

# Platform-Driven Ecosystem Prefacing for Emerging Markets in Developing Countries

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**Abstract.** Developing countries take frog leaps in technological advance. For example, moving to 4G communications from scratch. This reveals tremendous opportunities as infrastructure for advanced service delivery is suddenly in place. As the technological advancement is so disruptive, a lot of prefacing needs to be carried out prior to an ecosystems' emergence. This article presents an experience report on ecosystem prefacing for emerging developing country markets. We provide an analysis of the Tanzanian working environment; noting aspects that are present for a developing country, unique to the distinct culture, and similar to industrial countries. We then apply an ecosystem prefacing process that actively finds challenges and solutions for a fixed application context whilst acknowledging the previous aspects. For this experience report, we gather empirical data by executing the process in two-phase innovation workshop and stakeholder co-operation event where the fixed application context consists from SmartCity concept based on a major ICT vendor.

**Key words:** innovation in developing countries, stakeholder involvement in innovation, software ecosystem

## 1 Introduction

Developing countries digitize at an unprecedented speed, skipping many conventional technologies, and for example moving directly to 4G mobile communications from scratch [1]. This infrastructure enables delivery of a massive amount of digital or pseudo-digital services (i.e. non-digital service production has a digital facade e.g. reserving a barber with an online booking form, but the form

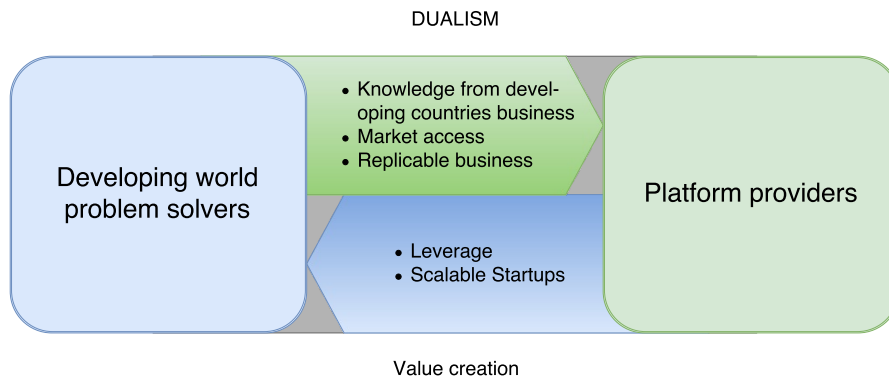
is still manually processed). However, service delivery in the digital age is also dependent on the service delivery and refinement chain. This chain is responsible for transferring the fundamental digital capability of the infrastructure into a sophisticated service; ready for end user consumption.

The digital communications service provider, the platform provider, and the platform-based or independent end-user service producer are major links identifiable from the aforementioned digital service chain [2]. The digital communications service provider is generally a locally based maintainer and operator of the physical communications equipment; responsible for delivery of digital communications capabilities. This capacity may be refinement by a platform provider. The platform offers, often several tiers more sophisticated, services delivery channel on top of the elementary digital network. We may use Google's Google Play as an example of such a platform. Google Play allows distribution of apps which are applications that use the Google platform (e.g., Android phones, Google Maps geospatial data and so forth) to build end-user services on top of [3]. Alternatively, a software producer may opt to develop a service immediately on top of the digital communication infrastructure; independent from digital platforms.

For many contexts, the last scenario is the only method for producing solutions (e.g. digitalization of context-specific business processes). Looking at the most versatile way to take full advantage of the widespread digital communications network, it is, arguably, much more efficient and thus lucrative to produce solutions on top of platforms [2]. Platforms offer distribution and advertisement networks (e.g. through application portals), they make development more efficient by simplifying and abstracting target hardware (e.g. Android framework allows developed application to be executed on mobile phones, tablets and smart TVs), and they provide several data repositories on top of which services may be introduced (e.g. geospatial and social networking data).

Another, arguably more important, aspect involving the digital platforms is that they have a crucial role in facilitating the emergence of (software?) business ecosystems [4, 5, c.f.]. As the platforms acts as an enabler, as per the previous paragraph, the platforms have an ability of steering like minded developers together in limiting the solution context and providing a common development infrastructure for this limited area. These contexts are prime areas for innovation emergence as joining members with initial ideas may take cues from the platform provider, the more mature projects exploiting the platform, and the more advanced developers working on technologies associated to the platform, and by using this support the ecosystem provides, to upgrade their initial idea into an innovative service or product [6, 7].

