Introducing technology solutions for agribusinesses

Thematic insights from delivering technical assistance to agribusinesses through the African Agriculture Fund’s (AAF) Technical Assistance Facility (TAF)
EXECUTIVE SUMMARY

Over the last 10 years we have observed a proliferation of digital technologies that have streamlined the collection and analysis of data. Widespread access to these technologies has radically transformed ICT for Agriculture (ICT4Ag) and created new opportunities for organisations to make technology investments throughout their entire value chain. Organisations are now afforded with an ability to digitise almost every dimension of their business, which has allowed companies across the globe to streamline operations, create new business models, and provide new products or service offerings.

Most organisations have a natural attraction to technology at a fundamental level and will cite similar end goals in their efforts to leverage ICT. Broadly speaking, technology brings a promise of ease and efficiency, which leads to greater impact, market share growth, and (ultimately) profits. In practice, however, we find that each company is unique in how technology will redefine and revolutionise its business. This has created a difficult and nebulous terrain for most organisations to navigate. On one hand, the widespread availability of technology brings the overwhelming benefit of a near limitless suite of options in which to invest. On the other hand, technology has in some ways outpaced our own understanding of its utility. Without a roadmap for success, most organisations experience a systemic confusion on how and when to effectively implement ICT in a productive and cost-effective way.

It is an unfortunate fact that despite the rapidly advancing development of ICT, most organisations still find themselves fighting a continual battle against technology, rather than experiencing the expected transition toward ease and efficiency. Understanding why this pattern occurs requires us to shift our mentality away from the technology itself and back toward a focus on the foundation on which technology sits: business goals and objectives translated into clear ICT requirements.

Our experience under the African Agriculture Fund (AAF) Technical Assistance Facility (TAF) was not an exception to the above. TAF saw the opportunity and vital role of ICT in data collection, data management, and business operations. However, this was often interpreted differently in the two worlds of the private sector and public sector, making it challenging to clearly define requirements and align technology solutions around project goals. TAF often had an overlapping (but sometimes diverging) two-pronged focus on meeting both partner company business objectives while succeeding in and monitoring the impact objectives desired by public sector funders.

It is counter-intuitive and surprising that a successful ICT implementation has a lot less to do with the actual technology implemented and much more to do with making sure that the overall environment and systems surrounding the technology are properly supported. TAF pilot projects associated with promoting use of ICT highlighted that it is beneficial to shift our primary perspective away from the technology itself and think more about the business, goals, and data behind the technology. In short: if the data makes sense, if the business model is viable and profitable, if the challenge being solved is well understood, and if impacted stakeholders are provided with sustainable and holistic support, it is almost impossible for technology to fail in its intended purpose.

TYPES OF TECHNOLOGY PROJECTS

The opportunity for technology to enhance data-driven decision-making to achieve project outcomes and inclusive business growth was identified in projects across the AAF TAF portfolio. Comparisons are structured under three sub-categories related to the categories...
This project was primarily funded by the EU, managed by IFAD and implemented by TechnoServe. The project received additional donations from the Alliance for a Green Revolution in Africa (AGRA), Italian Development Cooperation and United Nations Industrial Development Organisation (UNIDO).

of TA provided (upstream, downstream and BoP linkages to productively linking small-scale farmers and micro-entrepreneurs to market partner supply chains; and core business development supporting the growth of SME agribusinesses):

1) **Upstream and Downstream Data Collection:** Farmer Monitoring and Evaluation (M&E) and Management Information Systems (MIS) to understand smallholder producer / consumer dynamics, map and manage outgrower and consumer networks, and improve customer service. For projects of this nature, technology is a catalyst which aids in the collection of data, but is not a fundamental driver of the underlying business. Upstream and Downstream Data Collection projects are often early stage (the first technology projects implemented at a company), should typically leverage flexible and inexpensive technologies, and can be de-risked by TA facilities which fund the pilots and iterations needed to develop the data models which are a fundamental output of data collection technology projects. Most ICT4Ag projects fall into this classification, so this type of project has been covered in greater detail throughout this paper.

