**CHAPTER I**

**INTRODUCTION**

According to Mkrtchyan (2021), many things that surround us are products — the computer on your desk, the mailbox you use, the faucet on your kitchen sink, and the subway you take every day. They are indisputable parts of our lives, and we interact with them to satisfy our daily needs such as dining, communication, transportation, sanitation, healthcare, etc. The bigger the need, the more valuable and demanded the product that is designed to satisfy that need will be. This makes certain items more popular than others, and it's frequently one of the key elements determining whether a product will succeed or fail. Because of this, only those goods that successfully address significant customer needs and persistent difficulties have persisted on the market and continued to develop over time.

The continuous technological discoveries and advancements open new perspectives in terms of product offerings we see, as well as combine the old and new approaches such as the Internet of Things to solve already existing problems more efficiently. Several more people think that products have to be tangible objects. This was true decades ago, but nowadays this conception is not valid anymore. *“Softwarization”* is consuming the world, turning many of the tangible tools that were meant to solve specific business cases into software alternatives (Burnham, 2019).

Using software to record player information and scores allows for faster and more accurate data entry, reducing the chance of errors and saving time. The software can store

and organize player information and scores in a central location, making it easy to access and analyze data. This can also provide an efficient way to communicate and share player information and scores between coaches, players, officials, and fans. (Cols & di Milano, n.d).

The Baston: An Arnis Web- Based Scoring System with Mobile Support is proposed for digital automated scoring that will make it easier for them to track scores, create teams and bouts per Arnis Labanan categories and for the Arnis Anyo Competition. The proponents would like to help provide it so it could increase productivity for tournaments and lessen the manual recording of the organizers from creating a player profile with their information to assigning them to which categories they belong, formation of teams and the digital recording of the scores per match.

**Project Context**

* The project's concern is to ease the burden of manual scoring of all SACAJUFIMAC affiliated arnis tournaments and to increase productivity among players, coaches, and tournament organizers through this scoring up to share real-time updates.
* The respondent is going to be the San Carlos Jungle Fighter Martial Arts Club. This can benefit the Arnis community. The ones involved in the project are the researchers and the client.
* The research study is planned to commence in February 2024 and will be executed in a systematic manner with the aim of completing all activities and reaching its conclusion by December 2023. This timeline has been carefully established based on several factors, including the availability of resources, the complexity of the study, and the projected outcomes. The estimated final date has been set for December 2023, but it may be subject to adjustment depending on the progress of the study.
* The project will exclusively be carried out within the geographical boundaries of San Carlos City in Negros Occidental and will not extend to any other locations.
* An agile methodology will be used for the entire system development process, from planning to deployment, to improve the scoring system of SACAJUFIMAC Arnis tournaments and provide convenience to organizers and participants. Short sprints will allow for continuous refinement based on stakeholder and user feedback, while breaking down requirements into smaller tasks will ensure that the system meets the organization's specific needs. The result will be a flexible and adaptable system that enhances the tournament experience.
* The project development will be conducted in the following ways; we will first consult with our client on what specific factors are they having trouble with in terms of scoring, secondly, digitalize, and make a user-friendly web scoring system that fits the needs of our client. Lastly, with the help of our adviser, we will follow what methods are better to use during the process of making the project. We will debug, improve, and submit this as a requirement of the school.

**Purpose and Description**

The purpose of this web-based application aims to simplify Arnis sports and competition management by offering a centralized platform for recording scores and player information. Accessible from a mobile or the web, the application is user-friendly and provides real-time updates on match results and standings for all stakeholders. This includes players, coaches, officials, and fans, ensuring everyone is informed on tournament progress.

This study will be beneficial to the following:

**Tournament Organizers**. The centralized platform for recording scores and player information streamlines event management, increases the efficiency and accuracy of score recording, and enhances overall organization and communication of events.

**To the Players**. The system offers real-time updates on match results and standings, improving the collaboration and tracking of wins and loses.

**To the Coaches**. The real-time updates of match results and better tracking and analysis of player progress allows coaches to make informed coaching decisions.

**To the Technical Officials**. The efficient and accurate score recording and improved communication with other officials through the application help technical officials carry out their duties effectively.

**To the Fans**. The real-time updates on match results and standings, enhances the overall viewing experience for fans through efficient management.

**To the Future Researchers**. The application's centralized platform for recording and storing data on Arnis sports and competitions makes it a valuable resource for future research and analysis.

**Objectives**

Generally, our system aims to streamline Arnis sports and competitions by providing a user-friendly way to record player information and scores, and facilitating centralized organization and management. With a mobile or web-based platform, real-time match results and standings are easily accessible to players, coaches, officials, and fans, keeping everyone up-to-date on tournament progress.

Specifically, its ought to achieve the following:

* To provide a fast and accurate way to record player information and scores for any SACAJUFIMAC Arnis tournaments and competitions.
* To facilitate the management and organization of player information and scores.
* To provide real-time updates on match results and standings for players, coaches, officials.
* To improve communication and collaboration between tournament organizers, players, coaches, officials, and fans

**Scope and Limitation**

The scope of the Baston application is to provide a user-friendly interface for recording player information and scores specifically for any SACAJUFIMAC Arnis tournaments and competitions. The application will include features such as real-time updates on match results and standings, and a central location for storing and managing player information. It will be accessible from a mobile or web-based platform and the data collected can be used to improve tournament organization and management, and support the decision-making process.

However, one of the limitations of this application is that it will only be able to be used for Arnis tournaments and competitions and may not be applicable to other sports. Additionally, the application may require a reliable internet connection for real-time updates and data syncing, and a certain level of technical expertise to operate and manage the data. The application will only be accessible to those who have an account and have been granted access, and it may have limitations on scalability and integration to other systems, which may require further development to be able to do so.

**Definition of Terms**

**Arnis**. In this project, is a traditional Filipino martial art that uses weapons such as sticks, daggers, and other weapons to defend oneself.

**Baston**. In this project, it refers to a stick or cane weapon used in the Filipino martial art of Arnis, Eskrima, or Kali.

**Mobile application support**. In this project, refers to the technical assistance and services provided for mobile applications that are used on smartphones and tablets.

**Scoring system**. In this project, this is a method or tool used to assess and record the performance or results of an individual or a group in a competition or exam.

**Web-based**. In this project, refers to a system or application that is accessible through a web browser over the Internet.

