**PROJECT END REPORT**

**Project: AI Customer Analyzer**

**Group: 19**

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| Author: Gunarakulan Gunaretnam (Project Manager) | | |  | |
| Owner: Dr. Yasas Jayaweera (Project Executive) | | | |  |
| Client: DreamSpace (Private) Limited  Project Manager: Gunarakulan Gunaretnam (2208408)  Startup Manager: Sangeetha Thangavadivel (2135801)  Risk Manager: Haritha Thavarajah (2211320)  Schedule Manager: Mathumitha Arasakulasoorian (2211336)  Quality Manager: Delaxsan Raj Sathiyanesan (2211294) | | | |  |
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# 1 End Project Report History

## 1.1 Document Location

This document is only valid on the day it was printed.

The source of the document will be found on the project's PC in location

## 1.2 Revision History

**Date of this revision:**

**Date of Next revision:**

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| **Revision date** | **Previous revision date** | **Summary of Changes** | **Changes marked** |
| 06-02-2023 |  | First issue |  |

## 1.3 Approvals

This document requires the following approvals.

Signed approval forms are filed in the Management section of the project files.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Signature** | **Title** | **Date of Issue** | **Version** |
| Dr.Yasas Jayaweera |  | Project Executive |  |  |
| Gunarakulan Gunaretnam | A picture containing text, hydrozoan, night sky  Description automatically generated | Project Manager | 24-02-2023 |  |
| Kishoth Navaretnarajah | Shape  Description automatically generated | Client | 24-02-2023 |  |

## 1.4 Distribution

This document has been distributed to:

|  |  |  |  |
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| **Name** | **Title** | **Date of Issue** | **Version** |
| Gunarakulan Gunaretnam (2208408) | Project Manager | 24-02-2023 |  |
| Sangeetha Thangavadivel (2135801) | Startup Manager | 24-02-2023 |  |
| Haritha Thavarajah (2211320) | Risk Manager | 25-02-2023 |  |
| Mathumitha Arasakulasoorian (2211336) | Schedule Manager | 24-02-2023 |  |
| Delaxsan Raj Sathiyanesan (2211294) | Quality Manager | 24-02-2023 |  |

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## 01 Project Manager’s Report

### 1.1 Project Information

* **Name of the project:** AI Customer Analyzer
* **Client Information:** 
  + Name: Kishoth Navaretnarajah
  + Address: 7A Saravana Rd, Kallady 30000, Batticaloa.
  + Email: kishoth@dreamspace.academy
* **Project Management Team:** 
  + **Project Manager:** Gunarakulan Gunaretnam (2208408)
  + **Startup Manager:** Sangeetha Thangavadivel (2135801)
  + **Risk Manager:** Haritha Thavarajah (2211320)
  + **Quality Manager:** Delaxsan Raj Sathiyanesan (2211294)
  + **Schedule Manager:** Mathumitha Arasakulasoorian (2211336)
* **Project Management Group**: Group-19
* **Project Start Date**: 28 Jan 2023
* **Project End Date**: 24 March 2023
* **Total Budget:** LKR 2284000/-

### 1.2 Product’s Performance

**Accuracy:** The system accurately counts the number of visitors, and provide accurate predictions of age, gender, emotions, and race. It provides 80% of accuracy in counting visitors and faces attribute predictions.

**Speed:** The system operates in real time. The speed of the system's operation ensures that DreamSpace can respond promptly to any issues that arise and make real-time decisions based on the gathered data.

**Reliability:** The system is more reliable and operates consistently without downtime or system failures.

**User-friendliness:** The system should have a user-friendly interface allowing the system’s admin to analyze gathered data in the management panel.

Data Visualization: The management panel provides clear and easy-to-understand data visualization to enable DreamSpace to interpret the collected data accurately.

**Audio Monitoring:** The system's audio monitoring functionality accurately detects negative and positive words used by sales employees when talking with customers, providing valuable insights to improve their communication skills. It gives 90% of accuracy in detecting positive and negative words.