2) **Distribution MIS:** Sales and distribution MIS systems to drive decisions on new routes to new markets and manage distribution models. For projects of this nature, technology is not a solution to scaling, but plays an integral role in supporting a new business model which is integral to scaling and growth. TA facilities can de-risk Distribution MIS projects by funding experts and pilot tests to verify business models which support the technology long term. Prior to the incorporation of technology, organisations should undertake a substantial and conscious effort to understand how data relates to their core business and identify a small number of critical metrics which provide insight into the company’s progress and ability to achieve well-defined goals. If specific data elements are not available or inadequately covered, there is a strong case for implementing an ICT solution. In short, and without exceptions, collecting the right data (and knowing why) is overwhelmingly more important than collecting a lot of data.

**Two Approaches to Capturing Technology Requirements**

Many organisations still fail to adequately capture requirements for two specific reasons: 1) in some cases, organisations are unaware that their requirements are not at a level of detail suitable for technology implementation and/or 2) there is a lack of expert support able to define requirements in the context of both the industry and how that relates to technology. Proper requirements can be derived through two approaches – a pilot approach and an expert approach. In general, preference should be given category in which custom or partially custom solutions should be given preference. TA facilities can de-risk projects by providing capital to purchase the technology initially and supporting the company until a clear ROI is shown and adoption has matured past the point of change management. This may not always have a strong justification for TAF involvement/funding.

**CAPTURING REQUIREMENTS**

Requirements are the hardest and most important task in any ICT project. The modern technology landscape provides (in most cases) an open canvas for collecting data on almost anything, which often results in organisations having more data than they are able to analyse. Prior to the incorporation of technology, organisations should undertake a substantial and conscious effort to understand how data relates to their core business and identify a small number of critical metrics which provide insight into the company’s progress and ability to achieve well-defined goals. If specific data elements are not available or inadequately covered, there is a strong case for implementing an ICT solution. In short, and without exceptions, collecting the right data (and knowing why) is overwhelmingly more important than collecting a lot of data.
toward the expert approach; however, in practice many organisations do not have the resources to fund or support experts and must derive requirements through a more iterative pilot approach.

**Pilot Approach**

When a data model (data requirements) is not well known, flexible and inexpensive technologies should be chosen which allow the data fields collected to be changed or modified as new information regarding business requirements and user behavior are realised. Custom or partially custom, expensive solutions which require an RFP and procurement process should not be used for this type of project or stage of data collection until a data model is well understood and can be clearly defined at a database-level structure of detail. In the case of a pilot approach, there is value in TA facilities seeking to de-risk projects to provide support and funding until an ROI for digital data collection is able to be derived.

**Expert Approach**

The vast majority of technology projects follow the process shown below (Figure 1). RFPs are used for both procurement and to aid in researching potential solutions. In practice, this approach is very high risk, with most organisations receiving a wide range of products and solutions through bids which appear to cover the same requirements but follow a large range of prices and approaches. More importantly, and ‘RFP first’ approach often inadvertently casts responsibility for defining requirements on the technology provider, who is not an expert in the industry in which the company operates.

A more practical model is shown below (Figure 2). In this model, requirements are defined by an industry expert and a business model is proven prior to the release of an RFP. In this case, the technology provider is required to focus only on what they do best (technology) and build solutions from a clear set of detailed requirements which are not expected to change and are supported by a sustainable, stable, and proven business model.

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Successful ICT projects typically start with a successful business idea that has been evaluated by an unbiased expert who can pair business objectives with a specific technology solution.

### Ideal Project Structure

- **Business Idea**
- **Business Pilot**
- **Detailed Requirements**
- **RFP**
- **Functional Requirements**
- **Analysis and Design**
- **Development Iteration**
- **Development**
- **Quality Assurance**
- **Release**
- **Mobile App Iteration**

- A business idea is validated and tested rather than a technology solution.
- Short development phases lead to iterations that overcome gaps in requirements and aid in training & change management.
- High-level requirements move directly into a phase of detailed requirements led by unbiased experts.
- Experts finalize the solution before procurement and contracting; An implementer is selected based on more than price.

