouraging a less rigorous system.
	**2**	**Create intrinsic motivation by stimulating privacy**	• Stimulate **information privacy awareness** and **digital literacy**. • Stimulate **privacy legislation pressure**. • Increase intrinsic economic and societal value of privacy and private systems.	• Stimulating privacy is a long term process. • Privacy is a complex and quickly evolving topic. A lack of continuous due dilligence from involved HOs can do more harm then good.
	**3**	**Protect core-values by sticking to mandates in humanitarian demonstration**	• Allows for a proof of value/concept with minimal political obstacles. • Creates exposure of the technology to public- and private sector stakeholders, more direct exposure is possible through lateral services. • Increases **information and understanding of SSI**. • Increase **information privacy awareness** and further increases **online accessibility** factors such as **digital literacy** among beneficiaries in practice. • Can potentially emphasize value of rectifying unintenional exclusion, disarming intentional **identity exclusion motives**.	• Overinflating the value in terms of inclusion potentioal of SSI. • Function creep and unintenional exclusion when scaling to lateral services. • Risk of losing innovation budget.
	**4**	**Broaden the agenda to leverage interest of the private sector**	• Alleviates **onboarding obstacles** by enriching identities with private sector data. • Can create direct commercial incentives, by including SSI use-cases such as KYC sharing. • Creates **exposure of SSI technology** to private sector stakeholders. • Increased private sector interest creates pressure on government stakeholders on a national level.	• Due to differences in core values between HOs and the private sector, friction can arise between neutrality and commercial interest. • There is a risk of correlatability of data when extending functionality.
	**5***	**Delay government commitment by initiating network effects abroad***	• Expand through the way of minimal political resistance. • Allows for proof of value/concept, increasing **degree of information and knowledge of SSI**.	• Missing out on government capacity and expertise.

Figure 3: Evaluated artefact. (refined after expert validation, imlpications on requirements in bold.)*

technologies and identity types. This has resulted in a new formulation of the first process principle: “Advocate for further defining of KYC, flexible KYC and financial/social inclusion of un(der)documented.”

Secondly, with regard to the fifth support nurturing principle, it became clear that establishing a network effect in Kenya by relying on identity provision mandated stakeholders, especially in the area of refugees and asylum seekers, is not as promising as initially seemed to be the case. Changing the way in which identity or registration information is delivered will most likely not change the stance of the Kenyan government on service access. Especially not in the case of refugees and asylum seekers, as it is in the interest of the government to deliver a message of temporality. Establishing network effects abroad however, was positively assessed. This has resulted in a new formulation of the fifth process principle: “Delay government commitment by initiating network effects abroad.”

The other three principles were positively assessed by the experts. Together these five support nurturing principles, as an evaluated artefact, form the final result of this study. An overview of this final artefact, together with identified risks can be found in figure 3.

4. DISCUSSION

This study indicates that currently humanitarian SSI initiatives are mostly driven by international organizations. Up until now these systems have remained functional in purpose, somewhat limiting the social complexity that has to be dealt with. Scaling up these systems to a more foundational purpose however, does add significantly more social complexity. According to this study, HOs should anticipate on the fact that national stakeholders such as national authorities and private- sector stakeholders operate in a different context when compared to the international stakeholders. Due to the insurmountable dependency on these national stakeholders, be it due to significant blocking power or due to required resources, it is key to create significant interest and sense of urgency for these stakeholders. To establish a more foundational purpose of humanitarian SSI systems in these countries, which inherently needs to be more permanent and sustainable, it is key to create intrinsic motivation for national stakeholders. The most logical way to do this, according to this study, is to create the right circumstances and conditions in the country, which allow for support to emerge.

The research continues in line with earlier humanitarian research by Stevens (2018) and Meyling (2019) by exploring the possibilities for (humanitarian) SSI systems to create inclusion. It contributes to this by combining the knowledge of several industry experts. In this way, it provides novel insights in some important circumstances and conditions in a country that can drive or inhibit the acceptance of inclusion focused SSI systems. Furthermore, the research shows how some of the challenges resulting from the widespread and diverse identity stakeholder landscape can be harnessed using support nurturing principles.

This research also contributes on a societal level in several ways. Firstly, it contributes directly to humanitarian SSI initiatives. The research provides a first exploration, from a process perspective, in the further scaling of humanitarian SSI systems in Kenya.