### 1.3 The client's requirements

* **Welcome Visitors**-the system should welcome visitors in Tamil, Sinhala, and English as they enter the premises.
* **Counting Visitors**-the system should accurately count the number of visitors entering Dream Space’s premises.
* **Predicting Visitor Characteristics**-system should use computer vision and machine learning algorithms to predict the following characteristics of visitors such as:
  + Age Range-predict the age range of visitors using deep learning algorithms such as kids, teenagers, and adults, elders.
  + Gender systems should predict the gender of visitors, such as female or male.
  + Mood systems should predict the mood of visitors, such as neutral, happy, sad, angry, surprised, fear.
  + Race system should predict the race of visitors, such as Asian, White, and Black.
* **Mask Reminder**-system should check whether the visitors wear masks.
* **User-Friendly Interface**- the system should have a user-friendly interface that allows easy interaction with the system’s admin.
* **Backend Panel**-system should provide a backend panel for DreamSpace to view and analyze the gathered data.

### 1.4 Project Objectives

This project aims to develop an AI-powered computer vision-based customer analysis system that will perform the essential duties of a security guard, including welcoming visitors, counting them, and predicting their age range, gender, and mood. The system should also remind visitors to wear a face mask if necessary.

* To make the company’s mall an AI-based one.
* To build an AI-powered system to count the number of customers entering DreamSpace's premises accurately.
* To detect the age range of customers.
* To detect the gender of customers.
* To detect the emotions of customers.
* To detect the race of customers.
* To monitor sales employees' vocals to improve their professional communication skills.
* Provide a backend panel for DreamSpace to view and analyze the gathered data.

## 02. The review of the Business Case

for developing an AI-powered computer vision-based customer analysis system for DreamSpace is well-performing. The system clearly outlines the project's purpose, reasons, options, benefits, and risks, providing a thorough understanding of the project's scope and potential impact.

The system presents a compelling argument AI-powered for the analysis system, highlighting the limitations of traditional customer analysis methods and the benefits of real-time data collection and analysis. The options presented are thoughtful and well-considered, clearly comparing the different approaches and their potential benefits and drawbacks.

Overall, the Business Case is well-structured; expected Benefits:

* Improved customer service by 80%.
* Can get customer needs.
* Can market according to customer needs.
* Can market according to the gender-based
* Can market according to the current mood of customers.
* Can market according to the customer race.
* Can analyze data and provide better services to their customer and likes.
* Increased Sales: By analyzing customer behavior and preferences in real-time.
* Better Resource Allocation: With accurate data on the number of customers and their demographic.
* Improved Staff Performance: The system can monitor sales employees' customer interactions, providing feedback on communication skills and customer service.
* Enhanced Customer Loyalty: Tailoring services and offers to customer preferences and needs.
* Competitive Advantage: Using cutting-edge technology to gather real-time customer data, DreamSpace can gain a competitive advantage over other businesses in the same industry. This can lead to increased market share and brand recognition.

### 2.1 Benefits Achieved to date

The benefits archived to date are listed below.

* It has a backend panel to analyze the data.
* It stores information on collected data.
* We built the age detection model
* We built the gender detection model
* We built the race detection model
* We built the emotion detection model
* We built the mask detection model
* We built the backend panel.

### 2.2 Residual Benefits Expected

* Improve organization experience and satisfaction.
* Improve the sales of the organization.
* Improve the quality of data.
* Improve customer satisfaction.
* Increase effective management of customers.

### 2.3 Expected Net Benefits

* Increase the efficiency of financial management.
* Improve the efficiency of the institute.
* Gain more profits.

### 2.4 Review of Project Objectives

In this section, we discuss the project objectives, quality expectations, constraints, and risks are provided. The benefits obtained by each group member are also mentioned. Therefore, this section provides an overall review process of the system development.

