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MS Project Report
Submitted to the Faculty of the Department of Computer Science
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By

Daniel Otuo-Acheampong

In Partial Fulfillment of the Requirements
for the Degree of
MASTER OF SCIENCE

Computer Science

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Montclair State University
Graduate School

Title

A WEB APPLICATION TO DISSEMINATE REPATRIATION AND
TRAVEL INFORMATION ABOUT AFRICAN COUNTRIES

By

Daniel Otuo-Acheampong

The Supervisory Committee certifies that this *disquisition* complies with Montclair State
University's regulations and meets the accepted standards for the degree of


MASTER OF SCIENCE IN COMPUTER SCIENCE

Advisor: Dr. Vaibhav K. Anu

Co-advisor: Dr. Aparna S. Varde

05/23/2021

Date


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ABSTRACT

Africa is a continent with incredibly diversified cultures, landscapes, and people. Due its vastness, it can be difficult to assess accurate travel related information about African countries. The purpose of this project is to build a website that will serve as an African destination information insider. African countries are drawing people from all around the world, and this is evident in the formulation of initiatives to attract people to the continent during the past decade. Prime examples of these initiatives include Ghana's Year of Return initiative and Nigeria's door of return. This project, that entails the design and development of the Diaspora app (a web application), seeks to educate, and gather information that is needed by travelers to expose them to the nuanced, varied narratives and richness of the African continent.

In addition to providing travel related information, the Diaspora app is also targeted at individuals who are planning to repatriate to an African country. Repatriating to a different continent takes a lot of self-determination. Repatriation comes with its challenges and the Diaspora App is here to provide valuable resources and in-depth information for a smoother transplant to Africa. The design, experimentations, implementations, evaluations, and future work of the project are delved into to comprehend how this project can fulfill its purpose of helping people travel or move to Africa. Analysis of usability test feedback from a sample of Diaspora App users provided answers to key evaluation questions like "Are you looking to travel as a tourist or repatriate to Africa in the near future?" With feedback obtained from diverse users from nationalities including Nigeria, India, Cameroon, and Nepal, subsequent iterations of the Diaspora App will be improved and also include more countries and information.

Keywords – repatriation, web application, data analytics, human computer interaction, software engineering

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Website patrons for their valuable feedback about the app.

DEDICATION

I dedicate this project to all Africans in the diaspora, families looking to repatriate to Africa and to anyone looking to learn more about the African continent.

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1. INTRODUCTION

Every continent on Earth is unique. When it comes to Africa, its uniqueness lies in its vast lands, wildlife, people, and rich traditions that have persisted for centuries after centuries. Repatriating to Africa can be daunting. However, for people looking to repatriate, be ready to fall in love. The continent will not fail to win your heart over. There are enough reasons to visit or repatriate to an African country and the richness of the continent is one of them. From the flourishing rainforests in Congo and the marvelous warm coastline of Ghana to the ancient pyramids of Egypt, from the magnificent Victoria falls in Zimbabwe and Zambia, to the barely touched Omo River region of Ethiopia– the continent is grounded in ancestral knowledge, vast beauty, and richness and deserves a seat the table when it comes to repatriation and travel destinations. Human beings came into existence in Africa [1]. This is where human history began. Africans are tied to their older and long-gone generations and ancestors through their cultures, traditions, norms, and festivals. In most rural places in Africa, people hold dearly to their old beliefs and customs with pride and courtesy, sociability, and a shared spirit. They hold steadfast to commemorated ceremonies, fables that tell stories of ancient African empires and music and dance that goes back to Africa's golden days.

Traveling or repatriating to anywhere on the African continent can be a daunting challenge. This is a common reaction from many who have not been to the continent and are used to seeing it depicted in a negative light in the media, news, and popular culture. Hence, it is common that one often hears little about the shining lights of the continent: Mostly it is “Africa is risky”, “Africa is just for volunteering and safaris”, “not smart to travel to Africa alone”, “Africa is unclean and underdeveloped”, “Africa has diseases everywhere” etc. Nevertheless, Africa is one of those places that people are either captivated by or utterly terrified of the idea.

Unfortunately, the media bombards it more with striking images of diseases, war, crime, poverty, nepotism, bribery, corruption, and denigrating falsehoods all the time [2]. With little else to go on, it is common for people to naturally have a negative perception of Africa.

Africa is oftentimes thought of as a single place and as a country in the media and pop culture [3]. A striking example of such a misapprehension is the myth of ‘sub-Saharan Africa’. The 50 countries beneath the Sahara region consists of countries with extreme poverty with exception of a few according to most western media. Strips of land plagued with hunger. A place where the generosity of donors and volunteers are the only reasons why children survive infancy.

These are very far from the truth. For instance, observe any two countries from the arbitrary collective “Sub-Saharan Africa”. Ghana and Somalia as an example, the distance between these two countries is as far as Istanbul is from London. On a per-capita comparison, Ghana’s GDP is about 17 times that of Somalia, far greater than between the UK and Turkey [3][5]. Presently, if it were announced that the UK and Turkey are similar countries, it would be considered as untrue. However, when it comes to the countries on the African continent, prestigious organizations such as the World Bank and United Nations employ the term “sub-Saharan” all the time. This realization reveals a huge misconception that most travelers and expats are not aware of in this modern day.

The continent boasts of 54 countries, abundance of cultures, an estimated 1500-2,000 languages, and widely divergent landscapes with plateaus, mountains, ridges and basins with great rivers and depressions in-between. Africa is home to the largest desert on earth which is the Sahara Desert as well as the highest free-standing mountain in the world, Mount Kilimanjaro.

In the words of the former president of South Africa, Thebo Mbeki “Africa owes its beauty to the hills and the valleys, the mountains and the glades, the rivers, the deserts, the trees,

the flowers, the seas, the warmth of our sunshine, the heat of the midday sun, and the ever-changing seasons” [6]. Africa's beautiful landscapes are brought to life by the diverse wildlife present there, along with a sort of profound presence that adds so much depth and personality to the African wild. The continent is home to many magnificent animals, including elephants, rhinos, and lions. African safaris have become quite a travel cliché, but this does not take away from the beauty of an African safari. Watching wildlife in motion is at the Kruger National Park in South Africa is a sight to behold, so is communing with mountain gorillas in Uganda.

