DEVELOPMENT OF A WEB-BASED PLATFORM UTILIZING SATELLITE INSTRUMENTS, MODIS AND VIIRS FOR FIRE DATA COLLECTION AND RISK ASSESSMENT

Undergraduate Thesis
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Title of the Study : DEVELOPMENT OF A WEB-BASED PLATFORM UTILIZING SATELLITE INSTRUMENTS, MODIS AND VIIRS FOR FIRE DATA COLLECTION AND RISK ASSESSMENT

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Mohamad Ali A. Calanda was born on October 20, 1997, in Nauring, Pandan, Antique, and currently resides in Aniban 2, Bacoor City, Cavite. He pursued the Science, Technology, Engineering, and Mathematics (STEM) strand during his senior high school years at Magsaysay National High School – Main Campus in Occidental Mindoro and graduated with honors. He is currently enrolled in the Bachelor of Science in Computer Science program at Cavite State University – Imus Campus.

He successfully completed a rigorous full-stack web development program at Village88, Inc. in 4 months (2024), a bootcamp located in San Francisco, Tarlac, and received various certificates. He was honored with the Best Capstone Certificate for demonstrating exceptional performance in building the highest quality solo capstone within one week. Additionally, during his internship at Ollopa Corporation as a Quality Assurance Manual Tester, he was recognized with a Certificate of Appreciation for his outstanding leadership abilities in September 2023.

BIOGRAPHICAL DATA

Janna May Gensaya was born on May 13, 1999, in Mulanay, Quezon Province. She currently resides in Villa De Primarosa Subdivision, Brgy. Buhay na Tubig, Imus City, Cavite. She completed her elementary education at Mulanay Central School in Quezon Province in 2012 and her secondary education, both junior high school and senior high school, at Bondoc Peninsula Agricultural High School in 2018, located in Brgy. Sta Rosa, Mulanay, Quezon.

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INTRODUCTION

Fire is one of the most disastrous causes of both human negligence or nature, and its impact on humans can be extremely traumatic, resulting in injuries, property loss, or even death. A map is a useful navigation aid before, during, and after a disaster or calamity since it gives demographic information to determine the geographical location of a certain place. This assists authorities in developing a plan and strategy for

responding to and assisting the community. Imus City is an urban area and a densely populated city in the province of Cavite. According to the official website of Imus City (City of Imus, n.d.), it has a total population of 539,743 as of April 29, 2024, within its land area of 171.66 km^2. Some streets and roads in the city are inaccessible to emergency vehicles such as fire trucks or ambulances. These vehicles are too tall or too huge to fit in tight lanes and can harm or damage other property such as wires, residences, stores, etc.

As technology continues to grow and the community can easily access the internet, leveraging NASA's satellite instuments such as MODIS and VIIRS that can detect fire from space is a good idea. Fire Information for Resource Management System (FIRMS) of NASA distributes real time, near real time and ultra real time active fire data using the instruments aboard in different satellites, Moderate Resolution Imaging Spectroradiometer (MODIS) and the Visible Infrared Imaging Radiometer Suite (VIIRS). Unfortunately, these instruments can only distribute near real time data for the Philippines. According to NASA's definition, data that is distributed within 1 to 3 hours is near real time data.

The purpose of this study is mainly to help fire authorities to improve fire response based on the data accumulated by NASA's satellite instrument and identify high-risk to low-risk areas and its demographic characteristics.

Statement of the problem

The demographic characteristic of the affected area is very important as it can help authorities to plan properly and effectively how they respond to the area such as streets, roads, and establishments. *How does a map help the fire authority to plan and respond effectively to the affected areas?*

Fire data is important because it provides information such as location, date, and time of the fire. It can also be used to determine the high risk, moderate risk and low risk areas. NASA's satellite instruments like Moderate Resolution Imaging Spectroradiometer (MODIS) and the Visible Infrared Imaging Radiometer Suite (VIIRS) are amazing instruments as source of fire data to determine the fire history of Imus City. *How can fire data detected by MODIS and VIIRS be utilized to identify the risk level of the areas in Imus City?*

The web-based platform will be developed leveraging satellite instruments, MODIS and VIIRS that will help fire authorities in fire response planning or mitigation should undergo several testings to ensure its quality. *Will the web application be passed to ISO 9126?*

Objectives of the Study

The general objective of this study is to develop a web application integrated with FIRMS API that distributes Philippines fire data.

Specifically, this study aimed to:

1. To develop an interactive map with fire data information from NASA satellite instruments.
2. To develop a choropleth map showing the risk assessment levels for every barangay in Imus City.
3. To evaluate the web application using ISO 9126.

Significance of the Study

This study will significantly help the residents, the fire department, and future researchers:

1. **Imus residents:** This will help the residents to determine the fire information of Imus City.

2. **Fire Department:** This will help the fire departments with fire response, planning or mitigation.
3. **Future Researchers:** This can be used by future researchers as the basis for future studies related to this study.