### Table: Company, Industry, Project Type, Project Purpose

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<tr>
<th>Company</th>
<th>Industry</th>
<th>Project Type</th>
<th>Project Purpose</th>
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<td>Meridian</td>
<td>Input supplier</td>
<td>Downstream Data Collection</td>
<td>Baseline data collection</td>
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<td>Meridian</td>
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<td>Downstream Data Collection</td>
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<td>Goldtree</td>
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<td>Upstream Data Collection</td>
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<td>Ongoing data collection; and outgrower data management</td>
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<td>NGHL</td>
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<td>Goldenlay</td>
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<td>Distribution MIS</td>
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<td>WEF</td>
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<td>TopCrust</td>
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<td>Beverages company</td>
<td>Distribution MIS</td>
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UPSTREAM & DOWNSTREAM PROJECTS

Below we will explore two approaches to defining requirements within upstream and downstream technology projects using two case studies from successful TAF projects. The two case studies will illustrate the two distinctly different approaches to technology implementation and requirements gathering.

**M&E Approach:** A data-focused approach centered on ensuring data is collected to fulfill key indicators. Technology requirements are defined in terms of data fields, data structure, and relationships between the data which is collected. Platforms should be selected based on the flexibility of changing input fields and the ability to quickly change the data which is collected. This approach relies more on piloting and experimentation as opposed to pre-planning, design, and expertise.

**MIS Approach:** A process-driven approach focused on features and functionality which would help a company move from a current (inefficient) processes into an ideal state. In this case, companies should focus on technologies which offer specific functionality or features (how the data is used). This approach relies more on expertise and design, rather than pilots and iterations.

**CASE STUDY #1: M&E APPROACH - MERIDIAN**

Meridian is a leading manufacturer and distributor of fertilisers as well as other farm inputs and agricultural commodities such as seeds. The company has a strong presence in Malawi where operations include fertiliser production and distribution as well as a network of agro-dealerships through subsidiary companies such as Farmers World.

Malawian smallholder farmers have been using one compound which was formulated 30 years ago and developed when the priority was to deliver high nutrient fertiliser at the lowest possible cost. The use of this fertiliser has (over time) severely depleted soils of critical nutrients.

Farmers World sought to overcome the above challenges and improve yields by providing farmers with better inputs and guidance. With the help of TAF, Farmers World launched a pilot called the Productivity Improvement Programme for Smallholders (PIPS) to explore the viability of localised soil testing and the development of crop-specific fertiliser blends. This project included the use of SoilDoc, a portable soil testing kit, which allowed for the collection of thousands of soil samples and the engagement of “agronauts” (sales-extension agents) who could provide direct support to farmers through improved inputs and sound agronomic advice. The success of PIPS allowed Farmers World, in partnership with TAF, to establish the Farm Services Unit (FSU), which represented the company’s longer term commitment to fully incorporate agronauts into their business in an economically viable way. The impact of this effort has been far reaching. The company worked with 6,000 farmers through PIPS and is today reaching over 13,000 farmers through the FSU.

TAF and Farmers World quickly recognised that data collection through mobile technologies would be fundamental to supporting the long-term efforts of the FSU. Tracking the performance of farmers would remain critical in identifying trends and determining cost-efficient distribution schemes on the demand side of the Farmers World operations. Better insight into the needs of customers also naturally leads to market share growth, marketing opportunities for products, and more potential to provide farmers with well-rounded support such as greater access to credit.
Initially, a survey-focused technology called Open Development Kit (ODK) was selected to help Meridian agronauts collect data but was eventually shelved in favor of an MIS technology which could support more aspects of the FSU's operations. As the impact of FSU's work continued to grow, there was an increased need for the collection of data in real-time to help support farmers in tracking their productivity and income. Farmers World and TAF began to explore requirements for a custom MIS and mobile application which would overcome the limitations of ODK and allow them to use and manage data collected directly from their mobile devices.

Following the use of ODK, the company had derived over 250 requirements which were specific to the FSU's unique business model and the fertiliser production industry as a whole. The overall objective of the application was to improve the efficiency and accuracy of data collection with an emphasis on being able to track data on farmers year over year for key variables such as geographic and demographic information, crop volumes and yields, inputs purchased, and income and credit. The FSU also sought to use the application and database for trends analysis, including an alert and monitoring system based on gaps in performance targets.

Through a competitive process which is standard to TAF projects, a UK-based company, Revel, was selected as the most qualified provider, in part because their application, Smallholdr, had been successfully implemented in Malawi and maintained a considerable user base. Over the course of 2017 and 2018, Revel modified the Smallholdr application for use within the FSU, ultimately producing what could essentially be considered a custom application.