These wonderful facets define the face of the “motherland”. Clearly, there is a lot to see on the continent but most importantly, there is a lot to know about the continent and its 54 countries. This is where the goal of this project fits in:

“creating a website that informs people by providing current information and travel resources for traveling the countries on this vast continent.”

This is the main purpose of Diaspora App. The related goal is to explore informational resources in the top eleven countries that receive the most repatriates in Africa yearly which are Ethiopia, The Gambia, Ghana, Liberia, Mauritius, Nigeria, Rwanda, South Africa, Sierra Leone, Tanzania, and Uganda. This also, provides a way to scale the Diaspora project to include other countries in future updates.

2. BACKGROUND

This chapter discusses what it means to travel to Africa and highlights the positive narratives of Africa. It discusses the reasons why the Diaspora App comprises of the 4 sections namely: the country information, COVID-19 vaccine tracking, trivia section and resources section.

2.1. Repatriating and Traveling to Africa

There can be rigors when traveling in Africa, but the beauty of Africa can conjure up irresistible attractions among which are endless white beaches and relaxing resorts to compensate for the rigors. Would there be language barriers during travels; yes, there will be. Would there still be barriers after several months of repatriation; likely there would be. Despite the language barrier, this is part of the beauty of living, learning, and embracing a new culture which is different from anything ever experienced.

2.1.1. Africa in a nutshell

Music is more than a way of life in most African countries. It is an embodiment of past and current glory. As a traveler or an expat, one should get ready to feel it at these rhythmic destinations. Also, traveling African countries will help one hone their bargaining skill since bargaining is an integral part of trading in most of these countries. There are world-class hiking trails across Africa, which is appropriate for the continent where mankind first walked out of the jungle. Also, tourism is booming in Africa. Whilst in Africa, some of the best wildlife viewing on the planet is at your fingertips. The continent has countless enticing niche areas that are ripe for further tourism development. Some of these niches are safari tourism, business tourism; beach tourism, adventure tourism, diaspora tourism, domestic tourism, cultural tourism, and intra-regional tourism [7].

2.1.2. Changing the narrative of Africa through technology

A quick search of the word “travel” on Google images or unsplash images will reveal how biased the internet is when it comes to Travel. Only a few numbers of the resulting images would be about African destinations. Africa needs to maximize technology to promote the continent. According to United Nations World Tourism Organization (UNWTO), Africa member states should do their due diligence to ensure that technology and innovation are a priority for promoting tourism on the continent [8]. At the heart of the Diaspora App is to change the traveling narrative of African destinations through the internet by providing as much needed information to ensure that people are informed. Through the targeted efforts to effectively provide essential travel information of each African country alongside other resources, it is possible for the success of this project to tear down barriers and encourage conversation among travelers about what it means to Travel or move to Africa.

2.1.3. Developing countries in Africa are developing rapidly

The beginning of the past decade saw a lot of Africans leaving the countryside and flocking to urban areas in their legion [9]. The dynamic urban trend in these booming metropolises is on the rise. Many countries have had a consistent upward trend in GDP for a while. The population in Africa is the fastest growing in the world. It is expected to increase by roughly 50% over the next 20 years [10]. Some might consider this as a burden, while others might see this as a huge opportunity to establish businesses and companies on the continent . For example, Microsoft launched its first Africa Development Centre in Kenya and Nigeria, where young African talents can create solutions to provide value on a local and global scale. Recently, African countries opened their markets under the African Continental Free Trade Area

(AfCFTA) agreement [11]. This agreement allows African countries to trade goods and services across borders duty-free. The AfCFTA happened despite the COVID-19 pandemic.

2.2. A Modern View of the African continent

The past has not always been kind to African countries, despite that many Africans are embracing the future, bringing creativity and developments to the many cities and urban centers. There will be about 2.5 billion people living in Africa by 2050 [10]. This means by 2050, about 26% of the entire world's population will be in Africa. To help cope with this tremendous increase, African countries are working together and learning from each other to develop infrastructure that can support the population growth. More schools are being built; Free education policies are being implemented in countries like Ghana [12]. They are empowering themselves to succeed. Just like anywhere else on the planet, independent innovation as well as planned developmental strategies are going to be the keys to modernization.

2.2.1. Why the country information section

This section highlights 11 of the 54 countries in Africa and provide relevant travel information about them. There is a lot of misinformation on the internet and in the media, especially regarding African countries. Moreover, the increase in the number of information sources makes it hard to decipher what is factual, what is false, and what is propaganda. An absence of credible information can prevent travelers or expats from being informed accurately on particularly key issues of concern such as job opportunities, education, health, and local laws. This section is there to address this deficit.

2.2.2. Why the COVID vaccine section

COVID-19 is primarily a health crisis and a human tragedy now. The utmost pretentious countries in Africa are Egypt, South Africa, Ghana, Nigeria, and Algeria owing to their high

population. These countries recorded the highest number of commutative cases in Africa [13] and three of these countries are focused on in Diaspora App so far. Some African countries have good reasons to be skeptical of the COVID-19 vaccine. Some are haunted by the past problems with vaccines. However, they need to reconcile history with modern medicine, the facts, data, and truth. Tanzania's late president John Magufuli expressed doubt about COVID-19 vaccines sourced abroad, without offering any evidence [14]. Ignorance and fears should not be the reasons for to make decisions about not getting vaccinations. Many of those fears are due to false narratives doled out by conspiracy enthusiasts. The COVID vaccine section is there to ensure that the audience have the most up-to-date information about vaccines administered and to track COVID-19 cases in the country of interest. Vaccinations are important and they have been effective since at least the 1950s, and all groups have benefitted from them.

2.2.3. Why the African trivia section

The trivia section is an opportunity to learn more about African countries through an edutainment trivia. From questions about the Capital Cities to Work permits, this section is there to enrich a traveler's knowledge about African countries as well as provide the traveler with more insights of a particular African country.

2.2.4. Why the resources section

The resources section comprises of the following: African Narrative where there are external links to YouTube videos of Africans are telling their own story about their countries, African word of the week, African Proverbs, African Literature and novels and current news feed of the continent. Information about Africa essential to traveling or moving to continent cannot all be presented on the website. Therefore, this section is included in part to provide extra resources that may be peculiar to the expat or traveler.

3. DESIGN AND IMPLEMENTATION

This chapter describes the aesthetic decisions and functionality of each section of Diaspora App. Here the requirements to meet the purpose of each section of Diaspora App are explored. The technologies behind each implementation are defined. The resources needed for the organization of the components are defined and constructed. Although the process of design and implementation adopted in this project was sequential, they were not linear. This is because the designs and implementations also involved analysis which guided modifications to arrive at the latest design and implementation.

