

The NatiV Project



NatiV



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1 PROVISIONAL FINAL REPORT

1.1 Project Final Report

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1.1 Previews





1.2 ABSTRACT

This document discusses native languages, their importance and the relevance of Information Communication Technology (ICT) in learning them and in education as a whole. It explores the significance of the mother tongue on the results of globalization and second language learning. The phenomena of dying languages and methods of language preservation with an inclination towards ICT are discussed. One hypothesis is that dying languages can be preserved using ICT, more specifically through mobile technology. Special attention is on NatiV, an Android (mobile) Application that teaches early learners how to read (thus providing the foundation of actual language learning) a language native to Zimbabwe, Shona. The document further discusses the methods used to design a scale-up strategy for the application, which had not been launched publicly at the time of receipt of the FIRE grant. The projections surfacing from the conclusions lean towards diversifying m-learning (mobile learning) to other languages and lexicography in general.

1.3 Executive Summary of Achievements

With the FIRE Scale-up Grant, we were able to (among other achievements):

1. Scale to other Operating Systems: Our mobile learning app for kids grew from targeting one operating system (Android) to other operating systems (iOS, Windows) as well as the web.
2. Scale to other languages: We developed the model for an additional language, Ndebele, to add onto the app alongside Shona.
3. Scale our business outwards: We developed business processes and controls to ensure that we are internally sustainable. Through the help of the mentorship programme and lessons learnt from the interim evaluation, we are able to improve our business skills.
4. Scale to other regions of the country: By forming a strategic partnership with TTI, we were able to participate in a literacy boost programme that helped over 200 grade 3 students in six schools.
- 5.

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3 LIST OF ABBREVIATIONS

AFRINIC - African Network Information Center
API - Application Program Interface
ECD - Early Childhood Development
FIRE - Fund for Internet Research and Education
HTML - Hypertext Markup Language
ICT - Information and Communication Technology
IDA - International Dyslexia Association
IDE - Integrated Development Environment
MVC - Model View Controller
MVP - Minimum Viable Product
NLP - Natural Language Processing
OOP - Object Oriented Programming
OS - Operating System
PHP - Personal Home Page / Hypertext Processor
SAMP - Speech Assessment Methods Phonetic Alphabet
TTS - Text to Speech
UNESCO - United Nations Education, Scientific and Cultural Organization
VOA - Voice of America
ZIE - Zimbabwe Institute of Engineers

4 RESEARCH PROBLEM

Thousands of children in Zimbabwe, and millions across the African continent, have little or no access to enough early-learning material. UNESCO points out the advantages of mother tongue based education in the early years; when children are offered opportunities to learn in their mother tongue, they are more likely to engage and succeed in school. Furthermore, some native African languages are dying. Solutions created to address the need for learning content also offer a medium that solves the challenge of language preservation.

Ian Mutamiri addresses the research problem above in his thesis titled “Development of a Shona Early Learner Reading Application at Low Cost Tablet”, which is currently being peer reviewed under his Master of Philosophy in Telecommunications degree which commenced in 2013. Through his research, he has offered a mobile application called NatiV - which helps children learn to read and write their mother tongue. The mobile

This document aims to extend Mutamiri’s research to finding solutions to challenges surrounding the scalability to other African languages and mobile operating systems, and therefore to a wider audience; as well as the sustainability of the NatiV project itself.

4.1 Research Statement

It is possible to create mobile applications for language learning (reading) for Bantu languages by porting existing research done for the Shona version of NatiV to these languages, and further using lean methodology to efficiently scale the app to reach millions of children across Africa.

5 RESEARCH FINDINGS

Our research has in a way made submissions on the need to use indigenous languages within the learning process and it has introduced software that not only promotes mother tongue learning and usage but also interests of the learner through utilising current technology. Of critical importance is that the NatiV programme is designed in a way that respects many linguistic rights and inclusive education as it also caters for dyslectics. Furthermore, the objectives parallel those of

1. Zim Asset - **Zimbabwe** Agenda for Sustainable Socio-Economic Transformation (**ZimAsset**) is an economic blueprint that was crafted by the ruling **Zimbabwe** African National Union Patriotic Front (ZANU PF) government in 2013 as part of its developmental campaign initiative, (Matutu n.d.)
2. UNESCO's Literacy for All, ([Lind 2008](#))
3. The WSIS Action Line C8 - Cultural diversity and identity, linguistic diversity and local content,

And many more. In a way, the research walks the talk in as far as realizing the projections of the policy on language and education are concerned.

The mother tongue is essential when it comes to learning a new language, more so when learning any new concept. ICT is a technology that is now accessible to anyone through the internet and provides an efficient means of empowering education, in this case, mother tongue learning. Solutions can be made through the use of ICT to help children learn their mother tongue with little supervision. These solutions also guarantee the preservation of dying minority languages. Manipulation of ICT systems in education can also be extended to electronic dictionaries that have speech output to help learners with pronunciation and a project to digitalize monolingual dictionaries of Zimbabwean indigenous languages should be a worthwhile endeavour. While deployment of ICT in language learning is paramount, there is need for different stakeholders to collaborate and come up with a single package that can be manipulated to deliver the whole education curriculum electronically.

The study of Shona phonotactics reveals that a systematic way of phonetically transcribing Shona words exists. Phonotactics is defined as the study of the rules governing the possible phoneme sequences in a language. A phoneme is any of the perceptually distinct units of sound in a specified language that distinguish one word from another, for example p, b, d, and t in the English words pad, pat, bad, and bat. Bantu languages have similar phonotactics, and we therefore propose that the research we have done is portable to these other languages.

Our research has also enabled the creation of a linguistic transcription system whose 91% probability of correct transcription has been considered acceptable. A transcription system is

part of a text-to-speech system. This system will be used as a module in the speech synthesis system. Transcription accuracy may be increased by adding more entries to the existing lexicon¹. These findings are implemented in the porting of NatiV to Ndebele.

Findings that were a direct result of activities facilitated by the FIRE grant include the following:

1. NatiV can be scaled (with some significant ease and at very low cost) to other Bantu languages.
2. Lean methodology can be used to achieve sustainability.

6 FULFILMENT OF OBJECTIVES

The project objectives are listed below:

1. To port NatiV to Ndebele using existing research,
2. To port NatiV to iOS and Windows mobile platforms (Currently it is on Android)
3. To test lean methodology by implementing its concepts in the process of scaling of the project to achieve sustainability.

6.1 Objective 1: Porting to Ndebele

Porting to another Bantu languages requires two essential ingredients:

1. The language alphabet:
 - a. A list of vowels and consonants belonging to the language, that can be combined into syllables or words.
 - b. The sounds associated with those vowels and consonants
2. At least one word per consonant/vowel that belongs to the language, preferably a noun that can be presented pictorially.