The Smallholdr project is an example of a successful ICT implementation. Although all parties admit to some challenges in defining requirements, the project serves as a good example of the power and impact that technology can have within the context of a proven business model and known data requirements. The SoilDoc pilot was preliminary to (and in some ways separate from) the development and implementation of Smallholdr, but the process allowed Farmers World to define a viable FSU business model and establish clear data requirements which were core to FSU operations. Even through unforeseen setbacks, a strong focus on data requirements allowed Farmers World and Revel to ensure Smallholdr was received positively by field staff for the relevancy and usefulness of the application’s data.

**Lessons learned while implementing an M&E approach:**

- Organisations should recognise that there are high costs associated with bottom up customisation that are not always clear upfront, particularly when the user or data requirements are unknown.

- Organisations seeking to implement technology with an M&E approach will find the greatest success if they are able to derive a list of specific indicators which they need to collect data against. The implementation of technology often means organisations find they can collect new types of information (or more information) than before. Discipline must be maintained to ensure that the right data is collected in the right ways at the right times without falling into the trap of adding ‘cool’ but distracting capabilities which the technology offers but are not core to the needs at hand.

- Pilot processes are critical to establish a ‘reasonableness’ of data expectations and improvements to data capture (e.g. bags instead of tons, rows instead of hectares to determine yield). An M&E approach also recognises that the information collected may need to change with each iteration, so flexibility in changing data must be maintained until the data model has matured and stabilised.
CASE STUDY #2: MIS APPROACH - GOLDTREE

Goldtree is a palm oil production company located in Sierra Leone. The company operates in a market plagued by volatile setbacks, including a huge loss in productivity during a civil war which left a large number of smallholder-owned plantations neglected, abandoned, destroyed or closed.

Phatisa made an investment in Goldtree to re-establish plantation and milling operations. This afforded Goldtree the opportunity to establish itself as a large scale, commercial palm oil company with capacity to process 60,000 MT of fruit per year. The operations have expanded to reach over 7,000 farmers per year; but capacity utilisation of the mill is still low due to challenges sourcing outgrower fruit.

Goldtree's continued emphasis on sourcing the majority of their fruit from smallholder farmers has the opportunity to provide an overwhelming benefit to both the company and the farmers, but has been met with challenges such a poor infrastructure, inconsistent supply, and lower than expected yields. In addition, the company was faced with overcoming a supply chain in which farmers had historically processed their own oil from harvested fruits to sell to competing traders. Although farmers would be able to achieve cost-benefits and higher profit margins through direct Fresh Fruit Bunches (FFB) sales to Goldtree, increasing awareness of this new market opportunity required establishing the trust and buy-in of a large number of smallholder farmers.

In partnership with TAF, Goldtree increased support for farmers through extension services designed to improve yields and raise awareness regarding Goldtree's business model. The company invested in road development and established a network of buying stations closer to the villages, which included support for the transportation of fresh fruit to the mill. As the supply from smallholder partners continued to increase, but ultimately did not achieve expected levels of supply, Goldtree sought to refine its manual data collection processes to provide greater visibility into its supply chain and support improved outgrower management. An MIS solution was explored for supply chain management, risk reduction through the identification trends, tracking loyalty/supply trends and productivity among suppliers, monitoring and managing seedling loans, and generating critical reports for management.

Goldtree had long struggled with a reliance on Excel and manual data collection, which resulted in clerical errors, concerns over data integrity, and long lead times on reporting. The organisational structure around data management and collection also made gleaning insights difficult or impossible. Critical datasets for farmer registration, FFB purchases, agricultural inputs and farmer surveys were stored separately and managed by different individuals, which caused challenges in uniquely identifying and tracking farmers year over year.

Throughout the process of exploring MIS solutions, consideration was given to the internet and bandwidth challenges in the region of Sierra Leone where Goldtree operates. Previously used platforms were ultimately abandoned over concerns with offline functionality and hardware limitations such as battery life. Working closely with TAF, Goldtree began an extensive requirements gathering process which was facilitated and led by industry experts, consultants and Goldtree staff and stakeholders. Through workshops and working sessions, requirements specific to Goldtree's unique business model and the palm oil production industry as a whole were identified and documented. The overall objective of the application was to improve the efficiency and accuracy of data collection with an emphasis on being able to track data on farmers year over year.
year, tracking company inventory, managing outgrower yields and productivity, and providing holistic support to growers including input lending. Goldtree also sought to use the application and database for trends analysis and predictive analytics. TAF provided support necessary to ensure a viable business case for the ICT implementation was established.