**CHAPTER II**

**REVIEW OF RELATED LITERATURES AND SYSTEMS**

This section of the study presents a review of related scholarly studies found on the internet, in books, or in magazines that can provide additional input for this project. It offers an overview of accomplished works, which can supply ideas, methods, and insights on how to enhance the project. These studies serve as the foundation for the proponents in developing this project, creating a framework and methodology for its completion. They also guide the proponents in carrying out the project by providing ideas and filling in any gaps in the study. Furthermore, the review gives the proponents a thorough understanding of what project would be beneficial to the community, as well as alternative projects to existing ones.

**Foreign Literature**

According to (Melo, 2019), several drawbacks are associated with the utilization of paper documents for recording information, shedding light on the challenges faced in traditional documentation methods. Among the identified disadvantages are the limitations in storage space, where the accumulation of paper documents over time poses a significant spatial challenge. This concern is exacerbated by the constant growth in the quantity of paper, leading to an ongoing need for physical storage. Additionally, the proximity of stored paper documents becomes crucial for accessibility, requiring them to be situated in close proximity to facilitate swift retrieval. Moreover, the security of paper documents is identified as a concern, with the tangible nature of paper making it susceptible to various risks such as theft, loss, or damage. Editing problems arise due to the inherent difficulty of making changes to physical documents without leaving visible traces or compromising the integrity of the original information. The high cost associated with paper-based documentation encompasses expenses related to physical storage solutions, printing, and potential retrieval inefficiencies. Furthermore, Melo points out that the limited communication and collaboration inherent in paper documents can hinder the seamless exchange of information in a rapidly evolving digital era. Overall, Melo underscores the multifaceted challenges posed by relying on paper documents, highlighting the pressing need for alternative, more efficient information recording methods.

Another objective of this project is to facilitate the management and organization of player information and scores in a central location, where researchers emphasize these disadvantages of the paper document management system which is currently used by the tournament organizers of SACAJUFIMAC in recording player information and scores.

According to (László Csató, 2021)'s groundbreaking study, "A comparative study of scoring systems by simulations," delves into the nuanced dynamics of sports competitions, focusing on the renowned Formula One World Championship. The research meticulously explores the delicate tradeoff between two inherent risks in such tournaments: the threat of an early clinch, where the championship is secured before all contests conclude, and the subtler danger of winning the championship without securing a first-place finish in any individual contest. Csató's comparative analysis between four historical points scoring systems used in Formula One and geometric scoring rules surprisingly positions the former as not only competitive but, in certain aspects, superior. Beyond dissecting scoring mechanisms, the study offers valuable insights into the evolutionary trajectory of Formula One scoring systems, contributing to a deeper understanding of how point values should be assigned. Emphasizing the critical role of balance in tournament design, the study resonates across diverse disciplines, showcasing the broader relevance of scoring rules in decision-making, game theory, machine learning, market design, and political science. Ultimately, Csató's research positions the current Formula One points scoring system as a judicious compromise that effectively navigates the intricate objectives of minimizing the threat of early clinch and mitigating the risk of winning without securing a first-place finish. The study stands as a testament to the far-reaching impact of scoring rule analyses, extending beyond sports into the realm of decision sciences.

László Csató's study on scoring systems in sports competitions, particularly the Formula One World Championship, serves as a relevant context for understanding the importance of scoring mechanisms. Drawing parallels, our study on "BASTON: An Arnis Web-Based Scoring System" aims to enhance the scoring experience in Arnis competitions through a web-based solution. Both studies highlight the need for a balanced scoring system to optimize participant and organizer experiences. Csató's insights into decision-making complexity resonate with "BASTON," which seeks to streamline and improve scoring in Arnis, contributing to the broader discourse on scoring rules in sports technology. Ultimately, both studies share a common goal of refining scoring systems to elevate the quality and fairness of sports competitions within their respective contexts.

According to (Blobel et al., 2021), the author of the study titled "Structured Comparison of Commercial Sports Information Systems (SIS)," the research addresses the challenge faced by sport organizations in selecting appropriate Sports Information Systems (SIS) due to the heterogeneous requirements and the lack of a consistent definition of SIS categories. The study conducted a systematic search for relevant SIS providers and created a catalog of 164 review items to define essential features. Thirty-six eligible SIS from 11 countries were identified, and semi-standardized interviews with 21 product representatives were conducted. The analysis revealed common features across all SIS and variations in others, leading to the definition of distinct SIS categories. The study emphasizes the necessity for a more precise categorization and recommends considering these findings in the design and selection of SIS.

In conclusion, the study suggests that the term "athlete management systems (AMS)" may be insufficient, and a more accurate reference would be to categorize these systems as SIS, AIS/FIS, or CIS. The findings provide valuable insights for sports informatics, urging an interdisciplinary approach to address the diverse IT systems in sport. Additionally, sport organizations can benefit from the study by using it as a guide for product selection, conducting thorough requirements analysis, and integrating the chosen SIS effectively into internal processes. Clear communication, qualified staff, and strategic planning are highlighted as crucial elements for fully realizing the potential of SIS in advancing the overall efficiency and capabilities of the organization.

As it relates to our study on "BASTON: An Arnis Web-Based Scoring System," the comparison of sports information systems in the research team’s study highlights the importance of understanding and categorizing the features of technology solutions in the sports domain. This insight can be applied to the development and assessment of our Arnis scoring system, ensuring that it aligns with the specific needs and requirements of the sport, thereby optimizing its usability, maintainability, and accuracy for the benefit of Arnis practitioners and enthusiasts.

**Local Literature**

According to (Blanco, 2017), In this article, it has been emphasized how sports are a reality. Physically, emotionally, socially, and economically, it helps people, families, and communities grow strong and healthy. Life would appear to be drab, monotonous, and uninteresting without athletic activities. With the advent of the globalization of sports, the need to value it as a way of life becomes even more challenging and perplexing among nation-states, local institutions, sports organizations, and other sports stakeholders and actors, particularly in the field of governance.

More importantly, sports governance enables national sports to achieve greater heights—a source of national pride, joy, and honor for the country and its people. Sports governance is an outstanding precondition and prerequisite for global prestige and reputation as sports excellence highly equates with social, economic, and political growth and development, even making countries a sports haven for tourism. As sports organizations are required to become important for all students, researchers, and professionals working in sports to understand what governance is and how it should be achieved (O’Boyle & Bradbury, 2013)

Clearly, the importance of sports organizations adopting good governance, structures, and processes that are designed to ensure accountability, transparency, responsiveness, rule of law, stability, equity, and inclusiveness in which this project "BASTON: An Arnis Web-Based Scoring System," will be making one of the sports, Arnis, to adapt to it, in having good governance through this web-based scoring system that will make the organizations tournament flow smoother, set and centralized.