The Ndebele Alphabet is complete. Please see Appendix A.

Overall Progress Made on Objective 1: 100%

Please see Appendix A: Ndebele Alphabet.

6.2 Objective 2: Porting to other mobile platforms

This is being done using Unity3D, a cross-platform development environment that can render the NatiV app for iOS, Android, and Windows.

Overall Progress Made on Objective 2: 98%

¹ A dictionary

6.3 Objective 3: Implementing Lean

The lean methodology presents itself as an ideal method for business implementation as it significantly reduces the risk of failure and increases the rate of refinement of business processes. Lean enables the researchers to introduce controls where none existed, and improve on existing ones at a granular level. It is a 'measure-learn-build' iterative process, with short loops that keep the designer/engineer's engagement on these 3 pillars of design fresh and effective.

6.2.1 Implementing Lean - Financial

The NatiV project is housed under a legally registered entity Purple Zoom (Pvt.) Ltd. which is made up of three directors (two non-executive and one executive). NatiV has never generated any revenue, and no salaries have ever been paid out to directors ever since inception. The FIRE grant has enabled us to formulate means of getting started in terms of revenue generation via the paid version of the NatiV app. Our financial strategy aims at using the grant as a means of activation energy which shall see the commencement of sales and realization of revenue. Our Financial Controller, Mr D. Makonyere, oversees the business processes that affect our financial standpoint - making sure that we 'spend on what needs to be spent on', leaving enough runway for future undertakings.

Ian Mutamiri's employment as a Deloitte Auditor also exposes him to industry 'best practices' as well as the inner-workings of large companies (that also started small) - taking note of how business processes are mapped to ensure sustainability and continuous growth. This exposure has enabled our small team to start working on simple business processes that will be improved over time.

We now have properly documented processes based on this approach. See Appendix.

6.2.2 Implementing Lean - Business Structure

We have concentrated on working with people who understand our cause - and are willing to do the job at a fraction of what it's really worth. Our team is very small and includes one member with very little experience, who has grown in a wide spectrum of knowledge and experience in product design and development. Once the engine starts running, we plan on staying small as a team, but growing the other aspects of the business (scaling outwards).

We have also taken one year (2015) to test a revenue model. Our test came out with good results, and that is the model that we will use throughout the duration of the grant.

6.2.3 Implementing Lean - Product

NatiV started out as an idea, and was then build on a foundation of strong and disciplined research. We received our first grant from FIRE in 2013 - and for the past 4 years have been

building it internally. There has never been a public launch - only iterative design based on one-on-one feedback. We believe that the scale-up grant that AFRINIC has offered us again this year is the key to the next phase - a strong public launch and growth for sustainability.

Overall Progress Made on Objective 3: 100%
Please see Appendix B: Business Processes

6.3 Objective 4: Improving reach

We aim to reach the local (disconnected) marginalised rural area of Karoi, as well as the online community. This ties in to our partnership with TTI on the literacy boost programme. This objective suffered from the delay of the second disbursement of funds and shall be completed post reporting deadline.

Overall Progress Made on Objective 4: 70%

7 PROJECT DESIGN AND IMPLEMENTATION

7.1 Project Activities, Outputs, and Challenges Faced

| ACTIVITY | DESCRIPTION | EXPECTED STARTING DATE | ACTUAL STARTING DATE | TIME (DAYS) | ACTIVITY OUTPUT |
|----------|---|------------------------|----------------------|-------------|-----------------|
| 1 | Planning | 01/11/2016 | 1/11/2016 | 30 | - |
| 2 | Receipt of funds | 01/01/2017 | 1/1/2017 | 7 | - |
| 3 | Office set up | 01/01/2017 | 1/1/2017 | 7 | - |
| 4 | Equipment purchase | 02/01/2017 | 2/01/2017 | 20 | - |
| 5 | Preparations - Ndebele inclusion | 06/01/2017 | 6/1/2017 | 90 | Ndebele Model |
| 6 | Identification and consulting of Ndebele expert | 15/01/2017 | 1/3/2017 | 7 | Ndebele Model |
| 7 | Research - Data collection (schools and | 10/01/2017 | 10/1/2017 | 30 | Literacy Boost |

| | | | | | |
|----|---|------------|------------|------------|---------------------|
| | potential partners) | | | | Programme Plan |
| 8 | Porting to iOS, Windows, Android | 1/2/2017 | 1/3/2017 | 90 | NatiV App |
| 9 | Reachout Strategy Plan | 01/02/2017 | 1/2/2017 | 7 | Marketing Plan |
| 10 | Marketing Plan | 1/2/2017 | 1/2/2017 | 30 | Marketing Plan |
| 11 | Reachout Programme Execution | 01/03/2017 | 1/3/2017 | 30 | - |
| 12 | Baseline survey- Matau | 01/06/2017 | 1/11/2017 | 1 | Baseline Results |
| 13 | Official Launch at Rural School (Matau) | 01/06/2017 | 20/11/2017 | 90 | Impact Observations |
| 14 | Marketing and Sales | 01/06/2017 | 20/11/2017 | Indefinite | - |
| 15 | Online Launch | 01/08/2017 | 1/12/2017 | 1 | - |
| 16 | Endline survey - Matau | 01/10/2017 | 1/2/2018 | 1 | Endline Results |
| 17 | Final Report with survey results. | 10/10/2017 | 1/3/2018 | 1 | Report |

Challenges Faced

The second disbursement of funds was supposed to happen sometime in April/May, but was only received in September (see bank activity except below) due to reasons beyond our control. That was a 4 (four) month delay.

This caused activities 12 and after (which were crucial for the content of our final report) to be pushed forward, as purchases for tablets and other equipment and resources required for the launch and to perform marketing activities relied heavily on the second disbursement. We are unaware of the exact cause of the delay, but the project suffered as follows:

1. Purchase of tablets, marketing resources and other launch-related material was extremely delayed, causing launch delays in Matau, Karoi, as well as the online launch -

as activities from the Karoi launch were supposed to be used as marketing fuel to the online audience.

2. We had formed strategic relationships with government (the Ministry of Education, Ministry of ICT) and they were aware of our timelines. Our failure to deliver the launch as planned strained this relationship as we appeared to be disorganised. We are relying on our relationship with Tererai Trent International (TTI) as a key connection to local government as they were instrumental in assisting us with some kind of continuity during the 'dark period'.
3. We were excited to receive the second disbursement and our hope was rekindled. We did not want to compromise on the quality of delivery in all aspects, but we tried to expedite all processes that we could. Unfortunately, imports and associated waiting periods were beyond our control. We managed to source marketing related material locally.