Time and place of the study

This study was conducted at the Bureau of Fire Protection located in Imus Public Market, Imus Market Road, Imus City and started in June 2023. This includes the preparation of a possible target respondent, a questionnaire, conducting an interview, reviewing related literature and up to the launching of the system and evaluation.

Scope and Limitation of the Study

The study aims to develop a web application that monitors and collects fire data of Imus City from MODIS and VIIRS satellite instruments and an algorithm to identify risk level of the areas of the city with map features. The fire authorities and local communities are the users and beneficiaries of the proposed web application. Also, the study is open for future researchers and developers to do further study or development. Following are the features of the web application:

Fire Monitoring: the users can view the map of the Philippines and also of every city in the province of Cavite, especially the map of Imus City. The users can request fire data from the satellite by selecting the city or municipality in the Cavite, satellite instruments, date and day range. The result will display a fire icon where fire is located with fire information such as coordinates, confidence level and brightness.

Risk Assessment: the users can view fire data of Imus City in a choropleth map with legend of high risk, moderate risk and low risk area

Login and Registration: the users can register and login to the website and have full access to the features of the application.

Definition of Terms

FIRMS – Fire Information for Resource Management System is a NASA system that distributes real time, near real time and ultra real time active fire data to the world.

MODIS – stands for Moderate Resolution Imaging Spectroradiometer aboard the Aqua and Terra satellites

VIIRS – stands for Visible Infrared Imaging Radiometer Suite aboard S-NPP, NOAA 20 and NOAA 21 (formally known as JPSS-1 and JPSS-2).

Real Time – if data is distributed less than 1 hour

Near Real Time – if data is distributed within 1 to 3 hours

Risk Assessment – using historical data involves analyzing past fire incidents to categorize areas into high, moderate, or low risk.

Leaflet.js – a JavaScript library for interactive map

Conceptual Framework

The following is the conceptual framework of the study showing IPO or Input-Process-Output diagram.

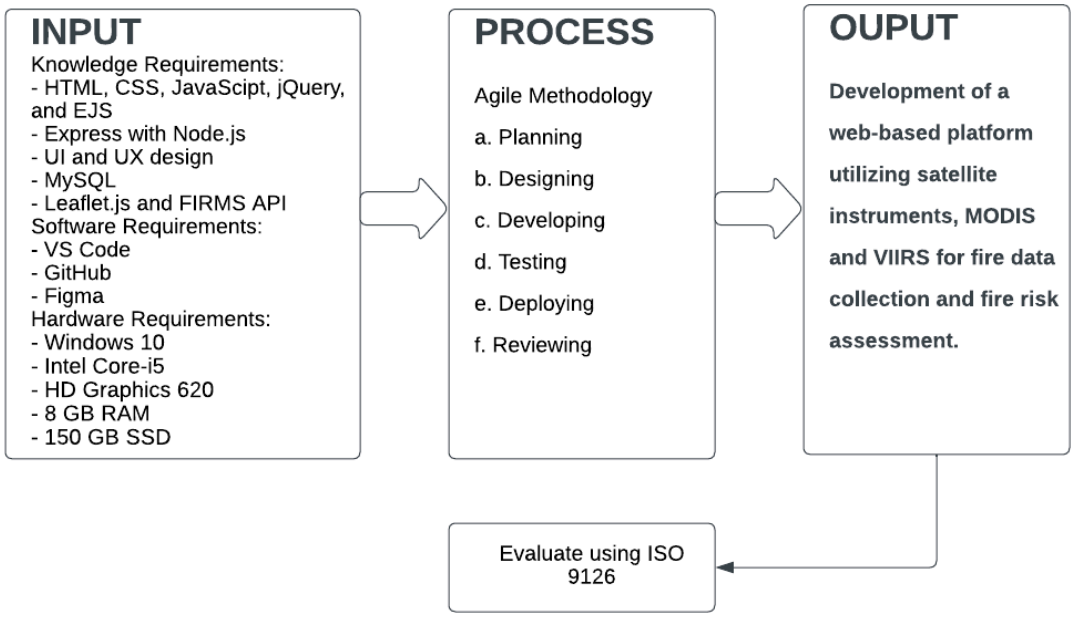

Figure 1. Conceptual Framework

Figure 1 shows the conceptual framework of the study consisting of input, process, and output. In input, the knowledge requirements refer to the skill or knowledge to develop the web application using the technologies such as Hypertext Markup Language (HTML), Cascading Stylesheet (CSS), jQuery, JavaScript, Embedded JavaScript, Express with Node.js runtime environment, User Interface and User Experience to create a pleasing to the eye and good user experience. Leaflet.js for interactive map and FIRMS API as source fire data through satellites sensor or instruments (MODIS and VIIRS). For software requirements, Visual Studio Code IDE will be used to develop the platform, GitHub for coding collaboration, and FIGMA to design

the wireframe and mockup of the platform. And for the hardware requirement, a computer with specs of Windows 10, an Intel Core i5 CPU, GeForce GPU, 8GB RAM, and 150 SSD,

In the process, the researchers will use an Agile methodology, which comprises six phases: 1) Planning, 2) Design, 3) Development, 4) Testing, 5) Deployment, and 6) Review.