**Foreign System**

According to (Boyacı & Tümbek, 2022), on the study titled "Remote Controlled Embedded System Based Scoreboard Design with Mobile Program," the research focuses on leveraging embedded systems, particularly Arduino boards, to develop a cost-effective and versatile scoreboard system for sports competitions. The study emphasizes the role of embedded systems in producing reliable, compact, and affordable devices, with a specific emphasis on wireless communication capabilities. The authors address the increasing demand for additional information in sports competitions and propose the use of cheap embedded systems like Arduino boards. They highlight the popularity of Arduino boards for their processing power, control, mobile programming, usability, and cost-effectiveness. The study successfully demonstrates the creation of a low-cost scoreboard system that utilizes Bluetooth communication from Android devices for transmitting messages and scores. The system incorporates a Real-Time Clock (RTC) module for accurate timekeeping and allows for adaptable panel size changes. The research concludes by highlighting the continuous one-week operation of the designed system with stable performance, underscoring its reliability in real-world sports settings.

The study on "Remote Controlled Embedded System Based Scoreboard Design with Mobile Program" aligns with our capstone project, "BASTON: An Arnis Web-Based Scoring System with Mobile Support." Both projects focus on developing cost-effective and adaptable scoring systems. The study's emphasis on wireless communication, particularly via mobile devices, resonates with our goal of providing mobile support. Drawing insights from this study, we aim to design a practical, cost-effective, and reliable BASTON scoring system for diverse settings, including sports competitions.

According to (Verlin, 2019), PoloTrac is a mobile, iOS application designed to allow coaches, players, and spectators to record play-by-play water polo game events as they happen in the pool. PoloTrac has the features that one might expect from a score-keeping app such as a functioning scoreboard and clock that can keep track of team fouls and timeouts remaining.  However, PoloTrac also produces post-game reports that are designed to be useful in determining player performance, team performance, and the effectiveness of certain tactics. PoloTrac makes use of the touch interface of iOS devices (iPhones and iPads) to allow users, with a simple tap of the finger, to input specific locations in the pool from which players shoot as well as locations on the net at which they aim. Compiling and charting this data may provide useful insights to water polo players and coaches as to what positions and tactics are producing success in competitions.  By utilizing the latest research and statistical models, PoloTrac is also the first application of its kind to bring advanced data analytics to the average water polo player, coach, and spectator.

The proposed study of Baston, a web-based application for Arnis sports management, shares a similar focus. Baston aims to simplify competition management through a centralized platform for score recording and player information. The application is accessible from both mobile and the web and provides real-time updates on match results and standings for all stakeholders, including players, coaches, officials, and fans. The study of Baston and PoloTrac both aim to improve the experience and analysis of sports through the use of technology.

According to (Znanatej Panga, 2019)'s study, "Automated Basketball Scoring System," submitted as a Problem Report to the College of Engineering and Mineral Resources at West Virginia University, the automated basketball scoring system is designed to detect made shots and can be adapted for recreation or training. It employs a Conductive Rubber Cord Stretch Sensor laced around the net, which stretches when a basketball passes through, allowing for the identification of successful shots through careful comparison of analog voltage values. The system incorporates LEDs on the basketball hoop that change colors in a specific order, determining the point value of each basket based on the LED color at the time of the shot. Unlike traditional basketball games where the point value depends on the shot's origin, this system provides a unique scoring mechanism. Additionally, it offers manual score adjustment options and game control features, such as start, pause, and restart. In the context of the project's problem statement, Panga aims to design a low-cost, battery-powered automated basketball scoring system. Furthermore, the study discusses existing automated scoring technologies, noting their complexity and expense. It highlights technologies using laser beam techniques and vibration sensors or accelerometers, pointing out potential drawbacks such as false statistics due to interference or the need for a multitude of laser beams. Panga's system aims to overcome these challenges with its innovative approach using a Conductive Rubber Cord Stretch Sensor.

Drawing parallels to our study on BASTON: An Arnis Web-Based Scoring System, there's a shared emphasis on leveraging technology to streamline and improve the scoring process in sports. In the context of "BASTON," the web-based system provides real-time score tracking, accessibility through online platforms, and user-friendly features for participants and organizers alike. By aligning with the spirit of innovation demonstrated in Panga's basketball scoring system, "BASTON" showcases a commitment to advancing the scoring experience in Arnis through cutting-edge, web-based solutions. Both studies underscore the transformative power of technology in redefining how sports scores are managed and enhancing the overall efficiency of the scoring process.

According to (Adelard, 2015), The newly developed Mobile Basketball Scoreboard application will be used to reduce or even solve problems experienced while using the paper-based point recording system as it helps in the quick generation of reports, referees, and fans. These reports can be used for monitoring the game in play and decision-making. In this project, the researcher created a mobile application called MOBSCOB for umpiring a basketball game. The game is developed for Java-enabled devices and is a standalone application. The objectives of this project were to develop a feature that will enable the fans, umpires, players, and coaches to record points in a basketball game.

The Mobile Basketball Scoreboard (MOBSCOB) application aims to solve issues with traditional paper-based point recording systems in basketball games. The app allows for quick generation of reports, which can be used for monitoring the game and decision-making. The researcher developed MOBSCOB as a standalone application for Java-enabled devices with the objectives of enabling fans, umpires, players, and coaches to record points in a basketball game.

Baston, a proposed study, shares a similar objective of improving sports management through technology. As a web-based app for Arnis sports management, Baston offers a centralized platform for recording scores and player information that can be accessed from both mobile and web. Both MOBSCOB and Baston aim to simplify sports management and enhance the experience for all involved. Thus, the proposed study of Baston is a crucial step in the direction of digitizing sports management and improving the overall experience for everyone involved.