We had hoped that an addendum or amendment to the original contract would be made to cater for the delays that we had experienced. However, the importance of meeting the reporting deadlines for the donors was highlighted to us. In that light, we hereby render this provisional report, giving full assurance that the project shall continue post-deadline to fulfil its stated objectives.

This provisional report is therefore subject to the challenges faced, mentioned above, and a final report shall be rendered upon 100% fulfilment of objectives. We thank the FIRE Programme for their understanding.

7.2 Methodology

7.2.1 Implementing Lean Methodology for Design via Feedback

Both qualitative and quantitative approaches were employed in short bursts for triangulation so as to get the best out of this research. Quantitative methods were used in the development of the transcription tool to be used in the Text-to-Speech voice which was to be used in the app, and which is currently still under development. This document's scope is limited only to the app.

7.2.1.1 The NatiV Mailing List and Website

A mailing list is a collection of emails, obtained by permission from each email address owner. The mailing list is subscribed to online, and the user does so by opting to join, and can unsubscribe at any time. In other words, people who participated in surveys and other data collection methods gave permission for the researcher to use that data, so the mailing list is an online willing population from where data was collected. Anyone is able to join the NatiV Newsletter mailing list from the website (<http://mynativ.com>) as well as a direct link to the mailing list. However, 100% of the current subscribers did so via the website, which was spread via

social media (Twitter, Facebook, Google+). At the time of this writing, the total number of subscribers was 133. The mailing list for the purpose of this research then became a chosen data (feedback) collection tool. We used it to measure and/observe different variables that would help us design NatiV.

Online data collection proves to have financial benefits as opposed to physically meeting people and creating/printing questionnaires for them to fill in, and afterwards gathering the responses into software for analyses. Qualitative methods applied to the Android application and online interviews were used to determine the general awareness of the benefits of mother-tongue learning (whether the audience understood and appreciated the value propositions that the research gives).

A total of seven Awareness Campaigns were sent out to subscribers. The reports gave out the general impact these made, and where (location) the interest was generated. This data is useful for understanding the demographics for which the app is being made for. The results of these campaigns shall be discussed in the Findings and Discussion section. The NatiV website continues to be available to people all over the world.

7.2.2 The Marketing Strategy

The marketing strategy was designed in collaboration/partnership with Prism Consulting. The plan also provides a foundation for M&E, as from it we extracted key performance indicators that we shall use (post release in June) to measure the effectiveness of the methodologies and processes used.

7.2.2.1 Prism Consulting

An introductory statement from Prism Consulting:

“Prism Consulting is an Integrated Marketing Solutions Company based in Harare, Zimbabwe. We are a subsidiary of Aurora Consulting, a diversified Business and Management Consulting entity. Prism Consulting is a Transformative Launchpad that facilitates a transition from Traditional Marketing into Dynamic Platforms that clearly articulate our Clients' core competences to a complex Digital- Era Audience. Prism Consulting fosters an optimized Business Partnership approach with all our clients in order to harness our 8-plus years of regional experience into streamlined and sustained benefits to you. Our mandate is to simply integrate our extensive experience seamlessly into your operations thereby giving optimum benefits in exposure and Results-Based Brand Optimization. As an Integrated Marketing Solutions Company, our emphasis at Prism Consulting is in Process, Method and Consistency. Integrated Marketing Approaches also give you better results with a quicker turnaround time. We employ the Radial Approach to show how marketing efforts interlink to achieve optimum results for the client.”



Prism was engaged at the early stages of the project from an observatory point of view, up to February 2017 when they were formally engaged as the Marketing Partner for the NatiV Project. Please refer to Appendix C: Marketing Strategy and M&E, for the Marketing Strategy.

7.2.2.2 Tererai Trent International



TTI has become a partner and sponsor for the NatiV project. We met Dr. Trent around mid July and realised that we shared a common vision: for underprivileged communities and persons to have unrestricted access to quality education. TTI have set up 40 reading camps in the rural area of Karoi, where NatiV will affect over two thousand children. Dr. Tererai Trent is one of today's most internationally recognized voices for quality education and women's empowerment. Distinguished as Oprah Winfrey's "All-Time Favorite Guest,". Tererai is a scholar, humanitarian, motivational speaker, educator, author, and founder of Tererai Trent International.

Degrees & Awards

- **PhD** Interdisciplinary Evaluation (Program/Policy) College of Public Health, Western Michigan University, Kalamazoo, Michigan
- **MPH** Epidemiology Concentration University of Berkeley, California
- **MSc** Plant Pathology (Agriculture) Oklahoma State University, Stillwater, Oklahoma
- **BSc** Agricultural Education Oklahoma State University, Stillwater, Oklahoma

Honorary Degrees / Honoris Causa

- Honorary Doctorate of Science, University of Massachusetts, Boston MA (April 2013)
- Honorary Doctorate in Women & Gender Development, Women's University in Africa, Zimbabwe (Dec 2013)
- Honorary Doctorate of Humane Letters, Oklahoma State University, Stillwater, OK (May 2014)
- Honorary Doctorate of Science, Loyola University Chicago, IL (May 2014)

- Awards
- World Vision International Hope Award
- Oklahoma State University-Distinguished Alumna Award
- Oklahoma State University-2012 Graduate of Distinction in Agricultural Leadership
- Kern University Humanitarian Award

7.2.3 Assessment of User

A full baseline survey was done in conjunction with TTI (see separate attachment). The results are currently being collated. Two groups or classes of children were selected - one acting as a control (using standard ways of learning to read) and one using the NatiV app. Assessment of the app's users shall be based on three key performance indicators (KPIs) which are

1. Accuracy (identification): A mistake is defined when after hearing a sound, a user picks the wrong corresponding syllable. The number of mistakes made on certain syllables shall be examined over time, for the same sample. This is the main KPI of interest as there can be a logical correlation between the length of time of using the app and the number of mistakes that a child makes. We expect that the number of mistakes reduces per syllable over time.
2. Accuracy (writing): Users should be able to shape the letters properly.
3. Usage time: The time the app was in use
4. Interest or Engagement: This KPI is an observed one, and can be rated out of 5, where 5 is high engagement and 1 is low engagement. Measuring this KPI could lead to the improvement of the user experience design of the application.

The functionality of measuring the main KPI (mistake) was implemented in the app.

Users would have their parents sign for consent. Please see Appendix D: Parent's Consent Form.

The end-line survey would be done after three months of continued use of the app.