Integrating the five identified support nurturing principles into a more complete process design has the potential to increase the chance of succeeding in advance, by shaping circumstances and conditions so that support among crucial public- and private sector stakeholders is more likely. Furthermore, this research contributes to society by laying the foundations for an easier pathway from functional to foundational SSI systems, potentially allowing for more inclusion in countries tormented by identity exclusion.

While this study does focus on an important process challenge for scaling up humanitarian SSI systems, it is by no means a complete process design. The need for a more complete process design which was expressed in chapter 1 is still there. In addition to that, the approach that this study has used relied heavily on practical insights instead of theoretical insights. While this does ensure the artefact remains relatable within its area of use, it also limits design generation and requirements to a certain bias of a relatively small group of respondents. Also, due to the lack of a demonstration step in the research, the value of the artefact still needs to be proven in a real world setting and currently only relies on the assessment by industry experts. Finally, this research does not make distinction to what extent support is required or to what extent specific principles create support, as this is rather difficult to quantify.

5. CONCLUSION

This research has performed a design science research inspired cycle resulting in five support nurturing process principles. These principles were identified during the study and were found to be useful for the humanitarian sector to nurture more support for the in-name SIM and mobile money registration of un(der)documented through humanitarian SSI systems in Kenya. It does this by creating more favorable circumstances and conditions in the country.

Furthermore, the research provides a framework which HOs can expand on to assess the circumstances and conditions in other countries. It does this by looking at several identified required circumstances and conditions. Using this, HOs can assess if certain countries are fruitful for a humanitarian SSI system or it can act as the basis for strategizing to make the environment more favorable for a humanitarian SSI system. During validation by the two experts it became clear that ‘local trust in humanitarian institutions’ needs to be added to this framework as an assessment aspect to make it more usable for countries other than Kenya.

Finally, during the research it became evident that the support of a humanitarian SSI system for social and financial inclusion goes hand in hand with a political issue: The extent to which governments want to include un(der)documented people in the first place. This is a technological agnostic issue but does play an important part in the nurturing of support. Other findings include that refugees and asylum seeker registration, while at first glance seem to pose an excellent use-case to demonstrate the proposed system with, is unfit for this purpose due to the message of temporality that host countries want to emphasize to these people. Finally, humanitarian SSI initiatives should find ways to create intrinsic motivation for stakeholders on a national level to use SSI and for identity inclusion in general.

6. FURTHER RESEARCH

This research only provides principles to nurture more support among public- and private sector stakeholders. However, that is just one of the process challenges for a more foundational humanitarian SSI. Further research should focus on exploring a more complete process design, taking into account an appropriate collaboration structure which manages participation of stakeholders, structures commitment and defines process rules for different phases of the process.

Further research should also explore the willingness and capability of un(der)documented people in Kenya to actually control their own identity. This research did not fully explore the digital literacy level in Kenya, it only established that the use of and experience with mobile phones in the country is relatively high. This does not necessarily mean that these people have sufficient capacity to grasp what it means to control their own identity.

Finally, it became clear in this research that more foundational identity is quite a sensitive subject for national governments. Complementary systems, in particular SSI, can be perceived as a threat of giving up control to foreign powers by national governments. To support a more complete process design, it would be interesting to explore if countries would be more open to humanitarian SSI initiatives when engagement is initiated and led by national HOs.

REFERENCES

Allen, C. (2016). The path to self-sovereign identity. *Life with Alacrity*.

Benenson, Z., Girard, A., Krontiris, I., Liagkou, V., Rannenberg, K., & Stamatiou, Y. (2014). User acceptance of privacy-ABCs: an exploratory study. *International Conference on Human Aspects of Information Security, Privacy, and Trust*, 375–386. Springer.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Gressin, S. (2017). The equifax data breach: What to do. *Federal Trade Commission*, *8*.

GSMA. (2017). *Refugees and Identity: Considerations for mobile-enabled registration and aid delivery*.

Gu, J.-C., Lee, S.-C., & Suh, Y.-H. (2009). Determinants of behavioral intention to mobile banking. *Expert Systems with Applications*, *36*(9), 11605–11616.