According to (Brunelle, 2019), the number of smartphone users globally has been on the rise in recent years and is projected to continue growing at an extremely high rate. According to the Ericsson Mobility Report (2018), by 2019, there would have been five billion smartphone subscriptions worldwide. That number is expected to reach over seven billion by 2024. (Ericsson Mobility Report, 2018). With such a high number of smartphone users, mobile applications designed to allow sports enthusiasts to follow their favorite sports teams have become very popular. According to Draper (2018), “The ESPN app has been downloaded 70 million times and has two million daily active users, according to Apptopia, an app analytics company. It regularly ranks as the most downloaded sports app.” An optimal solution will give amateur-tennis teams an interface that facilitates ease of input to record events in real-time during a match. To fans of the team, the solution will provide a user-friendly interface that allows them to see a report of match events as they happen, use customizable profiles, and receive notifications of upcoming match events. Additionally, all users will be given profiles that will grant them access to Topspin’s features. According to (Brunelle, 2019), Topspin, a mobile application for tennis, aims to provide a solution for amateur tennis teams. It offers an interface for easy input of match events in real-time and a user-friendly interface for fans to see a report of match events, access customizable profiles, and receive notifications of upcoming matches. All users will have profiles that grant access to Topspin's features.

In this context, Baston, a web-based application for Arnis sports management, presents a compelling study opportunity. Like Topspin, Baston seeks to improve the experience and analysis of sports through technology by offering a centralized platform for recording scores and player information, accessible from both mobile and web. With real-time updates on match results and standings, Baston aims to simplify competition management and keep all stakeholders, including players, coaches, officials, and fans, informed on tournament progress.

**Local System**

According to (Peñasales et al., 2023), the author of the study titled "E-Board Sports Management Information System with SMS Support: Usability, Maintainability, Accuracy," the research addresses the evolving challenges in the development of the student sports movement within universities. In the context of the professionalization and commercialization of sports, universities are seen as crucial entities not only for producing highly qualified athletes but also for maintaining the system of sports training. Peñasales and the research team devised an E-Board Sports Management Information System with SMS Support, employing the Rapid Application Development Model in the Software Development Life Cycle (SDLC). Both developmental and descriptive research approaches were employed in this study. The system is intended to assess usability, maintainability, and accuracy. The study underscores the importance of sports management systems in educational institutions to overcome challenges related to information silos, miscommunication, and manual processes. A centralized database and sports management system can help administrators make informed decisions and measure the effectiveness of sports programs. An E-Board sports management system, with its real-time updates, mobile accessibility, and integration capabilities, aims to improve efficiency, transparency, and collaboration among coaches, administrators, and athletes, ultimately leading to enhanced sports programs and experiences. Moreover, the study recognizes the role of the Global System for Mobile Communications (GSM) technology in wirelessly communicating SMS to LCD notice boards, contributing to the immediate dissemination of game outcomes and improved event administration. The researchers aimed to develop a system that assesses usability, accuracy, and maintainability, benefiting sports coordinators, officials, and players. In conclusion, the study found that the E-Board Sports Management Information System with SMS Support received high ratings for usability, maintainability, and accuracy, contributing valuable insights into the development and assessment of sports management systems within educational institutions, emphasizing their role in enhancing the sports experience for all stakeholders involved.

Their research on an E-Board Sports Management Information System aligns with our study on "BASTON: An Arnis Web-Based Scoring System." Both studies underscore the importance of fostering skilled athletes and effective sports training systems. It focuses on developing a system with enhanced usability, maintainability, and accuracy, while our study targets Arnis, a Filipino martial art. Both highlight technology's potential to streamline sports management, improve communication, and elevate the overall sports experience, contributing to the broader conversation about optimizing sports programs.

According to (Ceballos IV et al., 2014), the purpose of this study was to create a digital scoreboard for the UIC-Annex Gymnasium. The study aimed to determine the features, accuracy, precision, and clarity of the device in terms of game time, scoring, shot clock, fouls, and period determination. A two-phase method of experimental development and descriptive approaches was used, with 20 evaluators composed of coaches, players, spectators, and engineers assessing the device's functionality. The digital scoreboard was controlled by buttons in the controller and powered by a 220V-AC power supply. It had three parts: a shot clock, a display, and a controller. The controller was composed of momentary pushbuttons connected to a D flip-flop and a PIC microcontroller that manipulated input and converted it to output. The decoder then converted the binary output to a decimal value, which was displayed on the 7-segment display. The shot clock display board had a different flow, with the buttons connected to the PIC and decoder, which converted the binary output to a decimal value, and transistors that amplified the current to light up the 7-segment LEDs.

Comparing Ceballos IV et al.'s (2014) study to our capstone project, "BASTON: An Arnis Web-Based Scoring System with Mobile Support," both focus on improving sports-related systems. While Ceballos IV et al. focused on a digital scoreboard for the UIC-Annex Gymnasium, BASTON aims to modernize scoring systems by transitioning to a web-based platform with mobile support. Both studies use an experimental development and descriptive approach to assess features, accuracy, precision, and clarity with input from various stakeholders. Ceballos IV et al.'s hardware-centric approach for the digital scoreboard aligns with BASTON's use of a mobile interface, replacing the traditional controller for user convenience. Despite differing technological paradigms, both projects share the common goal of advancing sports-related technology, showcasing the shift from hardware-centric systems to more dynamic and user-centric web-based solutions.

**CHAPTER III**

**TECHNICAL BACKGROUND**

San Carlos Jungle Fighters Martial Arts Club was able to produce practitioners of Arnis sport. It was the ones who've been competing and bringing the pride of each San Carloseños and witnessing the capabilities of our well-disciplined practitioners. This was formally established by DIOMEDES N. MAMUGAY, a 3rd Dan Blackbelt at San Carlos City Negros Occidental.

Originally, the club was a non-government organization that has been promoting martial sports for over two decades, eventually, the club is now operating in coordination with the City Sports Office. There are practitioners of mixed martial arts such as Taekwondo, Muay Thai (kickboxing), and Wushu Sanda (grappling). Also shared some programs such as Grassroots Training Program and more to mention.

 However, this is the only organization that produces Arnis practitioners within San Carlos City hence, the founder was appointed to manage City Tournaments in regard to Arnis sports and it has been identified by the founder himself that all the processes in making tournaments and managing seem to be a lot of manpower and manual (paper-based) methods of recording player information, record scores, and bout making.

The proponents will create a web-based app that aims to simplify Arnis sports and competition management by offering a centralized platform for recording scores and player information. Accessible from a mobile or the web, the app is user-friendly and provides real-time updates on match results and standings for all stakeholders. This includes players, coaches, officials, and fans, ensuring everyone is informed on tournament progress.