7.2.4 Indicators

| Baseline | Indicators | Progress | Assessment | Course of action |
|--|--|--|--|---|
| <i>Refers to the initial situation when the projects haven't started yet, and the results and effects are not visible over the beneficiary population.</i> | <i>How do you measure project progress, linked to your objectives and the information reported on the Implementation and Dissemination sections of this report?</i> | <i>Refer to how the project has been advancing in achieving the indicator at the moment the report is presented.</i> | <i>Descriptions should be clear and ideally contain operational terms where needed. Please describe the quality dimensions.</i> | <i>What is the project team planning to do next is very important to document, especially if changes to the original plan have to be implemented for the success of the project.</i> |
| Classes had no exposure to digital literacy. | We have two classes, one control and one that is exposed to digital literacy. The following indicators are being tracked: Concepts about print (CAP), Letter awareness (the alphabet) - association of sound to syllable., Letter writing accuracy. | Both classes continue to work in separation and we hope to have results soon. | A baseline survey would be held (see attachment). A waiting period of at least three months would be required for observable results and then an endline survey held. Comparisons would be made. | It is imperative for us to continue to meet our objectives even though time has run out due to delays beyond our control. We have provided this provisional report and shall provide a final report upon successful completion. |

7.2.5 Project Outputs

The main project output is the NatiV mobile app. Through the grant funds, the app has been scaled (ported) to platforms other than Android (as per original design) such as iOS and Windows. The table below summarizes additional outputs and dissemination efforts that tie in with the Marketing Strategy.

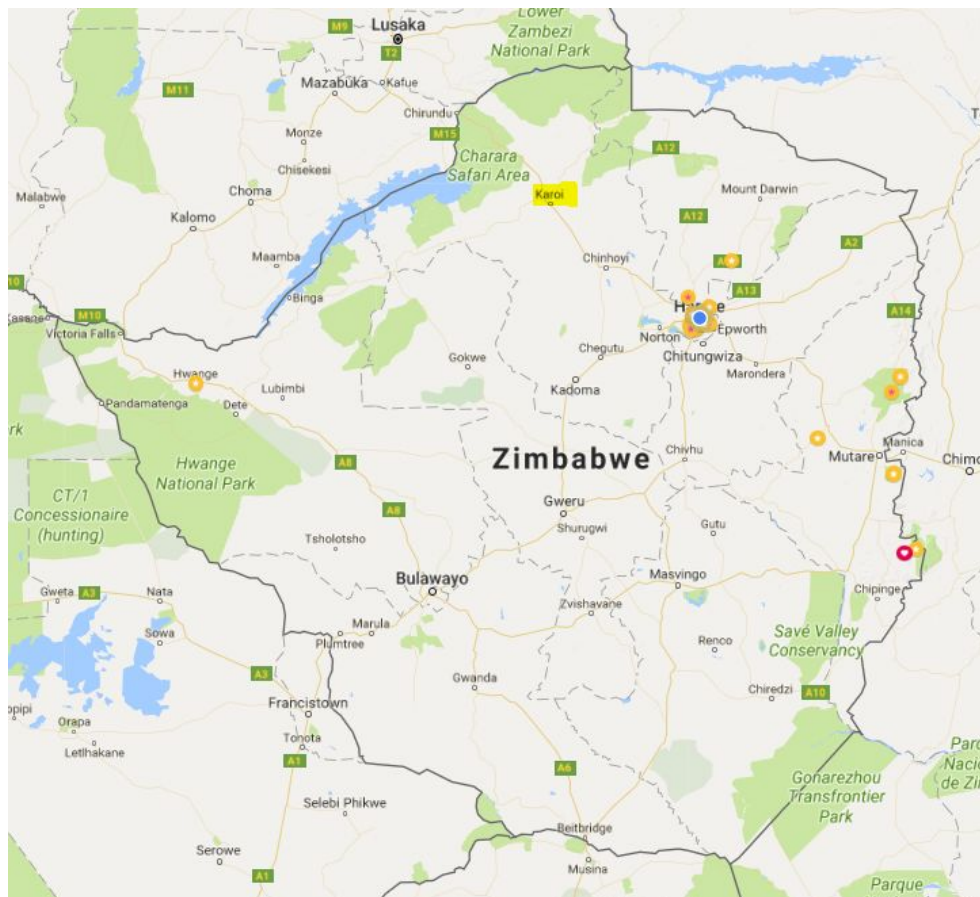
| Project outputs | Status | Assessment | Dissemination efforts |
|--------------------------|--------------------------------------|--|---|
| 1. Correct Shona Phonest | Completed | <p>Complete and comprehensive. Applicable Dimensions:</p> <p>Reliable – all Shona phones were listed and the corresponding SAMPA (computer-readable) format was created using international standards</p> <p>Conformance – the IPA (international phonetic alphabet) was used for theoretical writings. During voice creation, we are using SAMPA.</p> | <p>List of Publications:</p> <p>https://uz-ac.academia.edu/IanMutamiri</p> <p>http://conference.pixel-online.net/ICT4LL/files/ict4ll/ed0008/FP/2155-ETL1389-FP-ICT4LL8.pdf</p> |
| 2. NatiV App | Porting to iOS and Windows complete. | <p>Applicable dimensions and comments:</p> <p>Quality (functional) – performs the main function: to teach how to read, very well and in different ways too.</p> <p>Quality (structural) – uses object oriented programming and is modular. Android makes user interface design separate from application business logic – hence maintainability is made easier, and robustness can be added to business logic without ruining UI. Coding standards were taken seriously.</p> <p>Performance – meets all documented objectives.</p> <p>Efficiency – data management and data access handled as according to standards. There is room for improvement when it comes to sending data to remote storage. Currently being done ‘in-game’ and not after. However this is because there is very little data being sent. There is also efficient use of memory and cpu (to conserve power).</p> <p>Security – good exception handling, secure SQL server with</p> | <ul style="list-style-type: none"> - Pre-school in Old Marimba Park Awareness at the University faculties of Linguistics, Engineering and education using posters Targeting parents and individuals via: <ul style="list-style-type: none"> - Facebook page and website for interested fans https://www.facebook.com/nativevoicezim http://mynativ.com - Mailing list for people who look forward to urgent announcements and letters info@mynativ.com - YouTube videos (more coming soon from talented colleagues) https://www.youtube.com/watch?v=WDQthj9t0Q4 - Twitter personal account using hashtag #NatiV or #NativZim (changed so as |

| | | | |
|--|--|--|---|
| | | <p>authentication for app requests, system function access deemed private or public where appropriate in code.</p> <p>Maintainability – the code is readable, the UI is separate, understandable amount of dynamic coding (comments available), and documentation is provided by in-line comments in the code. Simple (not deep) inheritance trees.</p> <p>Features – fun, interactive (visuals, audio, vibrations), simple and intuitive to learn how to use, comes on a colour tablet with added benefits.</p> <p>Aesthetics – colourful graphics, friendly user interface that is easy to figure out.</p> <p>Reliability –uses MVC (model-view-controller) where possible, decent exception handling, component re-use, complies with OOP, and uses simple and CPU-friendly algorithms.</p> <p>Serviceability – software failures highly unlikely. Hardware failure as easy as replacement and reinstallation.</p> <p>Conformance to current standards – Android development takes design standards seriously and it is very difficult to diverge from these, as there would be little or no support in the case one needs assistance. We tried as much as possible to meet all standards from coding to UI design to meet users' expectations.</p> | <p>not to confuse with the band NatiV) and other conference/meeting/organization hashtags</p> <p>Presentation at Africomm Tech Conference (2013) in Malawi</p> <p>Presentation at IAD (Innovation Africa Digital Summit) 2013, Gambia</p> <p>Other Presentations...</p> |
|--|--|--|---|