A clear prerequisite for a platform-driven business ecosystem emergence is a welcoming environment: there are clearly distinguished needs—which fit a context limited by the platform—and capability to address them. This capability is mainly concerned with sourcing developers that are capable of understanding and solving the needs, but reaches to for example political willingness of local governments to support introduction of the service solutions for use.



**Fig. 1.** Value creation dualism between developing world problem solvers and platform providers working in emerging markets

In the remainder of this article, we discuss our motivation for creating platform-driven business ecosystems for emerging markets in developing countries. Further, the aim of the article is to build an emergence prefacing process for these ecosystems, and to apply it in a case-study fashion. The objective hence translates into designing a practical way to probe how welcoming the environment is for new ecosystems. Section 2 describes our motivation, the foreseeable value added for both single solution developers and platform providers working in emerging markets while Section 3 goes over selected previous work on topics related to this. Section 4 introduces our ecosystem prefacing process, and the process is then applied in Section 5. A discussion, highlighting lessons learned and future endeavours, is provided as the last section, Section 6.

## 2 Motivation

To motivate our work, we want to discuss the many potential benefits coming from a digital business ecosystem in the context of developing countries and their emerging markets. We have captured the most notable benefits in Figure 1. The figure presents a dualistic value creation proposal between the digital platform provider and the single solution developer discussed for the service refinement chain (c.f. Section 1), but the contents, the value creation proposals, are adjusted to highlight the special context of working in emerging markets for developing countries. Regarding financial feasibility for the actors, the single solution developers will see the low-cost of market entry while the platform

providers should find access to context knowledge—in return for hosting and marketing services—lucrative. The aim of the later parts of the article is to build an ecosystem emergence prefacing process. This process intends to understand if the dualistic value creation is capable of creating and sustaining an ecosystem. But first, let us go through the dualistic value proposals in more detail.

Starting with the leverage and scalable startups which are value proposals coming from the platform providers and are targeting the developing world problem solvers (i.e. single solution developers; more on this naming later). Leverage has two meanings here. First, platform providers have the ability of providing leverage by facilitating development. In developing countries, access to various technical equipment can be scarce. The platform provider generally has resources to organize joint development facilities or, at least, to organize hackathon or other similar-typed short events for initial solution development. The second meaning of leveraging here revolves around the platform providers being able to act as a support for advancing the platform-based solution for institutional adoption. Several developer struggle, especially in developing countries, to demonstrate adequate maintenance and sustenance levels which are required for example for municipal or nation wide use of particular solutions. This "sustenance-image" of the solution also aids in propping single user confidence and thus will to adopt the solution.

Scalable startups applies to all markets as a value proposition, not just emerging markets in developing countries. What this means is that for a mature platform there exists exemplar scenarios for how a startup maybe scaled together with increasing adoption of the service. In addition to this business advice and mentoring, the platform itself will be easily capable of addressing the increased demand for example for computation power and data bandwidth; if not, then the platform provider will advance the issue with for example digital communications providers to increase capacity of the network.

Moving to developing world problem solvers, we have renamed the single solution developers here to highlight that, in the context of emerging markets for developing countries, this group provides unique access to the challenges, solutions, and intrinsic context knowledge related to the market. Noting that all major platform providers are based in industrialized countries, the aforementioned perspective is extremely valuable for them. Thus, we note that the developing world problem solvers can make at least the value propositions about knowledge from developing countries business, market access, and replicable business. In practice the problem solvers will produce this information by proposing solutions on top of the platform.

Starting with knowledge from developing countries business, if the platform providers are successful in engaging single solution developers who genuinely represent the local context, the platform providers may expect two learn two things. First, the solutions introduced on top of the platform highlight the challenges relevant to that context. Second, the business data generated by the single solution developers working on these challenges will allow the platform providers to understand how business is conducted in these markets.

The market access value proposal follows from the previous. Firstly, the developed single solutions provide a route for the platform providers to access the market as a solution provider themselves. They may either opt to invest or to fully acquire upcoming solution businesses or they may use the business data gathered from them to adapt similar, already proven successful, solutions from other markets to this market. An example of the former being Google's acquisition of Quickoffice which is now a major part of Google Docs. Examples of the latter are obviously less reputable, but we may look for example at the design of the Weibo and QQ social media applications in China, and we may argue for how heavily they are influenced by their western counterparts.