And in the output is the developed web-based platform utilizing satellite instruments (MODIS and VIIRS) for fire data collection and assessment.

REVIEW OF RELATED LITERATURES AND STUDIES

This chapter presents the related literature and studies after the thorough and in-depth search done by the researchers. The studies included here are done both abroad and locally, which will help the researchers shape and broaden the study.

FOREIGN STUDIES

Earth Observation Science and Applications for Risk Reduction and Enhanced Resilience in Hindu Kush Himalaya Region

Thapa et al. (2021) present a comprehensive exploration of forest fire detection and monitoring in the Hindu Kush Himalaya Region. The chapter, part of the book "Earth Observation Science and Applications for Risk Reduction and Enhanced Resilience in Hindu Kush Himalaya Region," focuses on the practical experience derived from SERVIR. The authors discuss a web portal/application developed by ICIMOD, utilizing MODIS as source of fire data. This system offers a map service, allowing the visualization of fire incidents across various administrative levels. The portal also incorporates a damage-assessment form in Nepali, enabling authorized users to record fire-related damages. Notably, the system triggers SMS and email alerts upon fire detection. This literature provides valuable insights into the integration of Earth observation technologies for effective forest fire management, emphasizing the application of satellite data in real-world scenarios.

GIS-based urban village regional fire risk assessment and mapping

Hermawan, Warlina, and Mohd (2021) identified home fire incidents, assessed fire danger levels, and mapped the risk level in Bandung City, Indonesia, using a geographic information system (GIS) analysis approach and direct observation of the research area. The researchers took a spatial method to analyze fire risk in the residential area, mapping urban-village regional fire occurrences and assessing the risk level using GIS. Vulnerability factors, on the other hand, are based on the sociological features of the community: population density, proportion of old age and children under five, persons with disabilities, and the population's sex ratio. According to the findings, three neighborhood units are at high danger of fire, eight are at moderate risk, and nine are at low risk.

Integrated Satellite System for Fire Detection and Prioritization

According to a study by Mazzeo et al. (2022), an Integrated Satellite System (ISS) for fire detection and prioritization was introduced. This system leverages data from the Moderate Resolution Imaging Spectroradiometer (MODIS), among other instruments, and incorporates the Robust Satellite Techniques (RST) and the newly structured Fire Danger Dynamic Index (FDDI). The ISS provides near real-time, integrated information on fire presence and danger in formats suitable for Geographic Information System (GIS) technologies.

Results from concurrent winter and summer fires in Italy, validated against independent sources, demonstrate that the ISS can significantly aid in fire prioritization, potentially reducing the impact on populated areas, infrastructure, and the environment.

Research of Forest Fire Points Detection Method Based on MODIS Active Fire Product

According to Jie Wang, Guanghui Wang, Jianwei Qi, Yu Liu, and Wei Zhang, this study introduces a forest fire detection method using MODIS active fire products, enhanced with factors like Normalized Difference Vegetation Index (NDVI), slope, and elevation.

Using data from China in July 2018, the method achieved an identification accuracy of 88.94% and a missing detection rate of 4.25%, with errors mainly due to MODIS's low spatial resolution. The method's overall accuracy was deemed satisfactory for real-time early warning. The study also analyzed a forest fire in Qinyuan County, Shanxi Province, demonstrating how identified fire points can aid in monitoring and firefighting planning, providing a scientific basis for forest fire management.

Characterization of Spatial–Temporal Distribution of Forest Fire in Chhattisgarh, India, Using MODIS-Based Active Fire Data

Analyzing 17 years of MODIS data, this study by Tapas Ray, Dinesh Malasiya, Akshkumar Verma, Ekta Purswani, Asif Qureshi, Mohammed Latif Khan, and Satyam Verma explores forest fire trends in Chhattisgarh, India, a region prone to such incidents but lacking comprehensive studies. Results reveal an increasing trend, with the highest occurrences in 2017 and 2009, primarily in deciduous broadleaf forests and savannas. March to May sees peak activity, with a hotspot in the southwest. The study underscores the need for tailored fire management strategies to mitigate environmental and societal impacts.

Real-Time Wildfire Detection Algorithm Based on VIIRS Fire Product and Himawari-8 Data

This study by Zhang, D., Huang, C., Gu, J., Hou, J., Zhang, Y., Han, W., Dou, P., and Feng, Y. (2023) focuses on constructing a fire detection model using VIIRS (Visible Infrared Imaging Radiometer Suite) data.

Using the stable VNP14IMG fire product, the authors developed a fire label dataset and employed a random forest (RF) model for fire detection with Himawari-8 multiband data. The model incorporated features such as brightness temperature, spatial features, and auxiliary data. A recursive feature elimination method was used to optimize the model by excluding redundant features.