#### 2.4.1 Project Objectives:

* Achieved the informative and user-friendly management panel.
* Achieved customers' willingness to buy things by analyzing their facial emotions.
* Achieved customers’ likelihood by analyzing their genders and race.
* Achieved to get the customer's interests by analyzing their age groups.
* Achieved getting customer feedback and improving salesperson marketing ability by analyzing sentiment in their spoken words.

**Note:** The final project almost achieved the objectives defined from collected the client's requirements.

#### 2.4.2 Quality Expectation:

* Achieved 80% in customer counting functionality.
* Achieved 90% in negative and positive spoken word prediction functionality.
* Achieved 70% in age-group prediction functionality.
* Achieved 65% in race prediction functionality.
* Achieved 95% mask and non-mask prediction functionality.
* Achieved 65% in emotion prediction functionality.
* Achieved 65% in gender prediction functionality.

**Note:** The final system encounters the quality expected by the project team in requirements gathered from the client.

#### 2.4.3 Project Constraints:

**Time Constraint:** The project is expected to be delivered within ten weeks from the start date; as per the time constraint, the project was delivered within the timeline.

**Technology Constraint:** The project's success relies on efficiently using computer vision and machine learning algorithms; we used the correct Python libraries to achieve the expected outcomes.

**Budget Constraint:** The project budget is fixed, and any increase in costs beyond the agreed-upon budget may result in the project's cancellation or a reduction in scope. The project was finished within the cost.

**Data Privacy and Security Constraint:** The system collects and analyzes customers' personal information, which is essential to maintain data privacy and security; the organization provides consent notice as a poster to customers.

**Environmental Constraint:** The system is placed at the entrance of DreamSpace's premises and operates within the environmental conditions of the location, such as light and temperature, lighting is one of the crucial factors when it comes to computer vision application, DreamSpace fixed a bright lighting condition at their entrance.

**Communication Constraint:** Effective communication and collaboration between the project team, stakeholders, and DreamSpace's staff are essential for success. Any communication-related issues may delay the project timeline and impact project deliverables. It went well.

**Note:** The project constraints are properly aligned with the project development process and the collected requirements, no further issues come during the project duration.

#### 2.4.4 Risks

* Technical Risks: The project involves complex technical aspects such as computer vision and machine learning algorithms. There is a risk that the algorithms need to be more accurate, leading to incorrect predictions and unreliable data.
* Data Privacy and Security Risks: The project involves collecting and analyzing customer data, which could pose data privacy and security risks. Sensitive customer information must be hand carefully to avoid potential data breaches or leaks.
* Integration Risks: The system should be integrated with the backend panel to visualize and analyze gathered data. Integration problems can occur if the system does not work as expected with the panel, leading to errors in data analysis.
* User Acceptance Risks: The system is designed to interact with visitors, and there is a risk that some visit need to may not accept or feel comfortable with the system. This could lead to negative experiences and potential reputational damage for DreamSpace.
* Hardware Risks: To function correctly, the system requires specific hardware components, such as cameras and microphones. Hardware malfunctions or failures could cause the system to malfunction and provide incorrect or no data.
* Staff Training Risks: The system monitors sales employees' vocals to improve their professional communication skills. Staff training may be required to ensure they understand how the system works and how to use the feedback to improve their communication skills.

**Note:** All the risks were avoided by the project team, and the project has been completed successfully.

#### 2.4.5 Benefits:

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The benefits obtained from the project by each group member are listed below; each team member has gained valuable skills and experience through their participation in the project, which can be used to advance their careers and contribute to future projects. The benefits obtained by each member also demonstrate the project's success in achieving its goals and delivering value to the organization.

#### 2.4.5.1 Project Management Benefits

This section contains information on how the project manager, startup manager, quality manager, risk manager, and schedule manager are engaged in this project and how they contribute to this project at the management level and it explains what are the benefits that the gain from working on this project.