8 IMPACT

Local Impact

With our partnership with TTI and the use of the grant, not only did we scale to an additional language (Ndebele) and additional operating systems (iOS, Windows), we managed to scale to reach hundreds of children in the rural areas of Zimbabwe, specifically Karoi.



Karoi is a small town surrounded by several low-income villages. TTI have set up 40 reading camps to help with access to literature. The NatiV Project have donated their app to Matau Primary school which is about 100Km from Karoi town, as well as the 40 reading camps around. The app comes as a huge relief and benefit due to its mobile nature (compared to computers) since the reading camps do not have access to electricity. Solar chargers are used to power the tablets.

We have observed a stronger awareness of the need for native languages to be represented in the ICT space, which should also form a “Noah’s ark” for dying languages, as in, technology should be able to preserve these dying languages. Native languages need to be preserved and

used inclusively in the learning system for reasons mentioned by UNESCO - that the use of the mother-tongue in instruction generally improves intelligence.

Our development impact is currently and will always be young-people-centered, and in the future we hope to be a body that can influence policy planning and programming with reference to ICTs intended for use to promote mother tongue learning as well as the African culture in general especially affecting young people.

There is also significant impact on our internal operations as a start-up. The business processes knowledge continues to be effectively implemented in day-to-day activities.

9 OVERALL ASSESSMENT

The creation of NatiV, an Android app that can be used for teaching children how to read Shona, has been possible and achievable using current state-of-the-art technologies. The app has been test-driven at local pre-schools in an effort to

1. Measure the way in which the children use the app – through observation (emotional reactions for example) and measurable quantities like time spent on the app and the number of mistakes being made in associating letters to sounds,
2. Learning how to improve the app from the way they interact with the app's objects, sounds, animations, and other constructs
3. Building the app, and exposing the learners to each new version after going through steps 1 and 2.

The three steps above summarize the lean method of creation which was used by the researcher. Further work is required in evaluating the app's effectiveness on language learning (the reading part).

There are several risks associated with the project. Mitigation methods have been thoroughly thought about. The table below addresses the risks identified.

| Question | Risk | Mitigation |
|--|--|--|
| Which functionality is most important to the project's intended purpose? | Letter-Sound Association | All levels must implement this |
| Which functionality is most visible to the user? | Ability to pick a syllable and/or sound | All levels must implement this |
| Which functionality has the largest safety impact? | Ease-of-use | All levels must implement this |
| Which functionality has the largest financial impact on users? | Number of levels present | Look for great developers who would like to contribute |
| Which aspects of the application are most important to the customer? | Syllable identification and Data Capturing | All levels must implement this |
| Which aspects of the application can be tested early in the development cycle? | Data Capturing and general Workflow (Navigation from Screen to Screen) | Ensure smooth motion |
| Which parts of the code are most complex, and thus most subject to errors? | Game logic, taking into account response time for dyslectic children | Consult where necessary |
| Which parts of the application were developed in rush or panic mode? | User interface for the first prototype | Graphics can always be edited later after satisfactory functionality has been achieved |
| Which parts of the requirements and design is unclear or poorly thought out? | None. Although I can say that the concept of the game is the same, the only challenge is to bring this in different, interesting and engaging ways to users | Engage different developers with different creative flavours |
| What do the developers think are the highest-risk aspects of the application? | Look and Feel and other factors contributing to the appeal of the app to users | Engage good graphics designers |
| What kinds of problems would cause the worst publicity? | Overstating the application's abilities, hence disappointing users | Be honest, highlight the positive facts about it |
| What kinds of problems would cause the most customer service complaints? | Connectivity. To counter this we are making a 'lite' version that does not need data connectivity | Create 'lite' version, and make sure networking on the corporate version is 100% |
| What kinds of tests could easily cover multiple functionalities? | N/A | |
| Which tests will have the best high-risk-coverage to time-required ratio? | Connectivity tests | Test often and in different environments |

The amount of time invested in this project is immense (over 4 years now) and we have taken a disciplined approach to implementing our research and business methodology. While it has all been worth it, it has been challenging due to the economic situation of the country. Nonetheless, we shall continue to move forward and share our experiences with Africa as we “zoom into a sustainable future”, which is our mantra as Purple Zoom.

10 RECOMMENDATIONS

We would like to thank the FIRE Programme and Staff for their continued effort to assist us in many ways to make our projects come to life. Our only humble request is to be allowed to work towards 100% completion of our objectives in light of the delays that were beyond our control and thus provide a final, more conclusive report with the observations we expect.