**Organizational Chart**

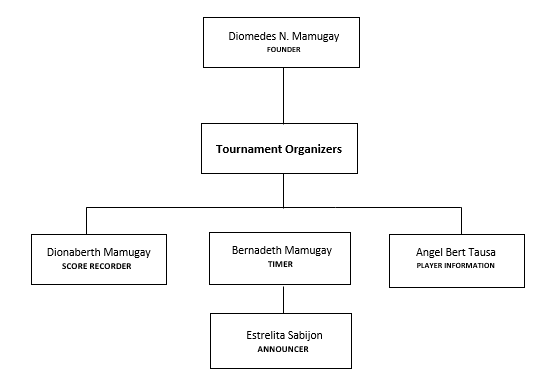
This part shows the organizational chart of San Carlos Jungle Fighters Martial Arts Club.

Figure 1. Organizational Chart

Figure 1. Organizational Chart

**Founder.** Establishes and leads the organization by developing its vision, making strategic decisions, and investing resources ensuring growth and success.

**Score Recorder.** The one whokeeps track of scores during the match, or competition.

**Timer.** The person responsible for measuring the duration of the event, or competition.

**Player Information.** Responsible for maintaining accurate records of members in the organization.

**Announcer.** The one who updates during a sports game or competition.

**Work Flow**

This Work Flow Chart shows the order of steps of the manual process of the tournament organizers in creating match and assigning categories where the score recording will rely upon to.

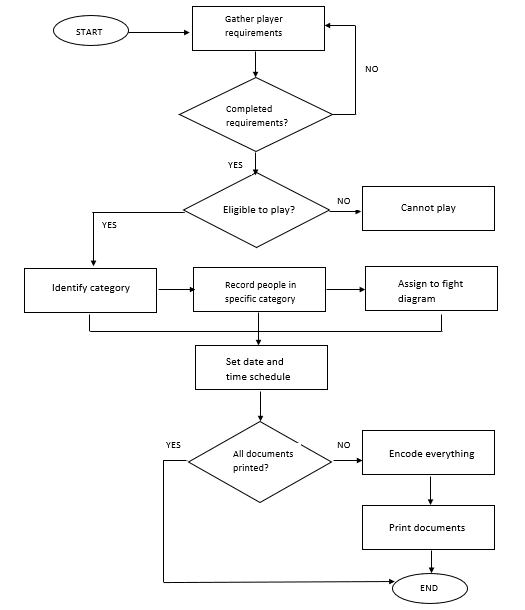


Figure 2. Workflow Diagram in Creating a Match

**Proposed Flow Chart**

This flow chart shows the process of data, where it should start and how it ends.

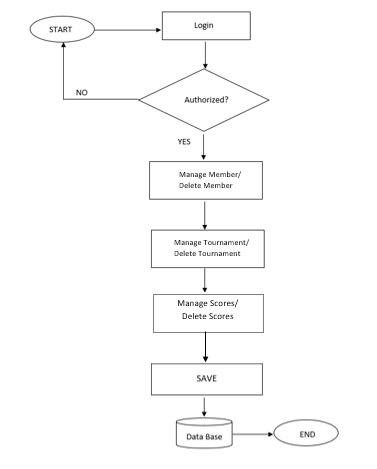


Figure 3. Proposed Flow Chart

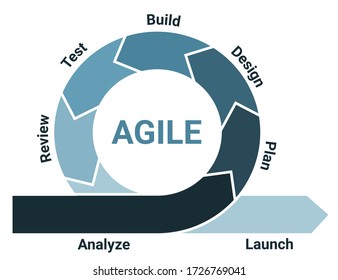
**CHAPTER IV**

**METHODOLOGY**

This chapter outlines the methodology used in the development and testing of Baston, an Arnis web-based scoring system with mobile app support. The purpose of this chapter is to provide a clear understanding of the research design, data collection, and analysis techniques used to create and evaluate the system. The methodology adopted in this study ensured that the system is user-friendly, accurate, and efficient in meeting the needs and expectations of Arnis practitioners. This chapter provides an overview of the user-centered design approach employed in the development of Baston, which involved gathering feedback from Arnis practitioners and experts. The chapter also highlights the data collection techniques used to obtain both qualitative and quantitative data, including interviews, surveys, focus groups, and observation. Additionally, the chapter provides an overview of the analysis techniques used to analyze the data obtained from the data collection process. The findings from this study will help in the development of future Arnis scoring systems and contribute to the advancement of the sport.

**System Design**

The BASTON: An Arnis Web-Based Scoring System with Mobile Support was developed using an Agile methodology, a dynamic and iterative approach prevalent in contemporary software design. Agile embraces flexibility and collaboration through its iterative cycles. Requirements, captured as user stories, are continually reassessed and adjusted throughout the development process. Design, implementation, and testing activities are interwoven in short, manageable iterations, fostering adaptability and responsiveness to changing needs. The Agile model prioritizes client feedback, allowing for early and continuous user input. This iterative and incremental approach ensures that BASTON system is not only responsive to evolving requirements but also aligns closely with user expectations, enhancing its overall effectiveness and user satisfaction.



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Figure 4. Agile Model (System development Life Cycle)

During this analysis stage when the researchers proposed this study, they were able to identify the problem for every Arnis tournament in San Carlos City as shared by the tournament organizers, specifically in recording match scores and organizing these matches to make per tournament well-plotted and to more productive without losing any records of each fight diagrams, information, and records. In the planning stage, the researchers prepared some more probing questions to specify what areas and process would be the system will take part of and what data is needed to be collected from member approval, assigning teams, and finally to the scoring which is the main part of the study. Additionally, the recipient also suggested for the match result and history to be recorded. Next stage, the researchers started to visualize the concepts and the interface of the system, making the design to be more user-friendly and easier to navigate. During the building stage, from the frontend to the backend part of the system, the researchers also considered what active backend platform to use (Firebase) together with the framework that we prefer (Quasar), making sure that every action should function well in accordance to the planned system. On the testing stage, researchers together with the adviser had undergone multiple testing to assure the quality of the system and at the same time, to figure out which part are still needed to be changed and errors are being fixed. Moving to the next stage, is to review all the changes applied and all the error that is being fixed. For the launching stage, the system is expected to be reliable and is guaranteed to launch/deploy.

**Requirements Specification**

The researchers gathered a range of data and facts that will help them create the suggested method. The researchers were able to meet every condition for the investigation. The researchers gathered their data from books, a sample thesis, and online publications to corroborate their findings. To achieve the goal of the system, the data was evaluated.