**Project Manager: Gunarakulan Gunaretnam (**2208408**)**

The main benefit that the project manager gained from the entire project was the ability to interact with the team as a visionary leader with the proper mindset to finish the project perfectly, and he managed the time, resources, and tasks in a right way and gained more management skillets. He performed well in planning, executing, monitoring, controlling, and closing the project. additionally, he obtained the skills of maintaining cooperation among team members. He drove the correct method to build the team spirit to complete the project successfully without any internal conflicts. During the project period, the project manager utilized many skill sets, such as identifying, planning, and dividing the project tasks within the team to ensure efficient functioning to reach end goals. Moreover, the project manager has improved the skills to resolve conflicts and unavoidable circumstances in a group and project. Furthermore, he learned to handle the project's allocated budget and work according to the PRINCE2 project management methodology.

**Startup Manager: Sangeetha Thangavadivel (**2135801**)**

The startup manager played a critical role in ensuring the project's success by working on the startup aspect of the project and gathered more information related to the organization, and she worked on the process of collecting requirements and engaged in the analyzing those requirements with the help of the development team. She learned so many skills in client management, and she is the one who is responsible for the client questions and certification, she knew and applied feasibility studies to determine if the project was viable, considering technical, financial, and organizational factors. Based on the study's results, the startup manager developed a detailed project plan outlining the project scope, objectives, deliverables, timelines, budgets, and resources required; throughout this project journey, the startup manager learned so many skills set on stakeholder management and her ability to interact with the client is so amazing.

**Risk Manager: Haritha Thavarajah (**2211320**)**

The risk manager was critical in identifying and mitigating potential risks with the project. She worked closely with the project manager and developers team to identify risks and create methodologies to reduce them; during the project period, she built more capacities in risk mitigation and has the skill set to identify more risks and issues with the project; she gained more knowledge in this field by working on this kind of project. Moreover, she ensured that risk management strategies were implemented effectively to the project scope. She conducted regular risk reviews and updated risk management strategies as needed; she identified privacy risks of customer data that could be exploited. She sorts it out by finding a law, so she gained much experience in this field.

**Quality Manager: Delaxsan Raj Sathiyanesan (**2211294**)**

As the Quality Assurance Engineer, he earned a vast knowledge of testing procedures and tools throughout the project. he used the selenium testing library in Python to test this system's management panel; he worked with the developers to perform the system testing and showed good quality control. He also learned to operate as part of a team and manage his time when coordinating with other team members. He gained knowledge on documenting the processes also. The acquired knowledge and skills will be instrumental in the industry through this project.

**Schedule Manager: Mathumitha Arasakulasoorian (**2211336**)**

The schedule manager was crucial in ensuring the project was completed on time. She developed and maintained a detailed project schedule identifying all tasks, dependencies, and timelines. She worked closely with the project manager and team members to ensure that the project was executed according to the schedule, and she prepared daily logs documents which contained daily standup of the project; during the project period, she gained a lot of experience working with scheduling things. Moreover, she monitored progress against the schedule, identifying any delays or issues that could impact the project timeline. she communicated regularly with developers to keep them informed of progress and any changes to the project schedule.

#### 2.4.5.2 Project Development Benefits (Coding)

This section contains information on how much the team members contributed to the development (coding) stage of the project, what are the parts of the development phases that they are involved in, and how much they gained and what are the skills and knowledge that they get from via involving on the development part.

**Gunarakulan Gunaretnam (2208408)**

He worked as a senior software developer on this project, and he is the project's focal point. He is responsible for all types of technical / coding work since he is the architect of this system. He had the responsibility for the AI stuff, and he ultimately took ownership of the monitoring system; he built the prediction part, such as age, gender, emotion, race, mask, and sentiment analysis part, and he is also responsible for the management panel to build backend functions and connecting database from monitoring and management systems, he used many Python libraries to achieve the destination. He used the Laravel framework to create the management panel of the system during this development period; he made a great capacity in coding skills.