Separate RF models for daytime (RF-D) and nighttime (RF-N) were constructed to evaluate their effectiveness. The RF models outperformed the Japan Aerospace Exploration Agency (JAXA) wildfire product, with recall and precision rates of 95.62% and 59%, respectively. The RF-D model demonstrated higher fire detection accuracy than the RF-N model, especially for small fires.

Overall, the VIIRS-based fire detection model shows excellent real-time monitoring capabilities and high detection accuracy for small fires, making it a valuable tool for wildfire management (Zhang et al., 2023).

Monitoring trends in global vegetation fire hot spots using MODIS data

According to the study by C. Sudhakar Reddy and N. Sarika, hot spot trends in global vegetation fires were identified based on 10 years of MODIS fire data. They analyzed fire hot spots across climate zones, global land cover, and biodiversity hot spots. Using spatial statistics and space–time pattern mining, they found no significant trends in vegetation fires from 2011 to 2020. Intensifying hot spots (38.1%) were most

common, followed by consecutive (30.5%), persistent (14.2%), sporadic (6.2%), oscillating (4.6%), and new hot spots (3.5%). Africa, dominated by tropical savanna and hot semi-arid climates, had the highest fire hot spot area. The study suggests standardizing techniques for identifying vulnerable zones in near real-time, predicting fire risk areas, and evaluating management effectiveness for climate change mitigation and conservation policies.

Development of forest fire risk map using geographical information systems and remote sensing capabilities: Ören case

Mehtap Ozenen Kavlak, Saye Nihan Cabuk, and Mehmet Cetin conducted a study in Turkey where they created a forest fire risk map for the Kütahya-Ören region using GIS analysis. The study identified very-high, high, moderate, and low-risk zones, with 36.86%, 60.39%, and 2.76% of the area falling into these categories, respectively. Additionally, visibility analysis for existing fire towers revealed that 82.8% of the region was visible from these towers.

In the Ören-Çamdibi region, remote sensing methods were utilized to detect burned areas in October 2001, which were officially recorded as 4 hectares. The study found the actual burned area to be 5.6 hectares, with 83% classified as moderate-risk areas and 17% as very-high and high-risk zones according to the fire risk map.

A GIS- and AHP-based approach to map fire risk: a case study of Kuan Kreng peat swamp forest, Thailand

Forest fires pose significant challenges to natural ecosystems, requiring proactive prevention measures. In the study conducted by Nuthammachot and Stratoulias (2021), Geographic Information System (GIS) and Analytical Hierarchy

Process (AHP) were combined to analyze fire risk factors such as climate, topography, and human influence. Focusing on a peat swamp forest area in Kuan Kreng, Nakorn Sri Thammarat province, Thailand, the research categorized fire risk into five levels. Validation using 705 historic fire events from 2006 to 2017 showed that 82% occurred in the highest risk categories, with minimal omission errors. This integrated GIS and AHP approach offers valuable fire risk maps for future planning and management of fire-prone areas.

Application of GIS and AHP Method in Forest Fire Risk Zone Mapping: a Study of the Parambikulam Tiger Reserve, Kerala, India

In the study conducted by S. Nikhil, Jean Homian Danumah, Sunil Saha, Megha K. Prasad, A. Rajaneesh, Pratheesh C. Mammen, R. S. Ajin, & Sekhar L. Kuriakose, forest fires in the Western Ghats region, particularly in protected areas like the Parambikulam Tiger Reserve, pose significant threats. Their research aims to delineate fire risk zones using GIS techniques and assess factors influencing fire initiation. Factors such as land cover types, slope angle, aspect, and proximity to settlements, roads, tourist spots, and anti-poaching camps are analyzed. The study employs the Analytical Hierarchy Process to determine weights and utilizes ArcGIS and ERDAS Imagine software for mapping. Five risk zones—very low, low, moderate, high, and very high—are delineated. Validation using fire incidence data from 2002 to 2020 shows that 71% of fires occur in high-risk and very high–risk zones. Receiver operating characteristic curve analysis confirms the accuracy of the risk zone map. This map can guide forest planners, officials, and disaster management departments in implementing mitigation measures to safeguard valuable forest resources.

LOCAL STUDIES

Visualization and Geo-Mapping of Philippine Fire Incidents

Oñate (2022) developed a program called FireStatPH. The researcher used statistics data on Philippine Nationwide Fire Incidents provided by the Bureau of Fire Protection through Open Data Philippines from 2012 to 2016 to investigate the importance of data visualization and analysis in extracting useful information that may aid planning and decision-making. For UI and UX design, FireStatPH was built with HTML, CSS, and Javascript, while open-source Javascript libraries like as Leaflet JS are utilized to easily generate various data visualization approaches, including maps. The software displays a line graph of previous year's fire incidences as well as a choropleth map to discover which areas were the most damaged in past years.