PIECES Evaluation Framework

Table 1 shows an evaluation of the present system based on the PIECES evaluation framework. These evaluations list the respondents’ claims, the supporting data, and how they identify systematic issues.

Table 1.PIECES Evaluation Framework

|  |  |
| --- | --- |
| **QUANTITY** | **REMARKS** |
| Performance | **Prolonged Score Recording**   * Doing manually cause delay and confusion given that the score recorder and the scorer are two different personnel. |
| Information | **Overwhelming Track of Data Before, During and After Tournament**   * Recording of Weights, manual pairing of bouts, scoring and score evaluation is an overload of data to take note. |
| Economy | **Increased the need of materials**   * A manual set-up, the operation needs a lot of bond papers, pens and inks. * The expense for these materials are overwhelming. |
| Control/Security | **The records are at risk**   * Manual data is prone to loss, redundancy, or duplication. |
| Efficiency | **Expedient is speed**   * Manually scoring, tracking of player information and retrieving score records takes a lot of time. |
| Service | **Time Consuming**   * Records manually produced can take hours for the evaluation of results. |

The table above discusses the evaluation that enumerates the problems discovered in manually consolidating the sales and collectibles based on Performance, Information, Economy, Control/Security, Efficiency, and Service of the process.

**Cause and Effect Analysis**

The implementation of a web-based scoring system has the potential to greatly improve organizational and score recording efficiency by providing a centralized location for storing and accessing important documents and information. However, it is important to consider the potential effects on security and data management, as well as the need for proper training and technical support for users.

Table 2. Cause and Effect Analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | PROBLEM/ OPPORTUNITIES | CAUSE AND EFFECT | SYSTEM OBJECTIVES | SYSTEM CONSTRAINTS |
| PERFORMANCE | Lack of performance | C. The Arnis community manually process the scores and evaluations.  E. It could take time before it could produce a result. | To provide a fast and accurate way to record player information and scores for any SACAJUFIMAC Arnis tournaments and competitions. | The system can be used by the founder and tournament officials. |
| INFORMATION | Lack of Information | C. Manually gathering player information and scoring data.  E. Delay and errors for data entry. | To facilitate the management and organization of player information and scores. | The records of information are accurate and cannot be altered by the viewers. |
| CONTROL/SECURITY | Lack of Control/Security | C. The records may be lost, redundant and duplicated.  E. It would be time consuming to process data. | To provide a centralize location for all data and information of the tournaments. | The data provided by the players are stored in system database. |
| EFFICIENCY | Lack of Efficiency | C. Using of excessive papers for recording data that can lead to confusion on what results or duplication/loss of the processing.  E. Delay the processing of tournament results. | To provide real-time updates on match results and standings for players, coaches, officials. | The records are shown as the data input is on-going. |
| SERVICE | Lack of Service | C. Confusion in between records, scores, and current standing of players during fights.  E. May lead to miscommunication to Arnis tournament organizers, players, coaches, officials, and fans | To improve communication and collaboration between tournament organizers, players, coaches, officials, and fans | System automatically shows the results of each fight directly to the system during tournament proper. |

Based on the results of the enumerated problem in the table 1 PIECES Evaluation Framework, the table above describes the challenges experienced by writing the problem’s cause and effect. System objectives are the intentions of the researchers to address the problem or opportunity found. Cause refers to the origin of the problem, and effect is the result if the problem is not treated. System constraints are the restrictions or limitations that must be applied to achieve the objectives.

**Gantt Chart**

This chart shows the development of the activities done.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Activities | August | | | | September | | | | | October | | | | November | | | | | December | | | | | January | | | | | February | | | |
| w1 | w2 | w3 | w4 | | w 1 | w 2 | w 3 | w 4 | w1 | w2 | w3 | w4 | w1 | w2 | w3 | w4 | w1 | | w2 | w3 | w4 | w1 | | w 2 | w 3 | w 4 | w 1 | | w 2 | w 3 | w 4 |
| **Chapter I**  Introduction |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Project Context |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Purpose and Description |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| General Objectives |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Specific Objectives |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Scope and Limitation |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Definition of Terms |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| **Chapter II**  Review of Foreign and Local Literature |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| **Chapter III**  Technical  Background |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Organizational Chart |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Workflow |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| **Chapter IV**  Methodology |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Requirements  Specification |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| PIECES Evaluation Framework |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Cause and Effect analysis |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Functional RequirAments |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Non-Functional Requirements |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Design and Software Systems |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Hierarchical Input-Process-Output |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Input-Process-Output |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Manual Flowchart |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Proposed Flowchart |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| ER Diagram |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Development and Testing |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Implementation Result |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| **CHAPTER V** |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| **Recommendation** |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Implementation |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Budget Recommendation |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Bibliography |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Appendices |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Users Guide |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |
| Biographical Sketch |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |

Figure 5. Gantt Chart

The Figure 5 above shows the context on how was the researchers easily track the progress of the project and ensure that we are on track to meet our milestones and deadlines. It also helps us to identify any potential issues and adjust our plans accordingly to ensure the successful implementation of the system.

**Functional Requirements**

The functional requirements highlighted the specific functions that the system

should be able to carry out.

* Description of the database entered the system are:

1. Admin’s Information
   * 1. Email
     2. Password
2. Player/Member Details
3. Last Name
4. First Name
5. Middle Name
6. Email
7. School
8. Birthday and Age
9. Gender
10. Contact Number of Member
11. Height (in cm)
12. Weight (in cm)
13. Address
14. Father’s Name
15. Mother’s Name
16. Guardian Name
17. Contact of Legal Guardian
18. Medical Certificate

c.) Team Creation

1. Approved Players

2. Assigned Player per Category

3. Assigned Player per Competition

d.) Match/Tournament Creation

1. Team Information

2. Teams VS. Teams

3. Bout/ Match Data

**Interface Requirements**

* Field accepts text, numeric, and images data entry.
* Design is responsive to all browsers.

**Regulatory/ Compliance Requirements**

* The system will limit access to authorized users.
* All the entries in the database should be correct.
* Data privacy, user details are secured only admin can request to devs to add users.

**Security Requirements**

* Only the SACAJUFIMAC Founder can fully access the system.
* The SACAJUFIMAC officials are the only ones who can use the system with the approval of the founder.
* Assigned Admin (only the founder) is the only one who can log in and view data and will later share access to the assigned official.

**Non-Functional Requirements**

This refers to the qualities of the system that are non-functional. This is divided into two main categories.