The business data gathered by the platform provider allows a further chance for market access to be exploited by way of sharing this data. The platform provider may act as a consultant for entering the emerging market, providing other businesses with valuable data about the context's challenges and solutions coupled with information about running the platform on top of the context-specific infrastructure.

Lastly, developing world problem solvers give a value proposal in the way of replicable business. Acting either alone or together with the original single solution developer, the platform provider may start to look for similar contexts, probe for the challenges existence in this context, and then advance the solutions adoption in this market.

Reviewing the aforesaid value proposals, we see that there is, arguably, a rather direct dualism between the value proposed by and for both parties.

### 3 Related Work

To provide an academic backdrop, we will visit selected related works on ecosystems, their emergence, the role of innovations, ecosystems assessment, and some foreseen general benefits attainable from working ecosystems. Additionally we will also discuss the developing countries component in relation to all previous; highlighting the potential development impact from previous works.

*Ecosystem Emergence* Cusumano [2] discusses the platform ecosystem. The argument here is that an ecosystem is built upon a software platform. That is to say, the platform provides the fundamental basis for all actors operating in this ecosystem. What this definition allows is that multiple ecosystem may reside on top of a single platform. Basole and Karla [8] discuss the emergence and evolution of platform ecosystems. They note that the ability of the platform provider to offer solutions for many of the common business requirements (e.g., goods delivery and payment processing), and to do so with a prefixed solution that may be scaled to all single solution developers of the platform have largely attributed to the pick-up and rapid growth of the platforms.

Adner and Kapoor [9] argue that another major contributor to the ecosystem's emergence is how welcoming the technological context is. When an ecosystem, which bases on new technological innovations, emerges it generally substi-

tutes old, existing, technology. Here emergence challenge is described as the possible bottlenecks of the supporting system that disallow the new technology from realizing its full potential. Similarly, they argue that the ecosystem extension opportunity—the ability of the raising ecosystem to enhance value generation for the old technologies—should also be considered.

*Ecosystem Value Generation Chains* Regarding value chains and their ability to generate additional value in ecosystems, Coursaris et al. [10] note the wide range of participants and activities that can be considered; listing the previous in the context of mobile technologies. They build a business-centric model of mobile interactions, arguing that in order to find all possible optimizations for current processes, we must first model the existing ones. Contrasting to this model, we may then opt to support or replace particular activities with mobile solutions. An example of primary activity is the visibility of materials and resources available to organization. Increased visibility may for example be linked to enhanced tracking of delivery deadlines. Provided example from a secondary activity included human resources management, and in this the automation of administrative tasks by way of understanding which digital solutions (e.g. easily accessible and pre-filled forms) could be provided.

*Ecosystem Sustainance* Regarding the platforms and their providers, several additional factors have been observed in the literature; adding to or redacting from the value generation chain. Allon et al. [11] discuss the role of the (platform) moderating firm. They note based on their modelling that the market outcomes are critically dependent on the moderator's involvement. Notably, they have a heavy influence in matching a properly established consumer prizes and demands emerge in unison. The moderator should understand if the marketplace (possibly running on the technology platform) is one that hosts a buyer's or a seller's market; operational efficiency tooling being emphasized for the former while agent communication is discussed for the latter to maximize revenue.

Another notable role is observed by van Angeren et al. [12] for the platform provider. Their analysis of the Google Apps store showcases that there is very sparse connectivity between single solutions; they do not share data amongst others to improve offered solutions. Rather, the platform provider's data sources are strongly linked to the value generation which emphasizes the role of the provider as an enabler. Arguably, another reason for why ecosystem emergence can be attributed to be, at least partially, dependent on the platform provider and its capabilities.

*Developing Countries* The setting for technological advancement is challenging in developing countries. Vivarelli [13] notes in his meta-analysis that developing countries generally struggle with internal research and development; showing as both scarce company internal R&D as well as low public funding commitment in R&D activities. On the other hand, Perkins & Neumayer [14] note that many developing countries who catch up technology-wise by leapfrogging several technologies are able to enjoy efficiency benefits as no intermittent infrastructure



**Fig. 2.** Ecosystem prefacing process

investments are done [15]. Partially relating, Vivarelli [13] states that developing countries often resort to importing technologies due to lesser internal investment caused by low R&D. In these cases, large technology vendors come into play with enabling technologies, like the platforms providers we discuss in this article.