Mapping and assessment of slash-and-burn farming in Palawan, Philippines using various fire and burnt area products

According to C. P. I. Canlas and A. C. Blanco in their study, slash-and-burn agriculture, also known as kaingin, involves clearing and burning forests for agriculture. This practice leads to forest destruction, grassland fires, soil degradation, erosion, and landslides. Using data from various sources like FIRMS and MODIS, their study examined fire patterns in Palawan from 2015 to 2022. Results show peak burning in April and March during the dry season, with a decline in fire counts in 2021 and 2022 due to La Niña. Fire incidents were found mainly in shrublands and open forests, with varying intensities and durations. High fire occurrence was noted in municipalities like Sofronio Espanola, Bataraza, and Rizal. Combining fire data aids in understanding fire characteristics for effective management strategies.

Mapping Forest Vulnerability to Fire and Landslides in the Cordillera Region, Philippines

From the study by Daipan, Bernard Peter & Racelis, Diomedes. (2023), forest fires are a significant threat to the Cordillera's forests, yet their vulnerability has been overlooked in previous studies. To address this gap, this study uses satellite imagery to identify fire-prone areas. In 2021, the region's forest cover spans 1.35 million hectares, but approximately 8.5% of this area is susceptible to fires. The study observes a rising trend in fire incidents and burned areas, likely due to increasing temperatures and prolonged droughts. Future projections suggest more severe fires and larger burned areas due to temperature increases and decreased precipitation. These findings underscore the need for urgent action to prevent further forest degradation from both human and natural causes.

METHODOLOGY

This chapter explains various methodologies that were used in gathering data and analyzing it, which are relevant to the study. The methodologies will include areas such as the research approach and design, requirements specification, research method, and development and testing.

3.1 RESEARCH APPROACH AND DESIGN

This study used descriptive research design as it helped the proponents to understand the "what," "where," "when" and "how" of your research study. The proponents conducted surveys to the respondents using a software model known as ISO 9126.

3.1.1 Study Setting

This study was conducted in the Bureau of Fire Protection, Imus Market, Imus Market Road, Imus City, Cavite to gather necessary information that will help to define the problems of the fire authority up to the evaluation of the system.

3.1.2 Sampling Size

The proponents calculated the total number of firefighters for every fire station and added them up to get the total population. The total population was used to calculate the sample size along with the margin of error and confidence level.

3.1.3 Sampling Technique

The proponents used convenience sampling based on the availability or accessibility of firefighters in the fire station. However, it's important to note that convenience sampling may introduce bias since it relies on readily accessible individuals.

3.1.4 Data Gathering Instrument and Procedure

Online Library: The proponents used in online libraries particularly GoogleScholar to gather related studies that will support and justify the study.

Interview: The proponents conducted a face-to-face interview in the Bureau of Fire Protection in Imus City to define the problems facing the authority in the current system used to fire response and decision-making.

Evaluation: The proponents used ISO 9126 model to evaluate the web application.

3.1.5 Analysis Strategy

3.1.5.1 Statistical Method

After a survey, the proponents calculated the mean scores of each criterion of ISO 9126 and then calculated the overall mean. The following is the formula to get the weighted mean:

$$x = \frac{\Sigma f x}{N}$$

$\bar{x}$ = weighted mean

N = total Number of Respondents

x = number of Respondents

Σ = summation

3.2 REQUIREMENTS SPECIFICATION

3.2.1 Functional Requirements

The following requirements are the requirements for the web application:

User Registration and Authentication - users are allowed to register an account with valid credentials and allowed to login securely with correct credentials.

Map-based Area Identification - users are allowed to focus or display the map on any city or municipality of the Cavite selecting the name of the place corresponding its boundary

Fire Data Requesting - users are allowed to request Philippines fire data from MODIS or VIIRS instruments from NASA by providing instrument, date, and day range then the requested fire data is displayed to the map with a fire icon.

Fire Risk Assessment - users are allowed to view choropleth map of Imus City based on the fire history from year 2020 and also identify risk level of every area in the city.

3.2.2 Hardware Requirements

Table 1. The minimum and recommended specification of computer for web application

ITEM	MINIMUM SPECIFICATION	RECOMMENDED SPECIFICATION
Operating System	Windows 7	Windows 10
CPU	Intel Core-i5	Intel Core-i5
GPU	HD Graphics 620	NVIDIA GeForce 940M

Memory	8 GB RAM	12 GB RAM
Disk Drive	150 GB SSD	222 GB SSD

3.2.3 Software Requirements

Visual Studio Code

Visual Studio Code is a fully integrated development environment that allows for the development of software for a number of platforms and programming languages. It has an abundance of features and tools to help developers write, debug, and deploy code more efficiently. Additionally, Visual Studio offers an easy-to-use graphical interface that allows developers to correctly design and model their systems.

GitHub

GitHub is a leading platform for software development and version control, enabling developers to collaborate on code seamlessly. It provides tools for project management, code review, and CI/CD automation.

Figma

Figma is a web-design tool used by designers to create a wireframe or mockup design for an application. Using Figma, teams can collaborate, contribute to a specific project, and share their ideas in real-time through a shared file or link that all teams can access. There are many interesting features of Figma that will make designing easier, such as shapes, frames, plugins, templates, and many more. This can save more time, effort, and money.