APPENDIX A - NDEBELE ALPHABET

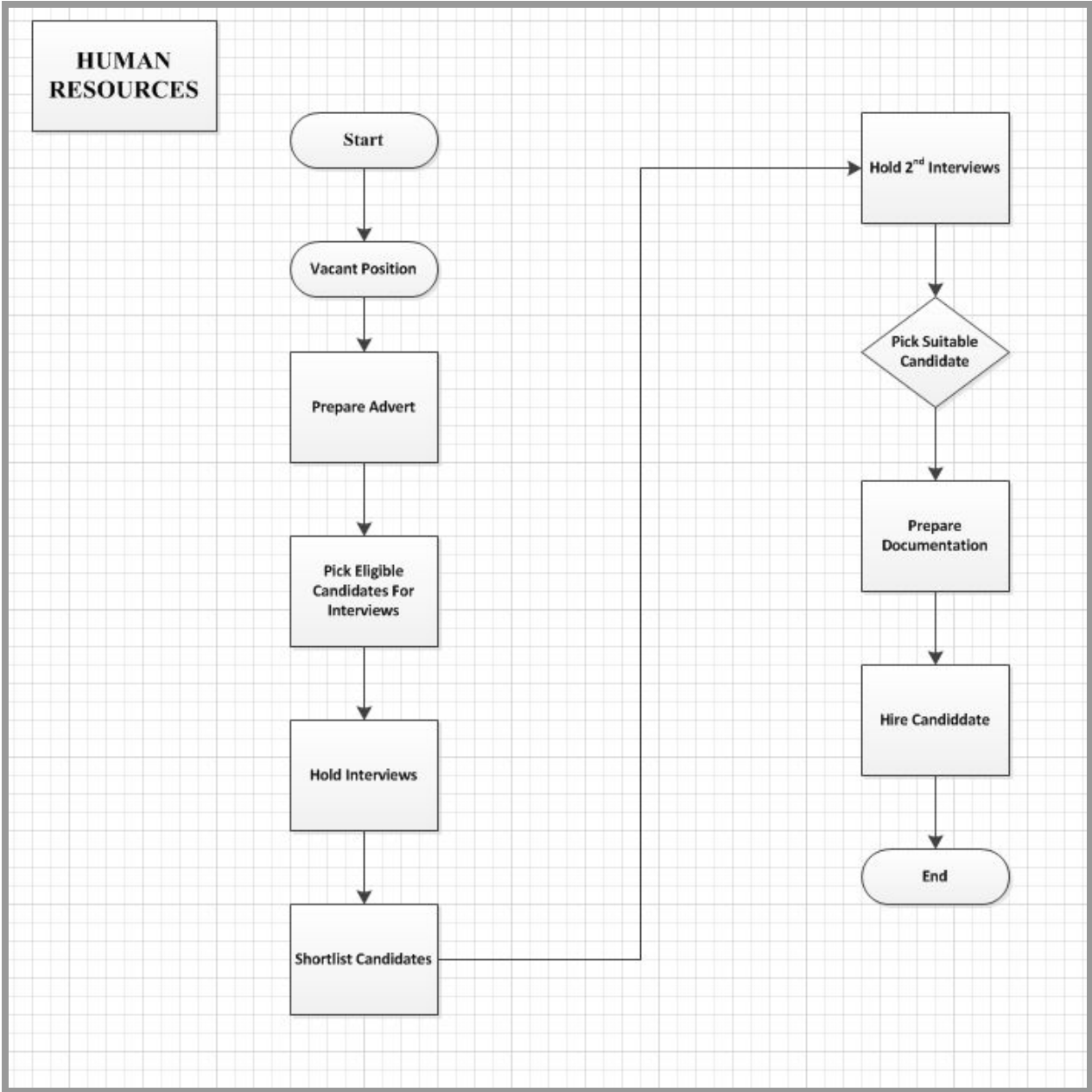
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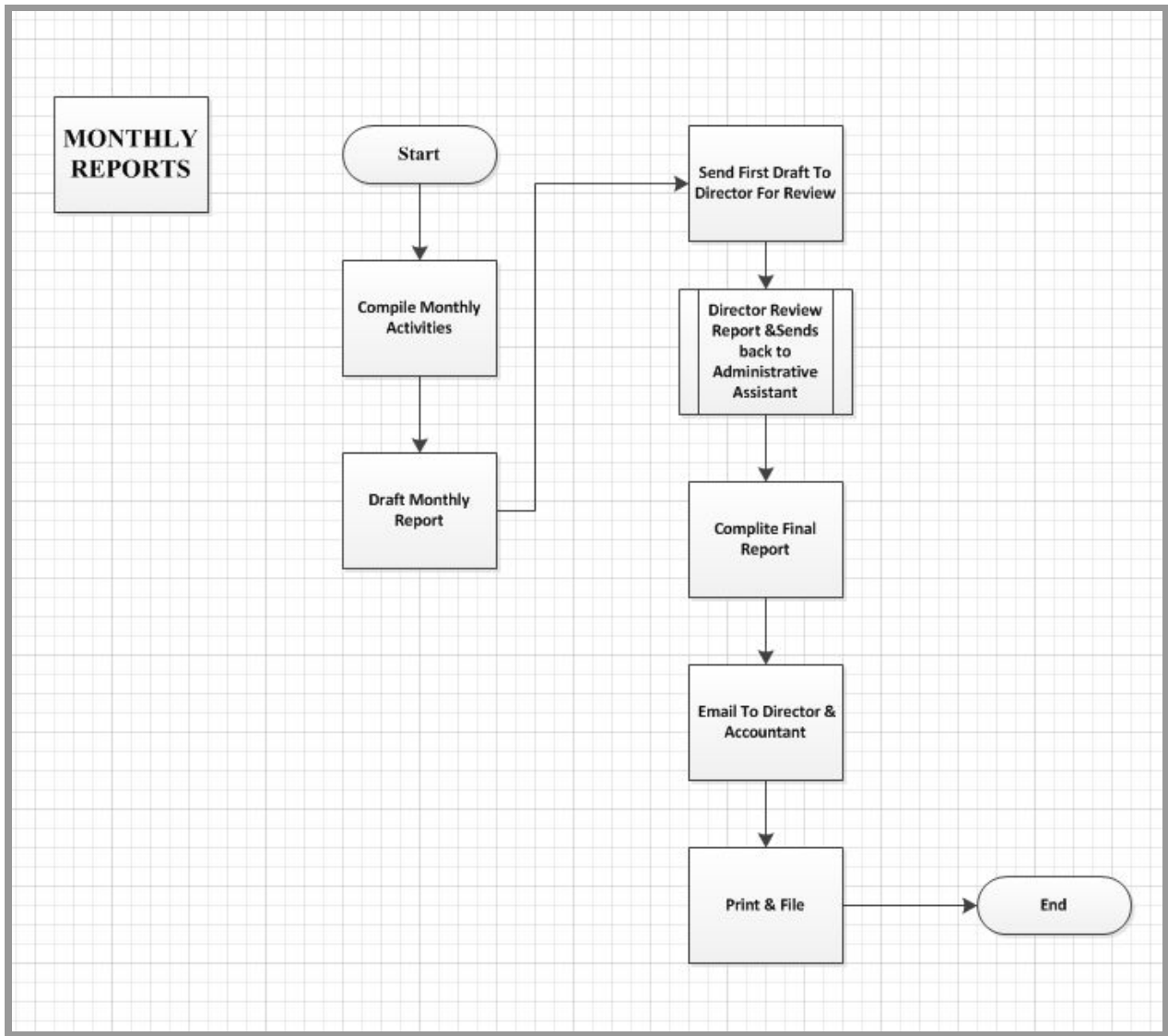
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APPENDIX B - BUSINESS PROCESSES