**Sangeetha Thangavadivel (2135801)**

As a developer, she developed UI as HTML / CSS elements. She is responsible for building a Line chart template using CSS / HTML and JavaScript. Also, she showed her maximum coding abilities to achieve the destination of the work; she is also responsible for the database structure, so she completely created a database for the project using MySQL engine; she ultimately showed her potential in the coding works, from this project, she gained and learned so many coding and technical-related things from the project.

**Haritha Thavarajah (2211320)**

She was responsible for building the pie charts as HTML / CSS elements and converting those HTML CSS elements as Laravel blade format to make the backend panel work as dynamic, so she worked on JavaScript and HTML / CSS to build pie charts that show the gender, age, race, emotions information in a nicely plotted way, she also worked on the UI sides a lot to convert those UIs as workable elements.

**Delaxsan Raj Sathiyanesan (2211294)**

He is responsible for writing Python selenium script that is used to test the management panel of the system, and he is responsible for the login page to coveted as workable elements; during the development process, he showed ultimate work performance, he is responsible for building the UI/UX of the vision data page and converts those UIs as Laravel blade template to make the management panel as dynamic, from this development project, he gained so many skills in coding and as well as in testing.

**Mathumitha Arasakulasoorian (2211336)**

She was responsible for building the audio data page in Laravel blade format in the management panel; as a developer, she provided her best abilities to make the project goes on the right track, and she is also responsible for the UI elements to be converted as workable elements, during the development period, she gained so much of technical and coding skills.

## 03. Review of Team Performance

**Gunarakulan Gunaretnam (**2208408**)**

Gunarakulan Gunaretnam worked as a project manager at the management level; when it comes to the development works (coding works); he worked as a senior development and engaged more in the AI stuff, and he was the focal point on building the monitoring system and the backend part of the management panel, he did his duties and responsibility on time with perfect quality of work, as his primary task he was to build prediction features and backend data flow of the management panel, he performed very well on his tasks, and he was able to finish all tasks dedicatedly, he was so passionate about the project.

**Sangeetha Thangavadivel (**2135801**)**

Sangeetha Thangavadivel worked as a startup manager at the management level. Regarding the coding part, she was assigned tasks such as building the database structure and converting the UI/UX as workable HTML/CSS elements and she performed well on her duties and responsibilities; she was also assigned a task to build the line chart that shows traffics of the customer in the front level using the JavaScript and HTML/CSS languages. she performed well on that and able to finish her work on time.

**Haritha Thavarajah (**2211320**)**

Haritha Thavarajah worked as a risk manager at the management level; in the coding part, her primary work was to build pie charts at the frontend level to show predictions data; she performed well on her responsibilities, and she able to manage to code in HTML/CSS and Laravel, moreover she nicely found risks and pointed them out.

**Delaxsan Raj Sathiyanesan (**2211294**)**

Delaxsan Raj Sathiyanesan worked as a quality manager at the management level; when it comes to the development part, he was focused on writing testing cases in Python Selenium, and he was responsible for building the login page of the management system, he performed well on his responsibilities and ensured to write good test scripts. He was also assigned to convert UI into workable elements; he performed that well too.

**Mathumitha Arasakulasoorian (**2211336**)**

Mathumitha Arasakulasoorian worked as a schedule manager at the management level; when it came to the development stage, she was assigned to build the layout of the audio data page in the front-end level using HTML/CSS then she needs to convert that into Laravel, she performed well on that and she was able to finish the assigned task on time.

## 04. Lessons Learned Report

* Attached as a separate document in the BERO.

## 05. Review of Products

|  |  |  |
| --- | --- | --- |
| Product Name | Quality Record | |
| Planned | Completed |
| Project Prototype | 18/03/2023 | 17/03/2023 |
| Finalized Software | 24/03/2021 | 24/03/2023 |