3.3 RESEARCH METHOD

3.3.1 Materials

For the development of the web application,, the developer used a computer system with a 64-bit Intel Core i5 processor, an NVIDIA GeForce 940M, and 4 gigabytes of RAM. For the design, the designer used Figma to create wireframe and mockup design of the web application.

3.3.2 Method

Agile is a popular project management method in software development. It breaks down project into phases and emphasizes continuous improvement and collaboration. The proponent used Agile framework called Agile Scrum Methodology which is a popular agile framework created by Jeff Sutherland and Ken Schwaber.

Figure 2. Agile Methodology (Beck et al., 2001)

Planning: The proponents gather information by conducting an interview to define the problems and to identify the requirements needed for the system to solve the problem of the organization.

Designing: After planning and having the requirements, the next phase is designing wherein the prototype system is being designing using Figma to visualize the appearance or features of the system including here the software architecture

Developing: Using the IDEs and knowledge in programming languages such as Javascript, Express, REST API, etc., in this phase, the system is being developing.

Testing: Once, the system has now fully developed, it must undergo with further

verification and testing to ensure that the system works accordingly. This is required to identify error by debugging or fixing it.

Deploying: In this phase, the system is now ready to deploy to the selected user after several verification and testing ensuring no error will interrupt the functionalities of the system but the developers still need to update and maintain the system such as adding new features, fixing bug, etc.

Reviewing: After deployment, the developers will need to review the system to ensure that all the requirements are met and that it is working properly and accordingly. This phase will minimize the possible problems you may encounter in the launch phase.

3.4 DEVELOPMENT AND TESTING

3.4.1 Project Schedule

Activity	April 25	April 26	April 29	April 30	May 1	May 2	May 3	May 4	May 5	May 6	May 7	May 8
Study FIRMS API												
Study Leaftlet.js												
Wireframing (Dashboard Page)												
Polishing Thesis Documentation												
Implementing Wireframe (Dashboard Page)												
Wireframing (Fire Data Page)												
Implement Wireframe (Fire Data Page)												
Wireframing (Registration & Login Page)												
Implementing Wireframe (Login and Registration)												
Testing and Debugging												
Implementing Mock Up Design												

Table 3. Gantt Chart

The Gantt chart displays the tasks performed by the developer in developing the web application. Each activity, along with its timeframe, is indicated to determine the duration of each task until completion.

3.4.2 Operations and Testing Procedures

The following are the operations and testings for the web application.

1. Register an account with both invalid and valid information.
2. Log in with both invalid and valid credentials.
3. Allow the user to select either PH fire data or Cavite fire data to zoom in and zoom out the map of the selected area and display fire data coordinates through fire icons.
4. Allow the user to select a city or municipality of Cavite to zoom in and zoom out the map of the selected area and display fire data coordinates through fire icons.
5. Allow the user to select a satellite instrument to request fire data.
6. Allow the user to select a date to request fire data.
7. Allow the user to select a day range to request fire data.
8. Enable the user to click on a fire icon on the map to view fire information (coordinates, instrument used, brightness, confidence level, date, and time) and to close it.
9. Enable users to select the risk assessment to view the choropleth map of Imus City and identify high risk, moderate risk, and low risk areas based on the color."

3.4.2.1 Evaluation Criteria

The following criteria will be used to evaluate the system based on the ISO 9126:

Functionality - the ability of a product or system to offer functions that meet stated and implicit needs.

Usability - the ability of a product or system to meet specified goals effectively, efficiently, and satisfactorily.

Reliability - how reliable a system, product, or component is in terms of how well it performs stated functions under specified situations.

Efficiency - defined as performance in relation to the amount of resources used.

Maintainability - the capacity of a product or system to be adjusted to improve, correct, or adapt to changes in the environment as well as needs.

Table 4. Numerical scale and interpretation to evaluate the system using Likert-Scale

Numerical Scale	Interpretation
1	Needs Improvement
2	Fair
3	Good
4	Very Good
5	Excellent

Table 5. Interpretation based on the range of the mean score.

Numerical Scale	Interpretation
1.00 – 1.50	Excellent
1.51 – 2.50	Very Good
2.51 – 3.50	Good
3.51 – 4.50	Acceptable
4.51 – 5.00	Highly Acceptable

3.4.2.2 Evaluation Procedure

The proponents chose firefighters in the fire station in Imus City based on their convenience to evaluate the web application using the criteria of ISO 9120. The following procedures must be followed:

- The proponents introduced the web application and trained them on how to use it.
- After the introduction and training, the proponents gave an evaluation form to the available firefighters to evaluate the web application.
- After the evaluation, the proponents collected the answer form and calculated it to get the final result.