Through a competitive process which is standard to TAF projects, the provider, SourceTrace, was selected as the most qualified, cost-effective vendor, in part because of their extensive experience with similar projects, mature platform with numerous pre-existing modules, and an extensive user base. Although customisations were required for Goldtree’s specific requirements, the project was essentially an off-the-shelf implementation and was able to be implemented at a rapid pace over the course of three months. SourceTrace’s depth of resources allowed the company to also provide expert support, including an “on the ground” platform specialist requested by TAF who was onsite for three months to support user training and adoption at the company.

The SourceTrace implementation project was ultimately considered successful in the short term and serves as a positive example of a rapid implementation project based on a mature product offering from a large and well established company. However, time will tell whether this is sustainably adopted.

Lessons throughout the MIS approach to implementation:

- A design phase is essential to establish reasonable functionality requirements and goals from both a technology perspective and within the context of the industry in which the company operates.

- Companies following an MIS approach should invest in design related to the interpretation of data. Even though this approach is process and functionality focused, companies should still be able to identify 3-5 key metrics which they consider most important to the company’s operations and goals.

- Finding and funding the right experts (two types specifically) are critical for this approach. An expert of the industry in which the company operates should be hired to work directly with a technology expert who maps requirements to technology features and functionality. Companies should never rely on a technology expert to also be an expert of the industry in which the company operates.

**DISTRIBUTION MIS**

A distribution technology implementation is a more complex technology (and potentially second iteration) of an Upstream and Downstream Data Collection project because it pairs data collection directly with a new business model. This type of project requires three things to happen successfully and simultaneously:

1. Piloting to establish a profitable, stable, and proven business model
2. Iterations to clearly define data needed to support the above business model
3. Expertise to support both the design of technology developed and the design of the business model.

**CASE STUDY #3 – GOLDENLAY**

Goldenlay is the largest producer and distributor of eggs in Northern Zambia with an estimated twenty percent of the market share. The company strategically positions itself around a core value proposition of quality, but faces a relentless wave of competitors who seek to gain market share by undercutting prices and reducing margins. Fierce competition is especially difficult
within the egg production and distribution sector, which relies on a fast paced, competitive, and complex system of distribution channels downstream from production. Eggs ultimately reach the market through a convoluted system of middlemen and distributors who purchase, resell, and transport the eggs to small vendors that make the final sale to the consumer. Goldenlay’s focus on production and quality meant that the company had historically considered downstream distribution dynamics as external to the company’s control. However, a partnership and research with TAF highlighted that a larger focus on the informal market could increase market share and profitably expand the company’s reach beyond formal retail.

With TAF support, a viable business model focused around direct engagement with bicycle peddlers (individual micro-distributors) was developed. Peddlers offered Goldenlay the ability to directly penetrate peri-urban markets beyond where its trucks could historically reach. This would allow Goldenlay to cut out the middleman while building brand recognition and loyalty directly dealing with the vendors who made final sales to the consumer. After mapping localities and identifying optimal distribution center locations, a pilot was launched with a goal of generating sales of 6,000 eggs per day. The pilot was overwhelmingly successful and was almost immediately shown to increase sales 10x the expected volume while reducing the historical distribution bottlenecks.

What is noteworthy about this case study was that TAF and Goldenlay found success by implementing ICT through what could essentially be considered two pilot phases. Leveraging the lessons learned from a sister company, Goldenlay was able to identify a provider, named OnlineOnly, as a good-fit technology solution. This allowed the company to test OnlineOnly in the early stages of the pilot shortly after the need for optimisation was realised. Beginning with 4 depots and 16 bikes, Goldenlay has been able to scale both the business and OnlineOnly up to support 24 depots and 47 peddlers, further proving the value of both the business model and the impact of ICT.