Finally, regarding ecosystems in the context of developing countries, Taniskanen et al. [16] discuss their potential development impact. Conducting their research in the context of mobile application vendors they note that while less dominant than middle income economies, there are active mobile application producers also in low income countries located in central Africa. The very affordable market entry prize associated with Google's Android platform and accompanying hardware is noted as a feature attributing to the producers' market uptake (also noted in [17]). While the locally provided solutions do not differ drastically from other contexts, the authors argue a notable development impact for them to come from the solutions' ability to pass certain industrialization related problems with post-industrializing.

## 4 Ecosystem Prefacing Process

Our three-stage ecosystem prefacing process is captured in Figure 2. The three stages consist from fixing the platform provider, finding innovations and solutions in a context that is sensitive to the platform and the working environment, and finally distilling challenges to use as a tool to assess feasibility for an ecosystem emergence. This process takes from the emerging market strategies presented in for example [18, 19] as well as innovation and market uptake practices discussed in [20, 21]. To the best of the authors' knowledge, no prior processes—closer to

the aforesaid ones—exist for probing ecosystem feasibility in developing country settings. The following describes these stages in more detail.

Our ecosystem prefacing process is started with the select platform stage (c.f. Fig. 2). With this stage, we argue that to initialize the ecosystem prefacing, we need to be able to fix the platform provider prior to any further ecosystem-supporting-actions are taken in the emerging market. Demanding the existence of a platform provider at this early stage relates to the various supporting functions we have described for the platform provider to have on to the single solution developer (c.f. Section 2). If we are unable to establish that this crucial support exists for the single solution developers we may not assume that the solution context used for finding solutions is actually actionable [22]. Surveying, discussions and initial agreements with platform providers are activities which will be used to advance this stage.

The other reason for fixing the solution provider at this early stage is to make sure that the digital communications infrastructure is actually in place (first part of the service refinement chain discussed in Section 1) and that it is able to accommodate the platform and thus the solutions which will be developed on top of it. Again, this adds to ensuring that the solution context will be an actionable one. [22]

Lastly, fixing the platform provider will also contribute to limiting the solution context offered for innovation and solution finding in the next stage. Limitation is important from the point-of-view of which developing world problem solvers (i.e. single solution developers, c.f. Figure 1) will be engaged [23]. Without a particular context limitation, it will be much more challenging to motivate stakeholders if they are unable to relate to the context and is capability in any way. It should also be noted that the context should not be too limiting, as this suppresses the approachable stakeholder group and thus the innovation context; a reasonable trade-off between innovation expressiveness and limiting the context to be approachable should be found.

The find innovations and solutions is the second stage of the ecosystem prefacing processes. This stage works directly on the limited, actionable solution context coming from the previous, select platform, stage. It is the responsibility of this stage to take the solution context and present it for the developing world problem solvers, those stakeholders who represent the emerging market end-users, their needs and culture of working towards meeting those needs [24]. Varying activities may be used to identify and locate relevant stakeholders and to bring the solution context to their attention. As per the previous paragraph some suppression of innovations may take place when the context is fixed, but as long as the problem solvers genuinely represent the local context we have a high degree of certainty that the merging innovations are based on authentic and novel challenges.

Facilitated innovation events (e.g., hackathons) are commonly used activities to advance this stage [25]. There is a number of benefits to using facilitated events: they can be advertised, with linear effort they scale to large audiences, they provide an ability to ensure that all participants have equal (or equally



good) consultancy and hardware in use, and they allow for finding needs and (iteratively) refining solutions to them with an established method. An established method is ideal here as the uniformly described innovations and solutions can then be subjected to analysis. To produce the stage's output, the analysis should discover the challenges that relate to implementing the concepts.

Finally, the last, assess feasibility, stage is used to understand how feasible it is to act on the solution concepts; how feasible it is to use this platform's solution context to discover needs and to produce solutions for them. Rather than using this stage to assess feasibility of individual solution concepts, the feasibility assessment is directed towards meeting the challenges that currently bar implementation of the individual, refined concepts. This is the reason why the previous stage is ended with a concept-implementation-challenge-identification analysis.