3.1. Early Design

The design of the web application evolved from preliminary experiments to the final state. From experimentations in mobile app to web application, earlier designs saw some intermediate states that came with their own challenges. A mobile application for the project was favored by the earlier designs.

3.1.1. Observations from early design

Figure 1 shows the mobile app design intended for the Diaspora App. The python mobile application development framework Kivy was investigated with in the earlier states of the project. Kivy was considered because it is a full-stack framework and a cross-platform mobile development tool. It is a full-stack framework because it allows the developer to create both frontend and backend application and cross-platform in the sense that the code can be run on all supported platforms whether it is on Linux, Windows, OS X, Android and Raspberry Pi [15]. Hence, for the intention of creating an application that can be easily accessed by users, a mobile application and Kivy looked like the path to go. However, Kivy presented its own challenges.

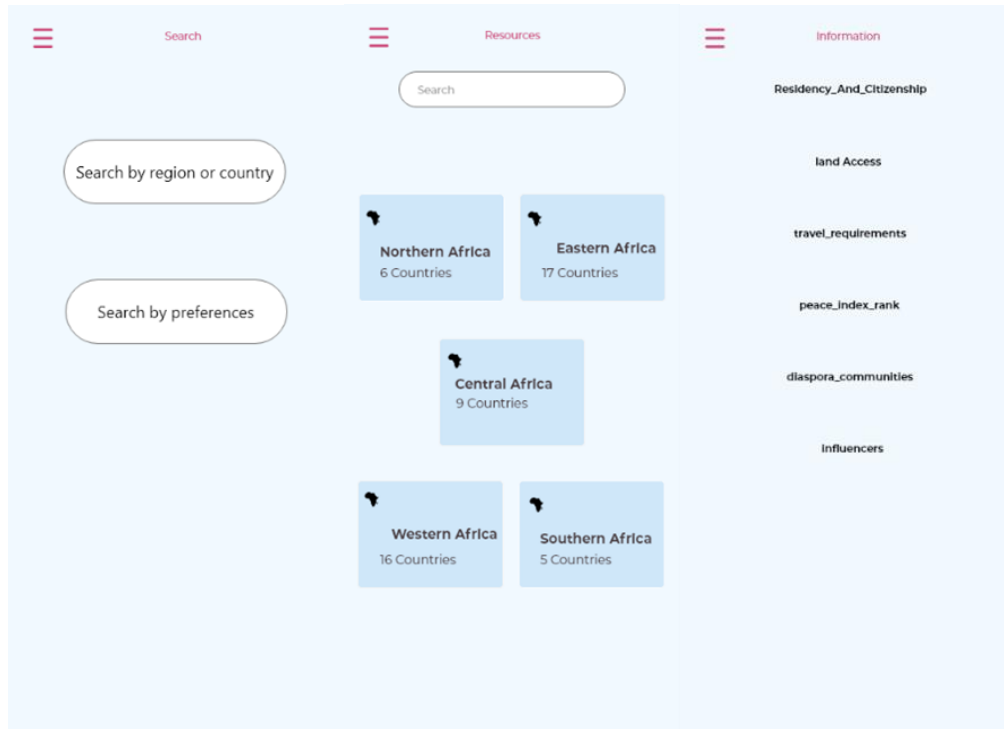
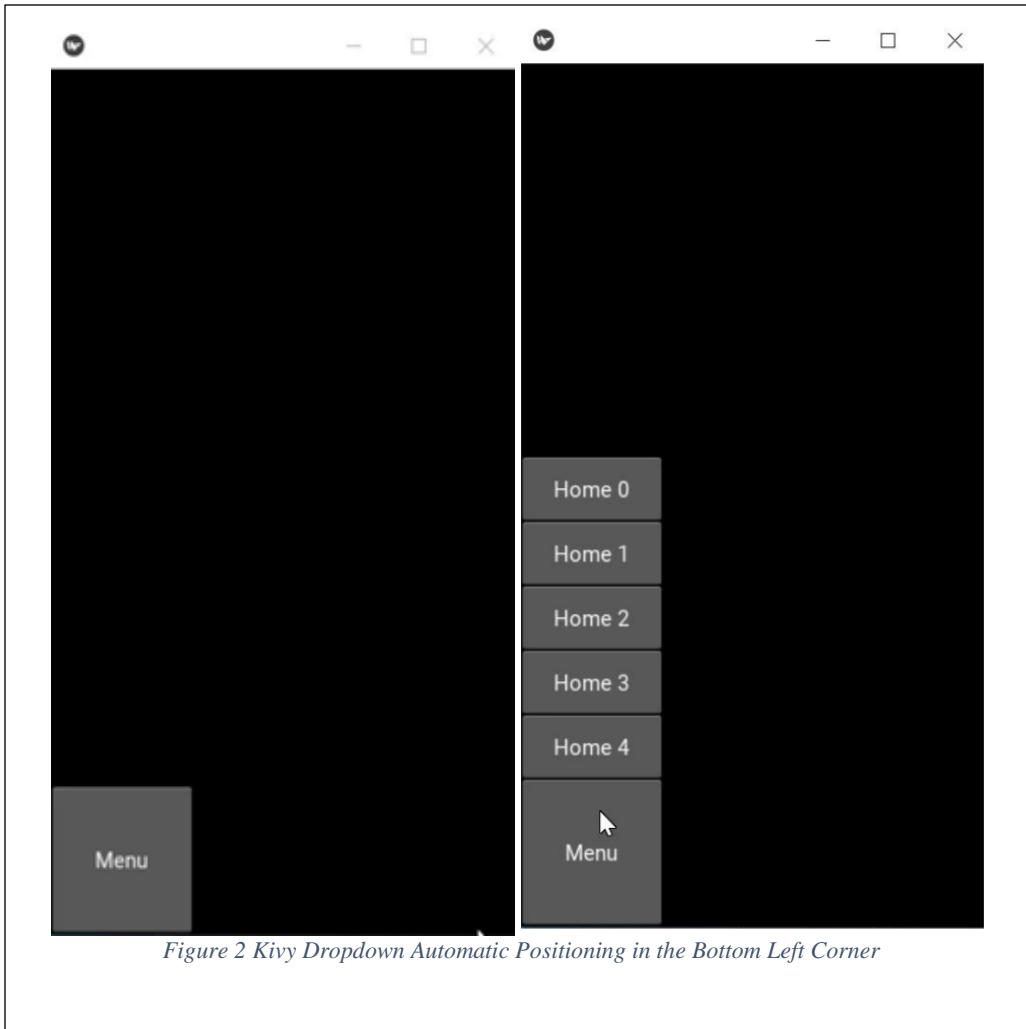