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APPENDICES

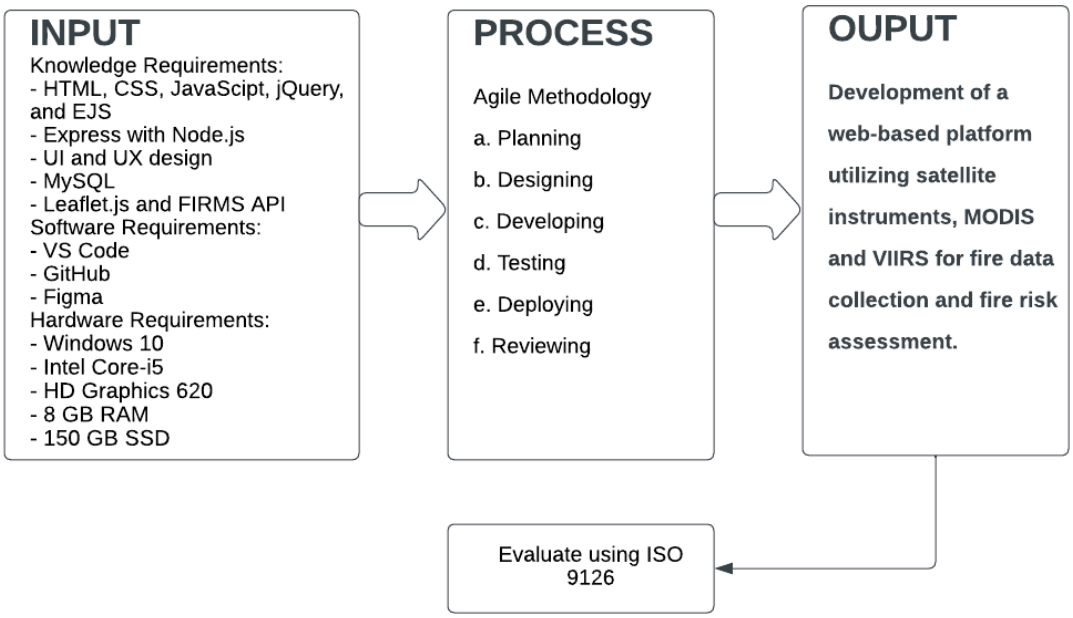

Figure 1. Conceptual Framework

Figure 2. Agile Methodology (Beck, et al, 2001)

Table 1: The minimum and recommended specification of computer for web application

ITEM	MINIMUM SPECIFICATION	RECOMMENDED SPECIFICATION
Operating System	Windows 7	Windows 10
CPU	Intel Core-i5	Intel Core-i5
GPU	HD Graphics 620	NVIDIA GeForce 940M

Memory	8 GB RAM	12 GB RAM
Disk Drive	150 GB SSD	222 GB SSD

Table 2: The minimum and recommended specification of android for mobile application

ITEM	MINIMUM SPECIFICATION	RECOMMENDED SPECIFICATION
Operating System	Android 7	Android 8.0 and above
Chipset	Snapdragon 425	Helio G80
GPU	Adreno 380	Mali G52
Memory	16 GB, 2GB RAM	64GB, 4GB RAM

Table 3. Gantt Chart

Activity	April 25	April 26	April 29	April 30	May 1	May 2	May 3	May 4	May 5	May 6	May 7	May 8
Study FIRMS API												
Study Leaftlet.js												
Wireframing (Dashboard Page)												
Polishing Thesis Documentation												
Implementing Wireframe (Dashboard Page)												
Wireframing (Fire Data Page)												
Implement Wireframe (Fire Data Page)												
Wireframing (Registration & Login Page)												
Implementing Wireframe (Login and Registration)												
Testing and Debugging												
Implementing Mock Up Design												

Table 4. Numerical scale and interpretation to evaluate the system using Likert-Scale

Numerical Scale	Interpretation
1	Needs Improvement
2	Fair
3	Good
4	Very Good
5	Excellent

Table 5. Interpretation based on the range of the mean score.

Numerical Scale	Interpretation
1.00 – 1.50	Excellent
1.51 – 2.50	Very Good
2.51 – 3.50	Good
3.51 – 4.50	Acceptable
4.51 – 5.00	Highly Acceptable

Mohamad Ali Calanda

Web Developer

Address : Aniban 2, Bacoor City, Cavite
Mobile # : 09701638399
Email : mohamadalicalanda20@gmail.com

Aspiring web developer skilled in modern technologies, passionate about user-friendly applications, and eager to learn and contribute to a collaborative team.

SKILLS

HTML, CSS, LESS, Bootstrap, jQuery, Responsive Web Design, Git, GitHub, MySQL, Database Design, ERD, PHP, OOP, Model View Controller (MVC), CodeIgniter 3, Ajax, Database Indexing, JSON, JavaScript ES5 & ES6, NodeJS, ExpressJS, ReactJS, EJS, Socket.io, Python, User Experience Design (UX), Figma, Agile Methodology (Scrum), Trello

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INTERNSHIP

Quality Assurance Manual Tester (August 2023 - September 2023)

Ollopa Corporation - Quezon City, Metro Manila

Promoted to team leader to supervise and guide other interns in their testing tasks and work with the AI department to debug and test AI web-based projects.

TRAINING

Village88 Online Coding Training (January 8, 2024 - April 26, 2024)

Finished rigorous and intensive Full Stack Web Development Training consistently from web fundamentals to advanced level. Exam passer in all certifications and developed 2 projects.