1. Execution qualities, such as security and usability, which are observable at run time.
2. Evolution qualities, such as testability, maintainability, extensibility, and scalability which are embodied in the static structure of the software system.

This includes the following:

**Security**

* **Log-In Requirements** – The founder can only access the system using email and password.
* **Password Requirements** – Combination of letters and numbers.
* **Inactivity Time-One** – Duration depends on the system activities.

**Audit**

* **Audited Elements** – It can audit the number of players per team in every SACAJUFIMAC tournament.
* **Audited Fields**- It can audit admin’s credential.
* **Automated File Characteristics**- encrypted file for the data in database.

**Performance**

* **Response Time** – Loading run (3) to (5) seconds at a stable internet connection to display on screen.
* **Processing Time** – The system would display all the uploaded files.
* **Query and Reporting Time** – Uploading and retrieving run (3) to (5) seconds at the stable connection.

**Capacity**

* **Throughput –** The system shall be able to handle multiple users at a time.
* **Storage –** Google cloud is reliable in storing files.
* **Database –** Google firebase is efficient for storing the application’s data.

**Availability**

* **Hours of Operations** – The system can be available anytime.
* **Locations of Operations**- The Operation will depend on the tournament location.

**Reliability**

* **Mean Time Between Failure –** The responsible shared-access/assigned officials can consult the user manual or get help from any of the system developers if a failure occurs.
* **Mean Time to Recovery –** Depending on the problem.

**Recovery**

* **Recovery Process –** Depending on the damage repair, the system can be completed after troubleshooting.
* **Recovery Time Scale –** The system can recover depending on the errors
* **Back-Up Frequencies** – The system back-up is often needed.

**Compatibility**

* **Compatibility with Shared Application –** Visual Studio Code
* **Compatibility on Different Operating Systems** – Windows 7 OS onwards, Android OS and iOS.
* **Compatibility on Different Platforms** – The hardware platforms are needed to work on such as:

1. At least 125MB available hard drive
2. 2GB of RAM
3. Keyboard
4. Mouse
5. Monitor

**Maintainability**

* **Conformance to Architecture Standards –** The system must be checked before the usage to maintain its functionality
* **Conformance to Design Standards –** For the design CSS, and Quasar Framework were used.
* **Conformance to Coding Standards** – The coding for the functionality was written in VueJs, HTML, CSS, and Javascript.

**Usability**

* **Look and feel Standards** – Screen resolution for at least 1366x768 for proper viewing of screens.
* **Internationalization/Localization Requirements** – Language – English; Paper size – Legal.

**Design for Software System**

This illustrates the flow of important data and information that must be entered into the system to get a reliable information output. The system's layout aided the creators in organizing their thoughts and providing the correct solutions.

**Hierarchical Input-Process-Output**

The diagram shows the data of the voters that are placed in a series of levels with different importance or status.

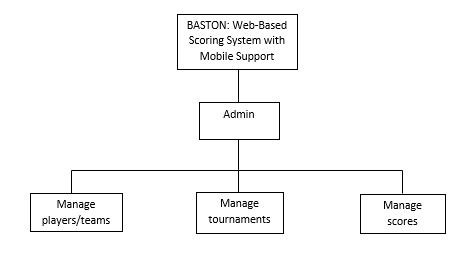


Figure 6. Hierarchical Input-Process-Output

**Input – Process – Output**

The diagram shows information of input and process so that the desired output will be obtained.

Output

Input

Process

Web-based Scoring System with Mobile Support

* Analysis
* Planning
* Designing
* Building
* Testing
* Reviewing
* Launching
* Players’ Information

Figure 7. Input-Process-Output

**Manual Flow Chart**

This chart shows a sequence of connected steps of the manual process.

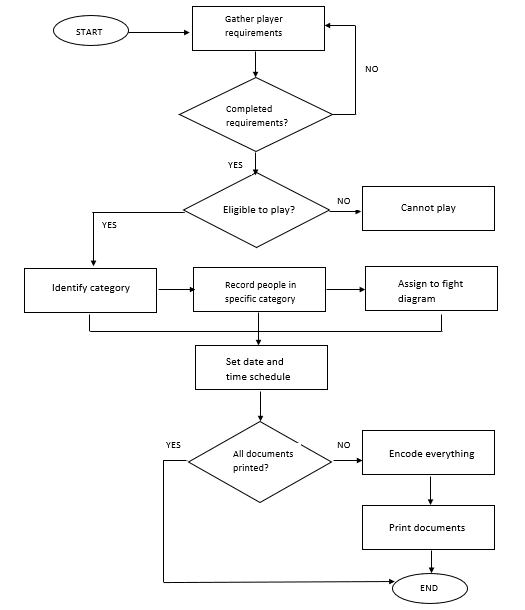


Figure 8. Manuel Flow Chart of Application Process

**Proposed Flow Chart**

This flow chart shows the process of data where should start and how it ends.

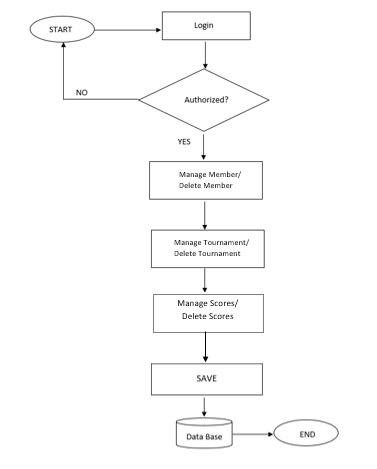
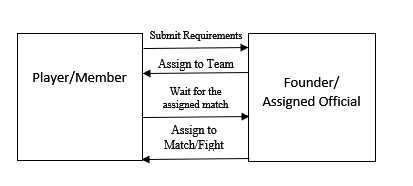


Figure 9. Proposed Flow Chart of Application Process

**Current Data Flow Diagram**

This diagram outlines the process of how data moves through without our system, including on how the assigned official gather and review player’s data and how they assign these players into teams, categories, and matches. By understanding this diagram, the researchers can gain insights into the efficiency and effectiveness of our data management processes, identify areas for improvement, and ensure that our data is flowing accurately and securely.

  
  
Figure 10. Current Data Flow Diagram

**Proposed Data Flow Diagram**

Our proposed DFD will illustrate the movement of data through the various stages in the system, including input, processing, storage, and output. The diagram will provide a clear understanding of the data inputs, outputs, and transformations within the system and help identify potential bottlenecks or areas for improvement.