Figure 1 Mobile app design mockups

3.1.2. Recommendations and revisions after early design

The two main challenges faced when experimenting with Kivy were the user interface themes and the inadequate community support. Kivy community is not particularly large. Also, for a mobile application, the design required a dropdown menu to serve as a navigation mechanism. This is important because it makes the app intuitive to use and helps the user get value out of the app without struggling. However, in Kivy the positioning of the drop-down list is fully automatic and cannot be chosen to fit onto a particular part of the screen. Figure 2 depicts the random positioning of the Kivy drop-down menu. These posed a challenge whilst testing the project ideas with Kivy. For this reason, earlier designs using the Kivy platform, and a mobile application altogether were discarded for a web application.



Deciding to create the platform as a web application that can be accessed through a browser was the final decision regarding the design of the project. This was achieved by using HTML, CSS, and JavaScript. Due to limitations faced with using Kivy for the project, it was imperative to select and stick to a technology that could ensure completion and fulfilment of the project.

3.2. Final Design and Implementation

The main mechanism for navigating these three sections is by scrolling vertically from one section to another or by using the hamburger menu. It is done this way to mainly focused on maximizing usability and making the web application as easy to use as possible.

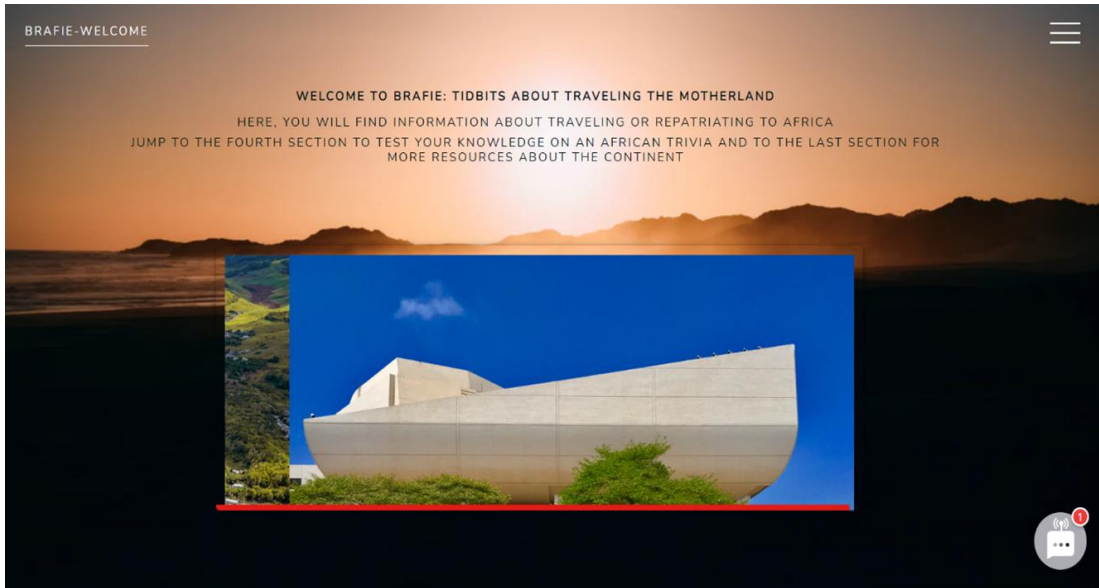


Figure 3 The Landing Page of the Diaspora App

3.2.1. Front End of the Diaspora App

The functionality of the web application is separated into four different sections that serve different purposes. These sections include Country Information section, African Trivia section, Coronavirus Vaccine Tracking Information section and the further resources section. The sections can be navigated by using the hamburger menu on the top right of the landing page of Diaspora App as shown in Figure 3.

3.2.2. Country information section of the Diaspora App

This section explores travel information and resources of the top 11 most repatriated countries in Africa in the last decade. With the aim of creating an interface that users find easy to use and pleasurable, Adobe XD was used to mockup a design that can get the task done with minimum effort. This section serves two main purposes. The first purpose of this page is to provide a visual representation of the African continent through an interactive map. The dynamic and interactive behavior of the map allows users to retrieve information from the countries on the map. The African map was built from scratch to ensure there is enough flexibility to implement

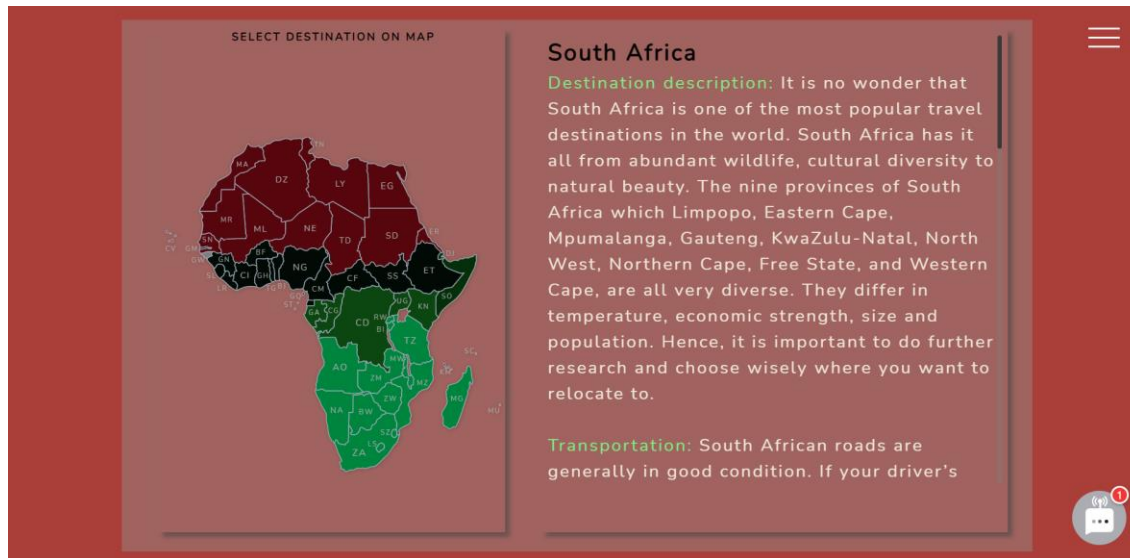


Figure 4 The Country Information Page of the Diaspora App

new features on the map in future iterations. The second purpose of this section is to show the retrieved information in the form of a modal that is appealing and intuitive. Figure 4 shows the information displayed when a country is selected. Hovering over the map highlights the country and shows the country's name as well.