PROJECTS

E-Commerce Website - developed to sell and buy various products. It has an admin page to add, update, and delete products and orders, and a customer page to purchase products.

SheetSoundSynth - a web application that can turn a music sheet image into a playable melody. The user can play the music into different instruments and save it in their account.

AWARDS

Best in Capstone Certification (Village88, Inc, April 2024) - built a solo quality capstone, a web application that converts image into playable melody within a week

Proficient in Front-End Development (Village88, Inc., April 2024) - passed exam in coding a tasks logger application using React for 9 hours.

Proficient in Advanced JavaScript (Village88, Inc., March 2024) - passed exam in coding a multiplayer application using Express and Socket.io similar to Minecraft game but in 2D for 9 hours.

Proficient in Advanced PHP (Village88, Inc., February 2024) - passed exam in coding an application using CodeIgniter that implements pagination for 9 hours.

Proficient in Web Fundamentals (Village88, Inc., January 2024) - passed exam in cloning a landing page of Home Credit website using Pure HTML and CSS for 9 hours.

Front-End Development Certification (Village88, Inc., April 2024) - finished front-end development track

Advanced JavaScript Certification (Village88, Inc., March 2024) - finished advanced javascript track

Advanced PHP Certification (Village88, Inc., February 2024) - finished advanced php track

Web Fundamentals Certification (Village88, Inc., January 2024) - finished web fundamentals track

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EDUCATION

Bachelor of Science in Computer Science (August 2024)

Cavite State University - Imus Campus, Cavite

JANNA MAY P. GENSAYA

OBJECTIVE:

I am looking for a suitable On-The-Job Training as Computer Science student and opportunity where I could practice my knowledge and develop my personality as a career person while utilizing my skills.

Contact Me

09663128894

jannamayg@gmail.com

Blk 33 Lot 35 Rose Street, Phase 2 Villa De Primarosa Subdivision, Buhay na tubig, Imus. Cavite

Education

- **Tertiary:** Cavite State University – Imus Campus
  Imus, Cavite
  Bachelor of Science in Computer Science
  2019 Present

- **Senior High:** Bondoc Peninsula Agricultural High School
  Mulanay, Quezon
  Technical Vocational – Food Processing
  2016 -2018

Mildred Apostol | Assistant Professor 3
Email: mtapostol@cvsu.edu.ph

Personal Information:

- Birthdate: May 13, 1999
- Age: 24
- Sex: Female
- Citizenship: Filipino
- Birthplace: Quezon Province
- Religion: Roman Catholic
- Civil Status: Single

Soft Skill:

- Dedicated and hardworking individual
- Responsible
- God Fearing
- Respectful and Humble
- Organized
- Time Management
- Adaptable

Hard Skill:

- Microsoft Office Proficiency (Word, & Powerpoint)
- Canva
- Pinterest
- Pixel Arts

References:

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Email: grace.ibanez@cvsu.edu.ph

Ricky Tepora
Phone Number: 09171267350
Email: rdtepora@cvsu.edu.ph

MS. SHARMINE D. TABUADA | STUDENT INTERN

Block 19 Lot 6 Bulacan Street, Villa Arsenia Phase 2, Mambog 3 Bacoor City Cavite 4102
+639122926284 / +639756348947
sharmtabuada@gmail.com

Able to handle fast-paced work. Willingness to take on any task to support the team and help the company succeed.

PERSONAL INFORMATION

Date of Birth: May 23, 1999
Place of Birth : Zamboanga del Sur
Citizenship: Filipino
Marital Status: Single
Age: 24 years old
Religion: Pentecostal
Father's Name: Simplicio G. Tabuada
Mother's Name: Josie D. Tabuada

Gender: Female
Height: 157.4 cm
Weight: 41 kg

EDUCATIONAL BACKGROUND

School Year: 2018-Present

Course: BS IN COMPUTER SCIENCE

Location: Palico IV, Imus Cavite

School/University: CAVITE STATE UNIVERSITY

School Year: 2012-2017

Location: ZAMBOANGA DEL SUR

School/University: TUKURAN TECHNICAL VOCATIONAL HIGH SCHOOL

School Year: 2006-2012
Location: ZAMBOANGA DEL SUR
School/University: STO. NINO TUKURAN ELEMENTARY SCHOOL

Hard Skill

- Web Designing
- Creativity
- Computer Literate
- Digital Art
- Microsoft Office Proficiency (Word & PowerPoint)

Soft Skill

- Willing to learn
- Can work under pressure
- Respectful
- Fluent in English, Tagalog, and Bisaya

INTERESTS AND HOBBIES

- Digital Painting
- Cooking
- Playing Online Games

WORK EXPERIENCE

- Customer Service Representative (Masterpiece Group Philippines)
- Hotel Bay Plaza (2018 - 15 days work immersion)
- Ocean View Hotel (2018 - 15 days work immersion)

CHARACTER REFERENCES

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