Harbach, M., Fahl, S., Rieger, M., & Smith, M. (2013). On the acceptance of privacy-preserving authentication technology: the curious case of national identity cards. *International Symposium on Privacy Enhancing Technologies Symposium*, 245–264. Springer.

Johannesson, P., & Perjons, E. (2014). *An introduction to design science*. Springer.

Lee, J. (2012). *Cash Transfers in Emergencies*.

LeVan, A. C., Hassan, I., Isumonah, V., Kwaja, C., Momale, S., Nwankwor, C., & Okenyodo, K. (2018). *Study on Marginalized Groups in the Context of ID in Nigeria*.

Meyling, J. (2019). *A Self-Sovereign Identity for financially inclusive Cash-based Assistance*. Maastricht Graduate School of Governance.

OCHA. (2017). *The new way of working*.

Stevens, L. (2018). *Self-Sovereign Identities for Scaling Up Cash Transfer Projects: Designing a blockchain based digital identity system*.

Strauß, S. (2011). The Limits of Control -- (Governmental) Identity Management from a Privacy Perspective. In S. Fischer-Hübner, P. Duquenoy, M. Hansen, R. Leenes, & G. Zhang (Eds.), *Privacy and Identity Management for Life* (pp. 206–218). Berlin, Heidelberg: Springer Berlin Heidelberg.

The World Bank. (2018). ID4D Data: Global Identification Challenge by the Numbers. Retrieved from http://id4d.worldbank.org/global-dataset

UN. (2015). Sustainability development goals. Retrieved November 26, 2019, from https://www.un.org/sustainabledevelopment/sustainable-development-goals/

UNHCR, & GSMA. (2019). *DISPLACED & DISCONNECTED*.

Appendix A: Local circumstances and conditions assessment framework

Suitability: / Local Circumstance / condition:	Unfavorable:	Moderately unfavorable:	Moderately favorable:	Favorable:
Privacy Legislation pressure	No Data protection legislation.	Consent focused data protection legislation which stimulates hedging against data breaches and data misconduct.	Legislation enforcing private sector data handling accountability which stimulates data responsibility offloading.	Legislation enforcing public and private sector data handling accountability which stimulates data responsibility offloading.
Information Privacy Awareness	Unaware of the elements* related to information privacy	Knowledge of the elements* related to information privacy.	Understanding that elements* related to information privacy exist in the current environment.	Projection what impact elements* related to information privacy have in the future.
Online accessability	Low mobile network coverage, low mobile phone penetration, insufficient access points in rural areas and low digital literacy.	Average / High mobile network coverage, low mobile phone penetration, some central access service points in rural areas and low digital literacy.	High mobile network coverage, average mobile phone penetration, wide spread central access service points in rural areas and some digital literacy.	Full mobile network coverage, high mobile phone penetration also in rural areas,wide spread central access service points and high digital literacy.
Identity exclusion motive	Mainly intentional exclusion.	Mixed intentional/ unintentional exclusion.	Exclusion mainly unintentional due to a burden of proof or cost for individuals.	Exclusion mainly unintentional due to lack of government registration capacity or voluntary exclusion due to privacy / security concerns.
Financial service onboarding obstacles	strict KYC restrictions.	KYC restrictions & limited remote registration.	KYC restrictions, limited remote registration & limited access to high risk areas.	Loose KYC restrictions, limited remote registration & limited access to high risk areas.
SIM card onboarding obstacles	strict KYC restrictions.	KYC restrictions & limited remote registration.	KYC restrictions, limited remote registration & limited access to high risk areas.	Loose KYC restrictions, limited remote registration & limited access to high risk areas.
Degree of information and knowledge of SSI	No understanding of SSI technology or value proposition. Not much available information.	Some knowledge and information on SSI value proposition, low technical understanding. No exposure and experience with the technology.	Sufficient understanding of SSI technology and value proposition. Low exposure to the technology.	Broad spread understanding of SSI value proposition and technical understanding. Exposure / experience with the technology.
Humanitarian involvement in Refugee and Asylum seeker registration process	Host Government-Led registration	Joint-Led, Parallel HO registration	Joint-Led	Humanitarian Agency-Led
Identity information asymmetry	Identity information symmetry between stakeholders	Low identity information assymetry between stakeholders	High Identity Information assymetry between stakeholders	High Identity Information assymetry between stakeholders. Especially with HOs.