3.2.3. COVID Vaccine tracking section of the Diaspora App

The COVID-19 Pandemic has brought about a lot of restriction in terms of traveling. More importantly, it has led to a huge desire for safety among citizens near or in COVID-19 affected areas [16]. The purpose of this section is to provide information about African countries administering the coronavirus vaccine. As more distribution, authorization, approval, and access of the vaccine increases in countries across the globe, there will more data to track vaccination rates for many African countries. The vaccination dataset is open access and uses the most recent official numbers curated by Our World of Data - a scientific online publication that focuses on large global problems such as poverty, disease, hunger, climate change, war, existential risks, and inequality. The data is updated by Our World of Data, with the most recent official numbers

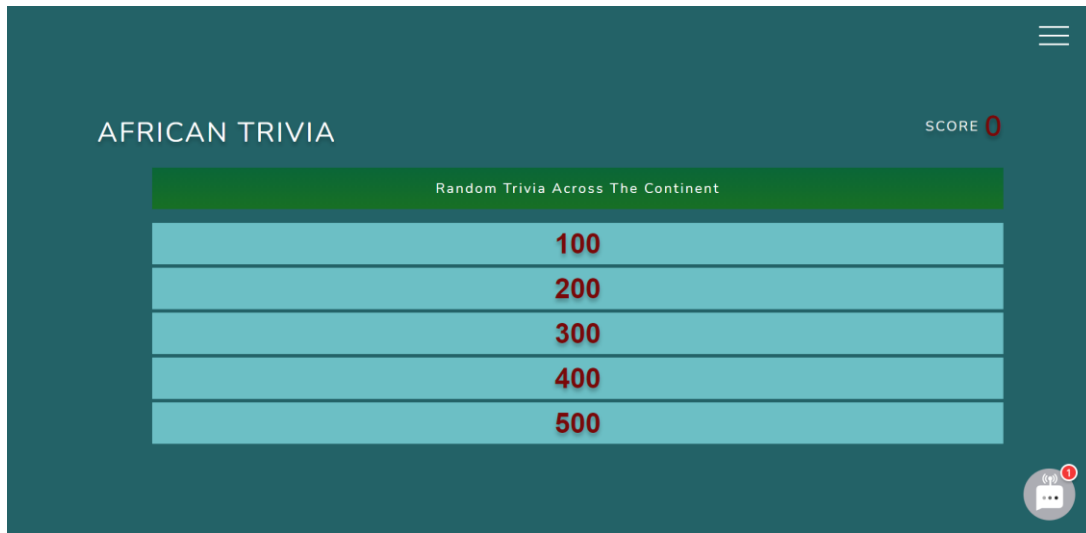


Figure 6 The Trivia Section in the on the Diaspora App

up to the previous day collected from governments and health ministries worldwide. The COVID chart below is updated frequently based on new data from Our world of Data. Figure 5 represents doses administered as of Apr 21, 2021.

It shows the total number of vaccination doses administered. This is counted as a single dose and may not equal the total number of people vaccinated, depending on the specific dose regime (example people who receive multiple doses). It also shows the total population of each country selected and the current number of active cases in that country. Countries selected for vaccine tracking were chosen from the list of countries whose destination information are shown in the country information section of the website. Charts for 9 out of the 11 countries are displayed since two countries Tanzania and Liberia are yet to have any vaccination records. Data wrapper was used to clean and analyze the vaccination data to get more insights into the rate of vaccination in these selected countries.

3.2.4. African Trivia Section of the Diaspora App

This section serves as an edutainment in the form of a trivia game. It is inspired by the famous jeopardy game in terms of the logic behind it and the structure of the game. The game

```
names = [{"african_category": {"id": 1, "title": "Random Trivia across the continent", "clues_count": 10,
                              "clues": [
                                {"id": 25,
                                  "answer": "Lesotho",
                                  "question": "Which country is completely landlocked by South Africa",
                                  # "value": 1000,
                                  "category_id": 4483
                                },...,
                                {"id": 26,
                                  "answer": "Lake Volta",
                                  "question": "Which is the largest lake in West Africa",
                                },
                              ]
        }
    ]
}
```

Figure 7 The Data Structure for Trivia Clues

consists of one category which is the African region. The region has a set of questions and answers pertaining to the countries in Africa. The game features a board as depicted in figure 6. The board shows the clues for the category, an invincible modal that contains the prompt and reveals itself when a clue is selected, a form for text input and a button to submit the form. Upon answering the prompt correctly, the score increases. The correct answer is shown to the user if the answer is incorrect.

The game uses data from the API to populate the trivia questions. Upon loading the page, the rows for each column in the game is populated by random questions and answers from the Africa category in the API. The data structure for the game is shown Figure 7. It has 2 parts: Category and Clues. Category is an array and within the array is an object. The object has a title and a list of clues with an id. Each clue has a unique id that corresponds to the Clues dataset. In the Clues dataset, there is a question and answer for each clue. This flat data structure makes it simple to look up clues from one central spot and as the data gets larger and more categories are added, this pattern will be easier to work with. Overall, there are 28 questions and answers for the African category.

```

1 from flask import Flask, request, jsonify
2 from flask_cors import CORS
3
4 app = Flask(__name__)
5
6 CORS(app, support_credentials=True)
7
8
9 category = {"africa_Category": {"id": 1, "title": "Random Trivia across the continent",
10                                "clues": [
11                                    {"id": 25,
12                                     "answer": "Lesotho",
13                                     "question": "Which country is completely landlocked by South Africa",
14                                     # "value": 1000,
15                                    },
16                                    {"id": 26,
17                                     "answer": "Lake Volta",
18                                     "question": "Which is the largest lake in West Africa",
19                                     # "value": 1000,
20                                    },
21                                    ]}}
22
23 @app.route("/category/<string:name>")
24 def get(name):
25     return category[name]
26
27 if __name__ == '__main__':
28     app.run(debug=True)

```

Figure 9 The API for Trivia

3.2.5. Backend of the Diaspora App

For the trivia to function, an API is needed to make HTTP calls to the server to get data to populate the dynamic parts of the web application. Hence, a simple RESTful API was built with the python micro framework called Flask. Flask was selected to serve the back end of the web application because it provides simplicity, flexibility, and fine-grained control [17]. Flask makes creating API very simple as shown in Figure 8.