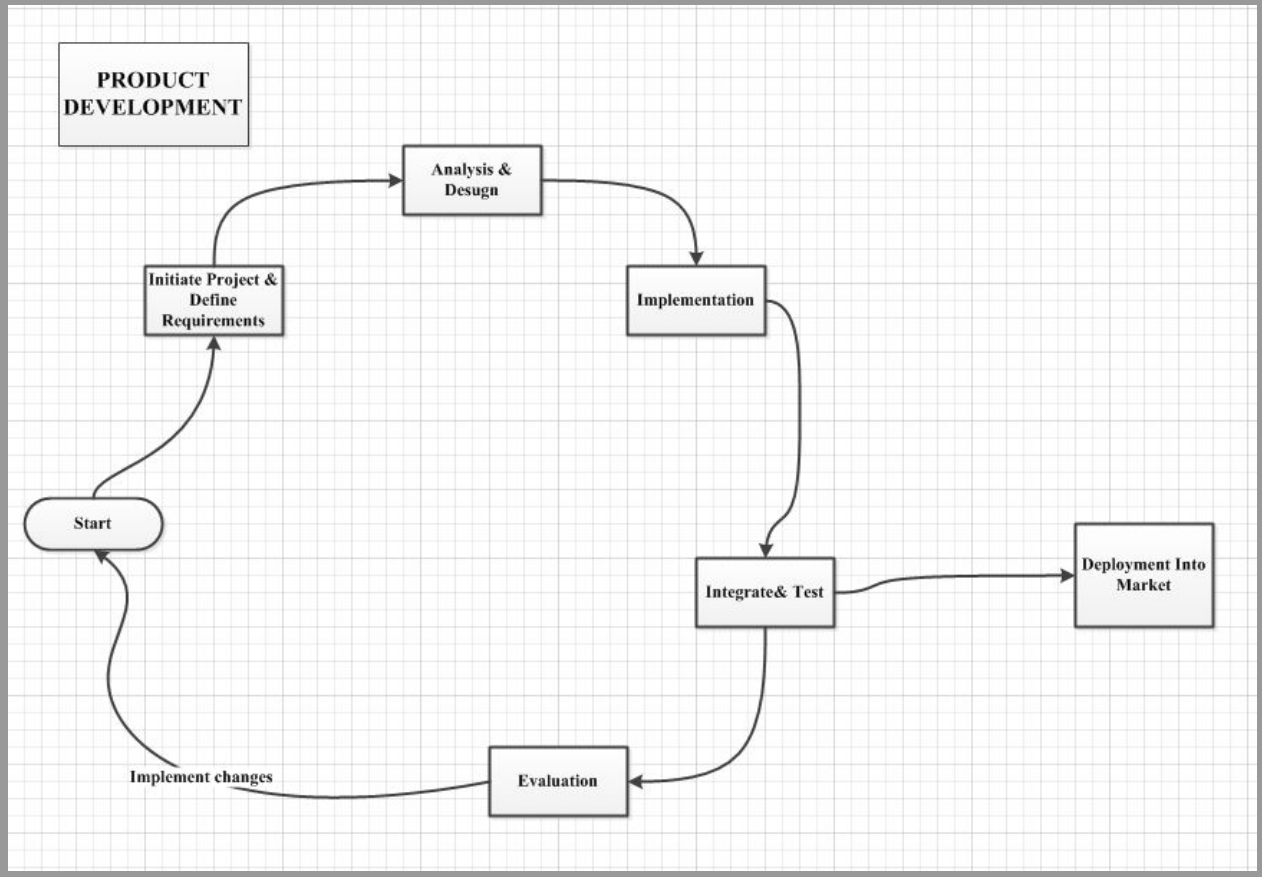
Human resources.