The facilitated events is the activity of choice for executing the last stage of the ecosystem prefacing process. Here, the platform provider can act as the facilitating party together with for example academic bodies that may convey a neutral analysis about the feasibility of the emerging market and the possibilities related to establishing the platform in this developing-country-context. The selection of invitees should be based on the identified challenges. Mainly this will include public sector actors and possibly some private sector ones as well. The main outcome of this stage should be an assessment of feasibility regarding if the identified challenges can be overcome. [24, 26]

## 5 Process Execution

We executed the ecosystem prefacing process described in Section 4 for a major ICT vendor's SmartCity platform. This limited the solution context to have a geospatial data element. In this case, the process was executed in the Tanzanian developing country setting wherein close history indicated that a market for the described context could likely emerge. The staged execution will be described in more detail below while limitations and reliability issues are discussed in Section 6.

In the first stage, the particular vendor was chosen as the platform provider due to a number of reasons. The vendor has been very active in developing advanced service delivery platforms especially for developing countries. Arguably, the vendor has an advantage in this as it is also heavily involved in delivery of 3/4/5G communications infrastructure for these countries. Due to the vendor's own interest and heavy dedication to establishing itself in the developing countries, no heavy prework was needed from our end, the academic actors advancing the prefacing process. Merely, we needed to ensure that the vendor would be available for the varying, upcoming activities.

The chosen solution context was the major ICT vendor's SmartCity platform. This is an advanced, multi-layered service delivery technology suite with the intention of connecting most, if not all, municipal infrastructure in an IoT



**Fig. 3.** Ecosystem prefacing process execution for the geospatial-limited emerging market solution context in the Tanzanian developing world setting

(Internet of Things) fashion. There is clearly a hardware component to this, involving upgrading and/or renewing existing infrastructure. Most of this is handled by the platform provider together with local actors. On top of this, the vendor's SmartCity offers a suite of multi-layered access and control methods which can be exploited by way of making developed single solutions use the offered interfaces. The vendor's pro-active approach to introducing the platform to cities ensures that the SmartCity provides an actionable context. The physical presence of connected hardware and the ability to convey location based information in the platform limits the solution context to having a geospatial component.

The second stage was to introduce this solution context to able and interested bodies representing the local context. We used the facilitated hackathon as the activity to advance this and organized the Geospatial SmartCity Innovation Workshop. To find relevant stakeholders, single solution developers, developing world problem solvers, we used a network of higher education institutes. Noting the technological and geospatial contexts, we engaged young ICT and geospatial experts from the relevant departments from Geography and ICT departments of two Tanzanian universities, University of Dar es Salaam (UDSM) and Ardhi University (ARU), to recruit attendees.

The one day workshop was initiated with a couple of presentations describing what the emerging markets have to offer and how the SmartCity platform can be utilized in this. The first round of innovation workshoping was facilitated as a problem discovery stage. Afterwards the teams presented circa 70 different needs that they had identified from their local context. The second round was used for refining innovations, solutions for the needs. For this, the teams were

presented with solution concept document which steered their thought process. The document had parts capturing the specific problem and the solution, tying a financial service model to providing the solution, describing the relevant existing solutions and stakeholders from where refined needs could be probed, and finally identifying if the previous parts highlighted challenges to advancing the solution creation. In the end this facilitation distilled the circa 70 problems in to 12 refined concepts. The concepts included for example incident response, traffic routing, waste collection, and settlement growth management solutions.

We should also note from the previous workshop that, arguably, it was important for the participants to have the ability to discuss in mixed groups, find peer support for their own ideas—leading to courage building, and to learn about technologies that are applicable to solving problems relevant to them. [25]

After the workshop, us the facilitators analyzed the 12 refined concepts. From these we were able to pinpoint six specific challenge areas that were barring the advancement of the concepts: sparse internet connectivity in specific areas, difficulties in co-operating with the government, access to technology, access to funding, deviations in own or acquired skill, and—possibly due to previous points—a general hesitance in perceiving the current overall readiness being rather far from being able to accommodate SmartCity solutions.