Figure 9 is the code for shuffling the trivia clues that are to be answered by the user.

```

180
181
182
183 // https://stackoverflow.com/q/6274339/11838734
184
185 function shuffle(a) {
186     var j, x, i;
187     for (i = a.length - 1; i > 0; i--) {
188         j = Math.floor(Math.random() * (i + 1));
189         x = a[i];
190         a[i] = a[j];
191         a[j] = x;
192     }
193     return a;
194 }
195
196
197
198

```

Figure 8 Shuffling Algorithm

4. EVALUATION

To assess the functionality and overall quality of the user experience and content provided, a usability testing was conducted to gain feedback from a sample of potential users. The result from the usability test is imperative for the next iteration and future developments of the website. The section delves into the feedback from the usability test taking into consideration each question asked and the corresponding response for the usability test takers. The usability test had 11 questions with 3 of these questions being open-ended questions. 5 of the usability test questions required a star rating, 2 of the questions were close-ended matrix questions that required ranking resources by their importance and 1 question was a multiple-choice question. There were 39 responses from the usability test and data from the responses were analyzed. The first data collected in the usability test comes from the first usability test question which asks whether “the audience is looking to repatriate or travel to Africa in the near future”. Figure 10 shows the total responses for the first question. There were 38 responses out of the 39 usability test takers. 63.2% of the responses said “Yes” to the question prompt whilst 18.4% responded with a “No”. 18.4% of the usability test takers sat on the fence with a “Maybe”.



Figure 10 Feedback about whether test responders are looking to repatriate to Africa

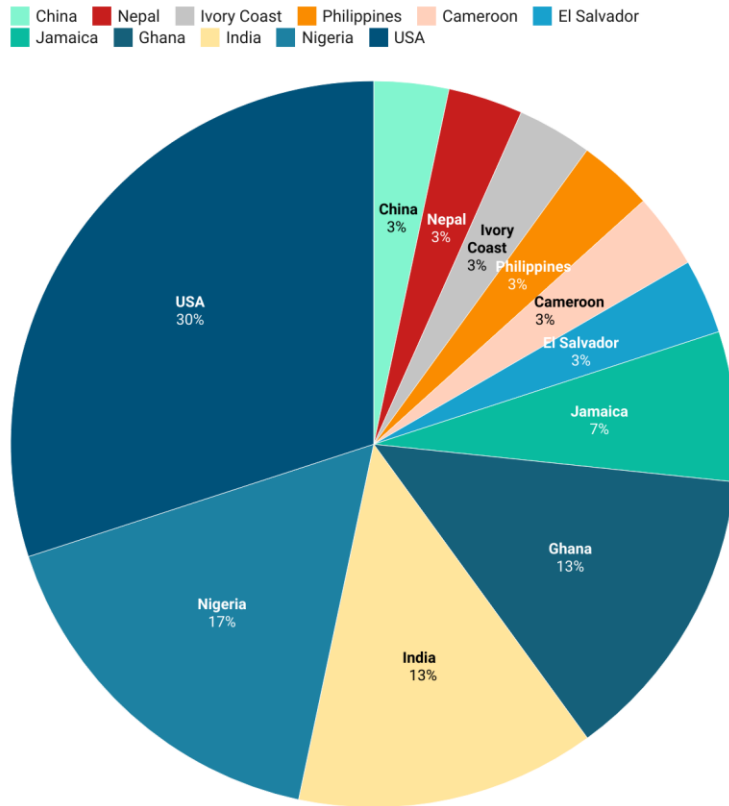


Figure 11 Feedback about Nationalities of Usability Test Responders

The second question in the usability test asks about “the nationality or country of origin” of the usability test takers of which there were 30 out of 39 responses. The question was optional to answer which can explain the low number of responses. Nevertheless, the 30 responses revealed the diversity among the responders as portrayed in Figure 11. With 30 answers, 9 people are of American origin, 5 are from Nigeria, 4 are from Ghana, 1 Cameroonian, 2 Jamaicans, 1 from Nepal, 1 from Ivory Coast, 1 from Philippines, 4 from India, 1 from China, 1 from El Salvador.

The third data analyzed is from the usability test matrix question to rank “the country destination information for when repatriating or moving to Africa”. The rank involved the following three criteria: important, very important and not important. The result from the matrix is important to determine information that needs to be provided to the audience and information

that is least required. From the 37 responses, “Safety” with a percentage of 83.8% and “Local Laws” with a percentage of 81.1% are deemed the most important to the audience when moving to an African country. On the other hand, “News and Trends”(22.2%) and “Climate” (19.4%) are the least important information needed by the audience. Figure 12 also indicates how important Security is to people looking to repatriate to Africa. Countries that lack stability usually have the least number of visits and is also a solid indicator of the country’s conditions for sustainable development.

	Important	Very important	Not important
Security	24.3%	75.7%	0%
Safety	16.2%	83.8%	0%
Climate	55.6%	25%	19.4%
Local laws	16.2%	81.1%	2.7%
Entry Exit requirements	40.5%	51.4%	8.1%
Education	35.1%	59.5%	5.4%
Job opportunities	18.9%	73%	8.1%
News and Trends	58.3%	19.4%	22.2%
Economy	27%	67.6%	5.4%
Language	54.1%	35.1%	10.8%
Community	40.5%	54.1%	5.4%
Culture	47.2%	50%	2.8%
Taxes	37.1%	48.6%	14.3%

Figure 12 Feedback about the criteria that test responders found more important when repatriating to a new country

The fourth data analyzed is from the usability test matrix question to rank “the country destination information for when traveling to an African country” based on the same three

criteria. There was a total of 33 responses to this question. Security and Safety with percentages of 87.5% and 84.8% respectively, were selected as the most important information needed whilst climate and Job Opportunities were deemed as the least important information for travelers. From figure 13, it can be seen that local laws are not as essential to people who are traveling compared to people who are seeking to repatriate. This can be attributed to the fact that repatriates normally move to a country permanently and hence have a duty to abide by the local laws.