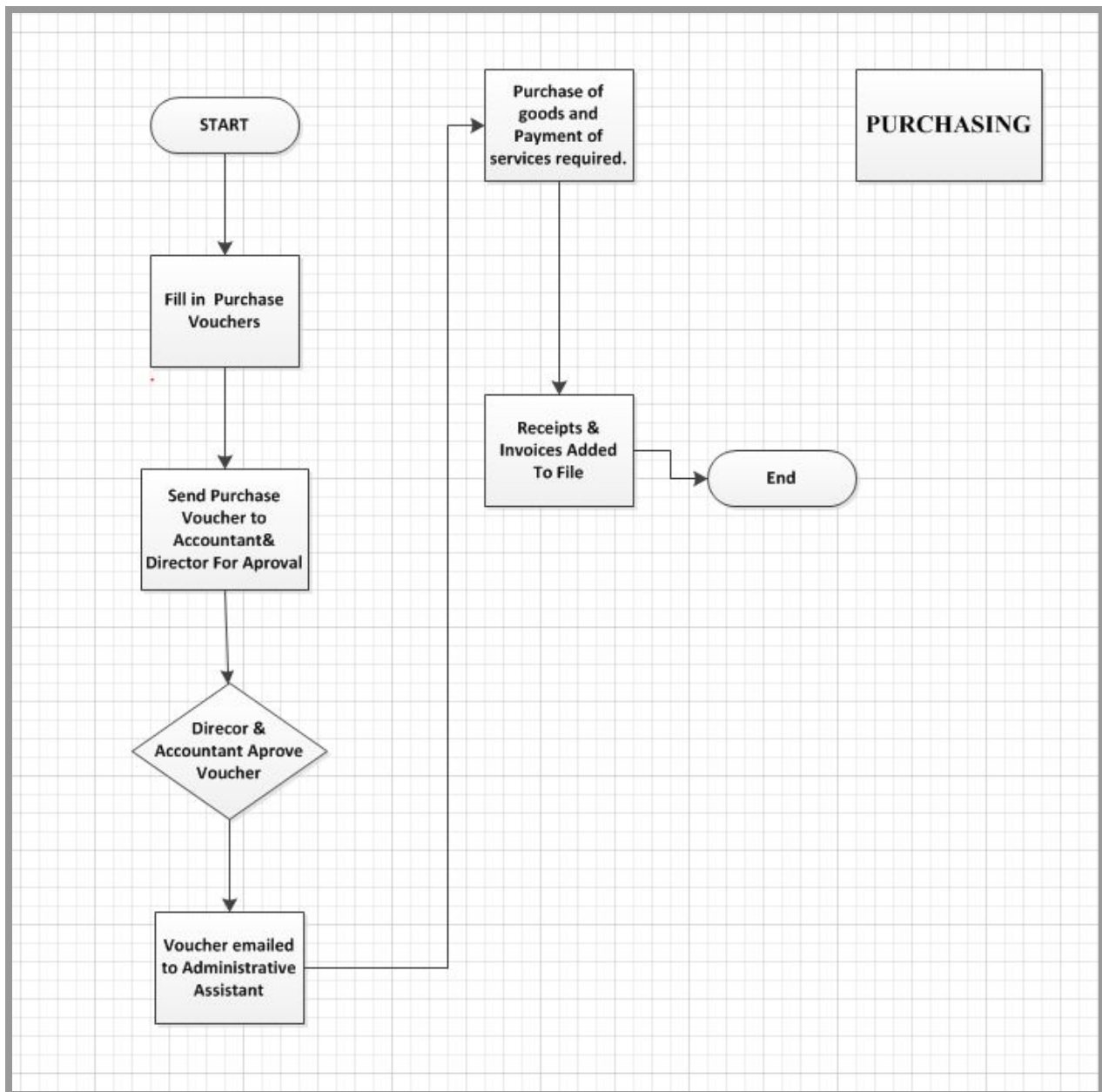
Monthly Reports



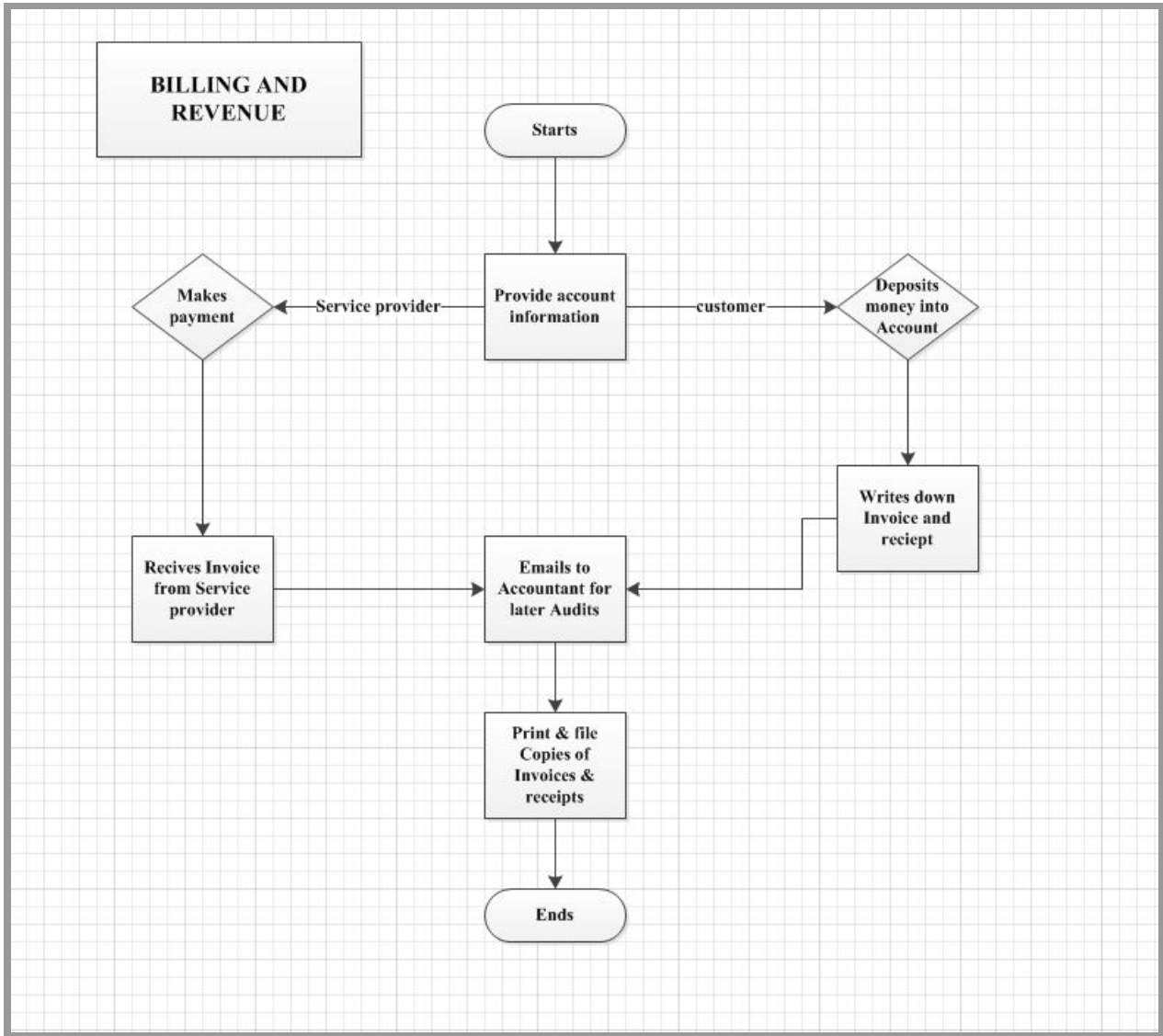
Product Development



Purchasing



Billing and Revenue



APPENDIX C - MARKETING STRATEGY AND M&E MATRIX

(Attached Separately)

APPENDIX D - PARENT'S CONSENT FORM

PARENT / GUARDIAN PERMISSION LETTER

(App-based mentoring for reading)

Dear Parent/Guardian:

Your child has been chosen to participate in the *NatiV Project* offered through their school. In the program, your child will be given an Android tablet that has applications to teach them how to read Shona. The app, called NatiV, will act as a tutor on how to read Shona, as well as act as a source of encouragement for them to keep learning. The activities between your child and the app will be closely monitored and structured by the Program Manager in charge of the project. The school feels that your child will greatly benefit from having such technology; and hopes that it will lead to increased academic (reading) performance, self-esteem, and emotional development.

The app has been thoroughly screened and investigated by *FIRE (Fund for Internet Research and Education)*. We respect your role as a parent/guardian and will provide every opportunity for you to analyze and test the app yourself and be involved in the continual development process.

As your child goes through the program, his/her teachers will monitor their reading performance. All information gathered about the effect of the app on your child's school performance is strictly for the purposes of evaluating the program and will be kept confidential.

We feel that this app will be making an excellent contribution to the quality of education in our school. If you would like your child to participate in the program, talk about it with them. If they are comfortable with the idea of having such an app, please grant your permission by signing below. One of our Program Managers will soon be in contact with you about your child's new Android tablet.

Thank you for your time. We hope this program will be of great benefit to everyone involved.

Sincerely,

School Principal

I give permission for my child, _____, to participate in the mentoring program at their school. I understand the nature and rules of the school's mentoring efforts and reserve the right to withdraw my child from the program at any time. I give permission for my child's school records to be released to the mentoring Program Coordinator in order to best support my child's achievement.

Parent/Guardian Signature

Date

Courtesy of The NatiV Project, *Helping You Learn Your Mother Tongue.*



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4. ZIM ASSET - Zimbabwe Agenda for Sustainable Socio-Economic Transformation (Accessed 09/01/2017) - <http://www.zw.one.un.org/resources/publication/zimbabwe-agenda-sustainable-socio-economic-transformation-zim-asset>

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