Finally, as the last stage the six identified challenge areas were used to assess the feasibility for the major ICT vendor's SmartCity platform based ecosystem to emerge. The facilitated event for this was the Nordic Week Event (Finland Day), which was jointly organised by the Embassy of Finland in Dar es Salaam, the vendor and University of Turku. Notable government and municipal actors, as well as funding bodies were invited. The facilitators of the event were the Finnish embassy, University of Turku and the technology vendor. The circa 40 attendees were representatives of various governmental bodies, private companies, NGO's and universities. After briefly describing the emerging market possibilities and introducing some of the technologies enabling SmartCity concept, we initialized the feasibility discussion by presenting the six challenge areas identified. The discussion was semi-formal and constructed as one that was motivated to overcoming the challenges in order to allow exploitation of the previously described emerging markets. At the end of the Finland day, the facilitators of the event were confident that there was strong will to enable and empower the development and business creation based on innovations, and that the vision for doing this called for acting on the presented challenges.

## 6 Discussion

As illustrated in Figure 2, there are three phases in the ecosystem prefacing process. For implementing each of the phases there are several possible approaches. In this case, for phase one, rather than having an actual platform, we chose to use a number of technologies from a single major vendor directing and constraining the solution space. In the second phase we focused on participatory need identification and innovation development, the main question being 'what

would it take to turn the idea into a viable business?'. This phase revealed various challenges that were discussed in the third phase. The main findings of this discussion were (i) citizens are invaluable in seeing and understanding the needs in the society, but they lack awareness of the technology and the possibilities of solving the problems, (ii) city and governmental authorities have a central role and duty in promoting innovation and problem solving, but the communication and contacting channels between citizens and authorities are dysfunctional, and (iii) citizens, even young university students, tend to assume that governmental bodies are needed as a leading stakeholder to introduce new solutions in the society. Especially this third finding suggests that the experimental and iterative innovation methods, such as lean startup, that have been widely and successfully used in more market driven economies, may not be fully effective.

Based on our single experiment we can already say that the model provides a fast and cost-efficient way to probe the potential in and challenges for new ecosystems. It should be noted however that the presented approach is supported only by the empirical evidence of its first implementation in Section 5. As such, both the theoretical and empirical foundations of the proposed approach are subject to limitations; some of which also affect reliability of the described process results and interpretations. Notably, competing or complementary emerging market processes are not thoroughly discussed here. For this reason, it is possible that for example some context attributes are not properly noted; making the introduced processes less sensitive to them. Gathering of qualitative data from on-site should counteract this to a degree. Heavy dependence on qualitative data on the other hand raises another concern about construct and external validity. Data analysis was committed by the authoring researchers. This can have a heavy emphasis on the results being interpreted in the context of developed countries. This can affect construct validity as later stages of the presented process are heavily steered by the output of earlier steps. External validity wise dependence on qualitative data immediately emphasizes that the data set is only representative of one group of students in Tanzania. As such, we conclude on limitations and reliability that the 3 phase approach should be repeated in other related settings and it can and should be varied based on educated decisions.

For the first phase our choice supported evaluation of the innovation climate, addressing issues such as public perception of innovation based entrepreneurship, roles and dependencies of actors in the field, as well as the general ability of these actors, such as university students to drive technological innovations to viable business solutions. For technological feasibility prefacing, the phases should be implemented differently. For example, with a chosen more precise technology platform, aspects of technical as well as commercial viability of the innovations can be evaluated. This selection would also naturally serve evaluation of the chosen platform as an actual basis for an ecosystem, for instance that the platform fosters the creation of a variety of solutions for different needs. In most powerful case the innovations drive the further development of the platform via screening needs and further potential.

We see several avenues for future research on the topic. First, we want to repeat and vary the process as noted previously to reduce some of its limitations. Second, we want to try and fix the process more directly to an intended output: the current process serves a general purpose tool for probing ecosystem emergence, but in order to remain feasible to execute the process should be fixed to for example link a platform limited in a particular way to a concrete "feasibility" output. An example of this could be a cooperation agreement between a platform operator and public sector bodies. Third, we want to execute a more breadth background investigation in to other competing and/or supporting emergence and feasibility gauging processes. The intention is to build a suite of processes that would offer the best set of activities to commit taking into account the technological, societal, and environmental setting. As a concrete next step, we have already agreed with several higher education institutes in Tanzania that we will be re-executing a revised version of the process in late 2018.

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