	Important	Very important	Not important
Security	12.5%	87.5%	0%
Safety	15.2%	84.8%	0%
Climate	36.4%	33.3%	30.3%
Local laws	28.1%	65.6%	6.2%
Entry Exit requirements	24.2%	66.7%	9.1%
Education	34.4%	43.8%	21.9%
Job opportunities	15.6%	53.1%	31.2%
News and Trends	58.1%	25.8%	16.1%
Economy	31.2%	56.2%	12.5%
Language	51.5%	30.3%	18.2%
Community	33.3%	51.5%	15.2%
Culture	39.4%	57.6%	3%
Taxes	24.2%	33.3%	42.4%

Figure 13 Feedback about the criteria that test responders found more important when traveling to a new country

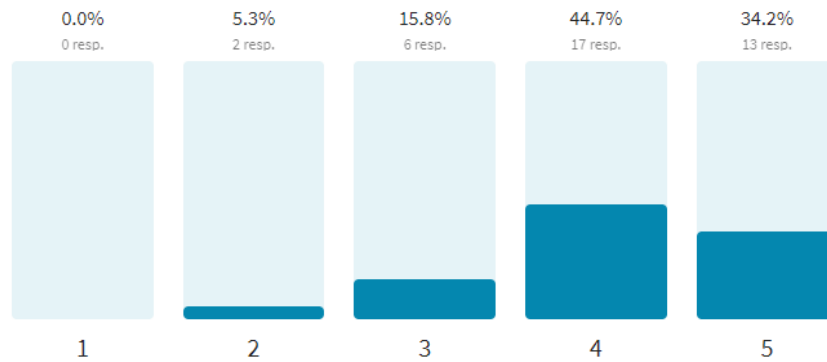


Figure 14 Feedback about the usefulness of the menu of the Diaspora app on a scale of 1-5 (1 being lowest and 5 being highest)

The fifth data was obtained from the star rating responses given to the usefulness of the “Menu” navigation of the entire website, with the highest rating being 5 stars. There was a total of 38 responses with an average rating of 4.1 stars as depicted in figure 14.

Figure 15 shows the star rating responses to the usefulness of the travel information section of the website. There was a total of 38 responses with an average rating of 4.0 stars. The two 2-star ratings can be attributed to the absence of some popular travel destinations and other essential resources.

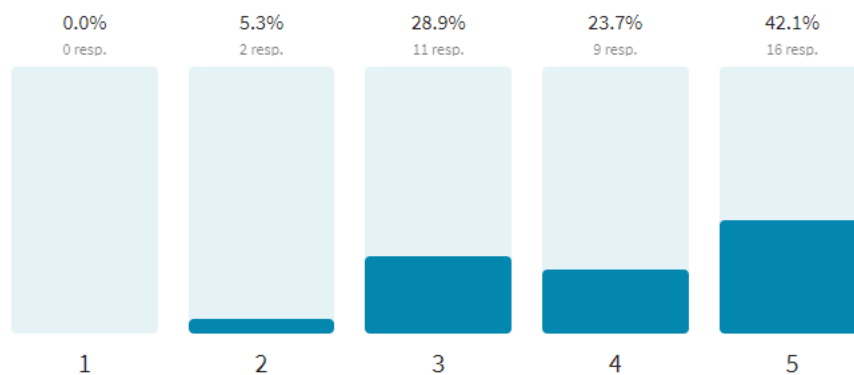


Figure 15 Feedback about the usefulness of the travel information section of the website on a scale of 1-5 (1 being lowest and 5 being highest)

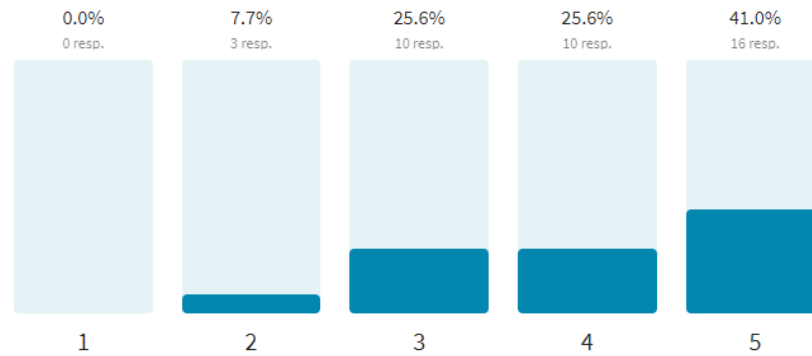


Figure 16 Feedback about the usefulness of the COVID vaccine information section of the website on a scale of 1-5 (1 being lowest and 5 being highest)

Figure 16 shows the star rating responses to the usefulness of the COVID vaccine information section of the website. There was a total of 39 responses with an average rating of 4.0 stars. The responses indicates that there is room for improvement in this section. For instance, more countries need to be added to the sample and the importance of the COVID-19 vaccine should be emphasized in this section.

The eighth data was obtained for analysis from the star rating responses to the Africa trivia section of the website as indicated in figure 17. There was a total of 32 responses with an average rating of 3.8 stars. This section has the lowest rating from the entire feedback, with 15 responses giving it a star rating of 3. This might be due to the smaller number of travel related questions in the trivia and the correlation between the questions and repatriation.

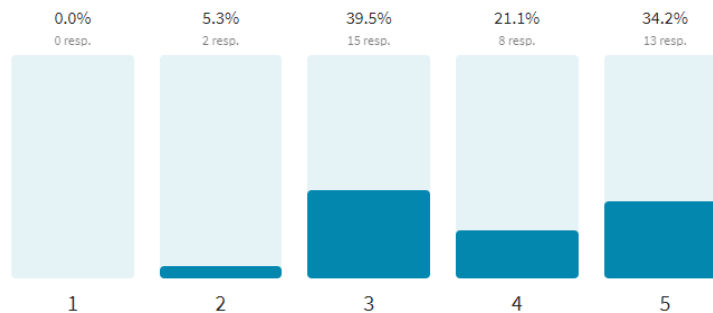


Figure 17 Feedback about the usefulness of the African trivia section of the website on a scale of 1-5 (1 being lowest and 5 being highest)