Piloting and implementing ICT at Goldenlay has been revolutionary for the company. Throughout the testing and pilot process of the ICT implementation, Goldenlay was able to establish an accurate understanding of inventory, customers, and field staff activities while opening new opportunities to optimise operations throughout the value chain.

As expected, the clear business case for Online Only makes the $3000 implementation fee and monthly subscription almost negligible relative to the overwhelming benefit experienced by the company. We observed this same effect through the Meridian case study. This case study also serves as an example of how ICT costs become relative when framed in the correct context. Most companies are unwilling to risk $30,000 to develop the first version of an application, unless it can be understood as a necessary component of a larger investment into a viable business model, such as the $200,000 commitment Farmers World and TAF made to the FSU. A business focus allowed Meridian and Farmers World to make data-driven investments in ICT solutions which better serve customers, support smallholder farmers, and (ultimately) allow the company to outpace competition in a competitive commodity market.

The Goldenlay story also demonstrates the importance of continual ICT implementation as part of business operations. Piloting and adopting OnlineOnly has been a catalyst within the company for future innovation and has helped Goldenlay establish internal channels for implementing future ICT projects. The company is preparing to pilot another platform focused on closing gaps in demand-side operations so it is able to introduce new offerings, such as loyalty programs, which were made possible.
only through the successful implementation of OnlineOnly. This also creates an opportunity for the implementation of larger technologies, such as the Corporate MIS.

Lessons Learned in implementing Distribution MIS systems

- Distribution MIS projects often require extensive planning and upfront costs. Although some exceptions exist, these types of projects typically rely on technology in order for the business model to be piloted, which means that both a business model and technology solution must be researched and selected prior to any results. This type of project can therefore be particularly difficult for partner companies to understand, but they offer the greatest potential for new growth.
- Similar to Data Collection projects, companies should expect to change the technology implemented within the pilot stage once final data requirements are known and a stable business model is established.

CORPORATE MIS

SMEs face a range of risks, and a centralised MIS can create efficiencies and allow for improved decision making. Corporate MIS systems are something a business should invest in from a core business growth perspective, but must be implemented at the right time once business models, metrics, and upstream and downstream data collection processes are stable.

This type of technology project is unique for the following reasons:

- It is often more difficult to prove the business case for corporate MIS systems even if a company is profitable. The ROI for corporate MIS systems is often derived from abstract concepts such as estimated / incremental time savings across multiple business units and/or the perceived value of capabilities such as improved reporting.
- For most companies, a corporate MIS is not an aid in scaling, but rather the specific solution to scaling. This often makes it feel easier to select a technology, since requirements are usually better known and there is typically a budget to support the project; however, the projects are also larger, touch the majority of a business, and therefore provide much less room for error.
- Projects typically require more soft skills, such as change management, which are often the key drivers in whether a project will be successful. This brings a new level of complexity to an ICT implementation, requiring tasks which are well outside the scope and skillset of technology development and requirements gathering.

CASE STUDY #4 – AVISON

Avison is an integrated fertiliser manufacturer specialising in products which combine organic and inorganic materials. Growth over the last few years highlighted inefficiencies in operations and the company sought a technology solution which could streamline production and the management of inputs.

Avison is an interesting case study in part because the technology implementation was at first a complete failure despite well documented requirements aligned with the business. The company invested a large amount of money in the enterprise version of an MIS platform, called Sage, which was well respected and popular on the African continent. Without a proper change management plan and lacking a clear understanding of how the MIS modules and functionality related to the company’s core business, the platform sat idle and was essentially abandoned.
Avison’s turnaround and eventual organisational-wide adoption of Sage is an incredible and powerful testimony to the positive, compounding effects which proper change management can facilitate. Through an arduous effort to define roles, responsibilities, and controls, as well as Standard Operating Procedures (SOPs), a small group of user-advocates were identified who found immediate utility in the Sage MIS technology. Initial participation by this small group of users provided new insights which began to highlight inconsistencies and gaps in available data. Data inconsistencies created a natural peer-to-peer demand for participation on the platform, and because each individual had been provided with autonomy and ownership over their specific role, a natural increase in participation quickly improved the platform’s usefulness. As new areas of inconsistencies were identified, a larger circle of users were incentivised (either from the technology’s utility or from peer pressure) to begin participating. This cycle of peer-led adoption continued until the platform was widely used across the majority of the company’s business operations.