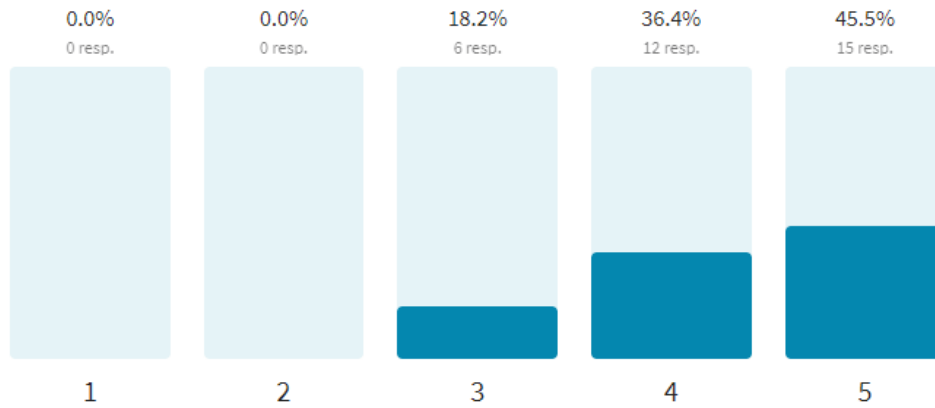


Figure 18 feedback about the quality of the user experience of the entire website

The final data collected from the usability test for analysis was retrieved from the star rating responses to the quality of the user experience of the entire website as shown in figure 18. There was a total of 33 responses with an average rating of 4.3 stars. The low number of responses to the question can be attributed to the lack of explanation to what a user experience means.

5. RELATED WORKS

Traveling to Africa can be traced back to the earliest 19th century throughout colonialism with countries such as South Africa, Tanzania, Swaziland, Egypt. Neither is repatriating to Africa a new movement. On February 6, 1820, the first group of African Americans to resettle in Africa departed from New York. African Americans envisioned the West African nation of "Liberia" as their new home in Africa [18]. In the early 1920s, Marcus Garvey, the Jamaican activist, publisher, and orator was heavily involved in promoting the repatriation of African Americans to Africa. His message which still resonates to a lot of people today, is a big inspiration for people to repatriate to Africa.

The narrative of Africa is changing, and the “African brand” is becoming more accepted across the globe. People are gaining interests in Africa through several avenues such as sports, new developments, political stability, among others. Many African countries are in transition from agricultural to manufacturing and service economies. Technology usage is on the rise in Africa. More startups are springing up on the continent and providing value to the people. More studies are being done about the continent to better understand its resources and ecosystem through data science. In Uganda, mobile money financial transactions are changing the way business is done by carrying out profitable self-sustaining small businesses without involvement of the big bank [19]. Morocco constructed the largest concentrated solar facility in the world with the hope of achieving 52 percent renewable energy mix before 2030. For the first time more people are getting involved and discussing climate change like it has never been seen before. Big data is increasingly being seen as a way to tackle problems on the continent including the effects of climate change. One big data study that can be beneficial in combating the threat of climate-change involves a mobile application that displays Sub-Saharan precipitation patterns [20].

The repatriation destination potential of Africa has resulted in several works being done to explore the continent and the potential it has. In her book “How to move to Africa”, Bridget Boakye discusses the challenges of moving to Africa and how to successfully navigate these challenges and establish a home on the continent [21]. “African American in Africa” is another avenue for African repatriation resources as they capture the experience of African Americans living in Africa [22]. Lastly, like this project has demonstrated, local laws are essential to traveling and repatriation and a recent study about disseminating urban policy knowledge for smart governance explores how technology can be used to understand local laws in urban areas [23].

6. CONCLUSION AND FUTURE WORK

Africa is of its own, but it is a world of different countries with a lot of similarities as well as great difference. From unique cultures and traditions to the continent's untapped potential, African countries have a lot to offer for people looking to visit or repatriate in the future. There are many divergent cultures, developed from each country's history, and uniqueness. The expectations of the Diaspora App are to gather resources and information for people seeking to travel or move to the continent.

Several Africa countries have gently opened their arms to their African diaspora to return to their home countries. More African countries are making it easier for people to gain entry visas to their countries. More expat communities are spinning up in major African countries, encouraging more people to repatriate to the continent. Some even believe Africa is future destination of expats because of its untapped potential. There is more to what makes Africa attractive and appealing to travelers and expats in general and the Diaspora App seeks to aid in any traveler's transition to traveling or moving to Africa now or in the future.

However, the Diaspora App has more room for improvement in terms of user experience, more opportunities for scalability in terms of expanding the scope of information provided and more modifications needed to be done. These developments when done, will increase the number of audiences to the website and will provide impactful value to the people who patronize the website. The requirements needed for the project to reach the next level are elaborated in detail in the future works and the expected milestones for the project are clearly defined. The technology stacks chosen for the project are enough to mitigate any future challenges regarding new implementations and scaling.

From the usability test results and feedback, it is important to take into consideration the necessary modifications that were suggested. Hence, the next iteration will address these modifications and, implement features that would improve the user experience in terms of color choices, contrast between fonts and background. The sections and figures on the website will be optimized for all mobile phone and tablet screens. Font sizes in the landing page will be increased to make words more prominent to visitors.

Secondly, to get improved feedback from the audience the usability test must be upgraded. Character limit should be increased for open ended questions and fonts must be optimized for all screens. The questions and answers will be modified to allow flow in the answer choices especially the matrix questions. Also, some of the usability test questions will be replaced with questions that are clear and much more understandable. An option for an “other” feedback must be included to give the audience more flexibility to share more opinions about the website.

Moreover, as a travel destination insider for Africa, the website would need more countries to be added in the next iteration. The vast amount of data that can be collected for the other 44 countries that are not in the top 11 destinations provides an opportunity for scaling the application. Besides adding more countries to destination information section, the COVID-19 vaccine tracker must be monitored and updated for each new country added. Addition of other metrics to the country information would be considered in the next iteration as well.

Furthermore, more analysis will be added to the COVID vaccine tracking to make the section more helpful and meaningful. For instance, instead of only charting the number of COVID vaccine doses administered in each country, it will be more beneficial to show the percentages of doses administered per a certain number of people within a given population.

Also, the number of trivia questions will be increased to reduce the probability of the same questions repeating many times. More of these questions would be tailored towards travel and repatriation as way of providing more information on the African countries. A reset button will be implemented to avoid reloading the whole website just to restart the trivia. Moreover, to make trivia more friendly to an audience seeking to learn more about the continent, multiple choice answers rather than an input answer to each question, would be more appropriate and educative for the audience.

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