Avison’s successful change management efforts have allowed the company to move forward with the confidence afforded by new realisations and insights into their operations. This has expedited almost every dimension of operations ranging from finance to fraud detection and allowed the company recover from mismanagement, generate new partnerships, and focus on optimisation. Similar to other projects and consistent with previous lessons learned, the successful adoption of Sage (though initially fraught with failure) emerges as an example of a company who exemplifies all of the lessons learned presented within this paper. Avison’s entire ICT infrastructure is now designed around the relevancy of data, backed by a proven business model that has, through its tangible impact, instilled an organisational-wide confidence in the important of ICT. This foundation has allowed Avison to expand the reach of Sage and explore opportunities on the upstream and downstream side of their operations through new technology pilots.

**Lessons learned in implementing Corporate MIS systems**

Corporate MIS systems are large and require the same levels of expertise discussed throughout this paper to define requirements for suitable technologies. What makes Corporate MIS system projects unique; however, is their strong requirement for change management. An ICT solution is only as useful as the extent to which the solution is adopted, and although most organisations recognise this, there is a tendency to assume that a useful technology will be quickly understood and well received. In practice, adoption and change management is often complicated because it requires an internal transition as roles and responsibilities are redefined. ICT solutions bring potential for increased efficiencies and new opportunities, but can also quickly invoke a general sense of uncertainty and natural resistance to change if the user base is left without a complete understanding of the technology’s intended purpose. Organisations should seek to clearly define roles and responsibilities for all impacted users, align technology features and functionality with the roles and responsibilities of each user, and tie the use of the technology back to incentives and performance metrics. Upstream and Down Stream Data Collection and Distribution MIS systems provide some flexibility to learn through iterations which naturally invoke a change management process, but for Corporate MIS systems, user-led change management is the largest and most complex component of the project and often offers very little room for error.

**CROSS-CUTTING LESSONS LEARNED**

The rapid progression of ICT invariably means that the relevancy and maturity of available technologies will inevitably change. The principles below are therefore designed for application
across all types of digital data projects, both now and into the future, regardless of how the ICT landscape progresses and evolves.

The root cause of unsuccessful or difficult attempts in technology implementation is usually related to an improper pairing between the maturity of a company’s requirements and business model, process for developing the requirements, and the type of technology solution offered. In general, companies which are able to clearly define requirements at a ‘use case’ level and have a well-defined, stable, proven, and profitable business model are able to explore more permanent, custom solutions, while organisations with uncertainty in any of these areas should allow themselves flexibility to iterate with inexpensive technologies.

In reality, most organisations have huge gaps in understanding their requirements and because of that should not see these gaps as risks, but rather (with the right structure) opportunities to innovate. Technology spans a grey area of design between engineering and human behavior that affords an opportunity for (and in many ways demands) real-time experimentation. Anyone who has taken part in multiple ICT implementation projects will testify to the fact that user-centered design will vary significantly from one project to another, especially across demographics such as geography, education, and wealth which play a role in the technological competency of a user base. Similar to the development of a new business model, a perfect design for technology, and gaps in requirements, features, and functionality, can only be found through the trial and error of testing with actual users. Technology must continually grow with the organisation and ever-changing operating environment (both during development and thereafter). If implemented correctly, this process compounds in a positive way, creating new opportunities which increase an organisational appetite for ICT.

The principles described in this paper hint at change which should be made to the process organisations take for vendor selection and procurement. In short, the evaluation of a technology provider should extend far beyond pricing and must consider how a potential partner’s business model aligns with requirements, objectives, project constraints, and project approach. The size of the vendor, the type of product they are offering, and the personnel part of a partner firm will have a large impact on a project’s success. Smaller companies often provide a greater level of flexibility and provide more attention to projects but are also inherently less stable than larger companies. Local providers may be cheaper but can lack in specific expertise. There is a grey area between custom and off the shelf that can be misleading without a third party unbiased opinion. A list of tradeoffs will continue indefinitely, and organisations will always face constraints in finding an optimal solution as new products and technologies are offered. We hope the concepts described in this paper will enable organisations and technical assistance facilities to successfully assess their technology landscape, de-risk projects, and implement right-fit technologies that fuel growth. We look forward to building off of these lessons learned through future projects and additional research.

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