1.0

LOGIN-Admin

**ADMIN**

4.0

Fill-out Forms Upload Medical Certificate

**GUEST**

2.0

Manage Players,   
View Player Data, Organize Tournament, Scoring Per Fight

DATABASE

**ADMIN**

Explore Platform

Logout

3.0

SIGNUP-Member

**GUEST**

Figure 11. Proposed Data Flow Diagram

**Entity-Relationship Diagram**

An Entity-Relationship Diagram (ERD) is a graphical representation of entities and their relationships to each other, used to model and design databases. An ERD typically consists of entities represented as rectangles, with relationships between them represented as lines connecting the entities. The purpose of an ERD is to visually represent the structure of data in a system, to communicate the design to stakeholders, and to serve as a blueprint for database development.

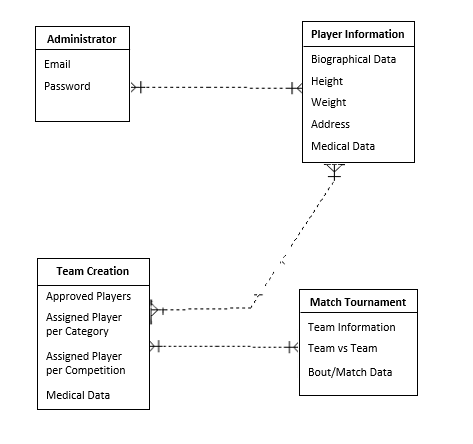


Figure 12. Entity Relationship Diagram

**Development and Testing**

This system was developed using software programs such as VueJs, Javascript, CSS, and HTML. The reason Google Firebase was chosen was because it was very quick at retrieving information, had cutting-edge features for everything from authentication to storage through a database management information system, and could be easily accessible and used by network facilities running Windows.

**Implementation of Result**

The BASTON: An Arnis Web-based Scoring System with Mobile Support has been successfully implemented and is now available for use. This system aims to streamline Arnis sports and competitions by providing a user-friendly way to record player information and scores, and facilitating centralized organization and management. With a mobile or web-based platform, real-time match results and standings are easily accessible to players, coaches, officials, and fans, keeping everyone up-to-date on tournament progress. The researchers are confident that this new system will increase the productivity and organization for future SACAJUFIMAC tournaments.

Table 3. Summary of System Evaluation

|  |  |
| --- | --- |
| **SYSTEM CAPABILITIES** | **RESULT OF EVALUATION** |
| Performance | * The task at hand that needs to be done over a period of time is completed without delay |
| Information | * The information input/output by the end user is present, complete, and accurate. |
| Economy | * The APIs and Software needed to deploy the system are both free. |
| Control/Security | * The system is password-protected, preventing unauthorized access. |
| Efficiency | * The amount of effort needed to manage the system is moderate. |
| Service | * The system generates records and reports that are accurate, consistent, and dependable. |

Table 3 above is the summary of the system evaluation with the use of PIECES Evaluation Framework from Ahmad Fatoni, Kusworo Adi, Aris Puji Widodo and done by the end users and IT experts. The system is presented, manipulated, and evaluated by the IT experts/ end users with a corresponding rating based on the system capabilities.

**Research Instrument and Statistical Treatment of Data**

Using the PIECES Software Evaluation Framework Questionnaire determines how effective and efficient the developed BASTON: An Arnis Web-based Scoring System with Mobile Support. This standardize questionnaire was used in evaluating the end-users and IT (Information Technology) experts’ satisfactory rating on the effectiveness, efficiency, and usability of the developed system. To examine the functionality of the developed system, the areas of performance, information, economy, control, efficiency, and services were evaluated. For each question in each area, the respondents answered based on a 5 – point Likert Scale with the verbal description: 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree. The total score and weighted mean were calculated from the items.

Table 4.Research Instrument and Statistical Treatment of Data

|  |  |  |
| --- | --- | --- |
| **RATING** | **WEIGHTED MEAN** | **VERBAL DESCRIPTION** |
| 5 | 4.21 - 5.00 | Strongly Agree |
| 4 | 3.41 - 4.20 | Agree |
| 3 | 2.61 - 3.40 | Neutral |
| 2 | 1.81 - 2.60 | Disagree |
| 1 | 1.00 - 1.80 | Strongly Disagree |

The formula for LSM is:

X = 5 \* fi + 4 \* fi + 3 \* fi +2 \* fi + 1 \* fi

N

Where x = weighted mean

fi = frequency of the 1st score

N = total number of the respondents

The Effectiveness, Efficiency, and Usability of the developed BASTON: An Arnis Web-based Scoring System with Mobile Support assessed and evaluated by the end – users and IT experts.

Table 5. Response of the End – Users and IT Experts on PIECES Software Evaluation in terms of Performance throughput and response time.

|  |  |  |
| --- | --- | --- |
| Indicators | Weighted Mean | Interpretation |
| 1. Small amount of work is performed over a period of time. | 4.50 | Strongly Agree |
| 2. There is no delay in viewing records  and generating reports. | 4.42 | Strongly Agree |
| **Overall Weighted Mean 4.46** | | |

Table 5 shows that the overall Performance of the BASTON: An Arnis Web-based Scoring System with Mobile Support was rated and the respondents agree with the weighted mean of 4.46. The respondents such as faculty and IT experts agree with the weighted mean of 4.50 in terms of the small amount of work is performed over a period of time, and agree that there no issue with viewing record data and generating the reports with the weighted mean of 4.42.

Table 6. Responses of the End – Users and IT Experts on PIECES Evaluation in terms of Information Input, Output and Data Storing.

|  |  |  |
| --- | --- | --- |
| Indicators | Weighted Mean | Interpretation |
| 1. Forms used were accurate in capturing data because forms don’t lack the Required information which the user would fill-in. | 4.42 | Strongly Agree |
| 2. Forms used to capture data was not redundantly saved because system won’t allow Forms containing the same information. | 4.33 | Strongly Agree |
| 3. Does not lack of required forms to capture data. | 4.50 | Strongly Agree |
| 4. Reports contain complete information. | 4.42 | Strongly Agree |
| 5. Reports don’t contain too much information which is not needed. | 4.33 | Strongly Agree |
| 6. Reports doesn’t contain unnecessary and irrelevant information. | 4.33 | Strongly Agree |
| 7. Stored Data/Information is accurate. | 4.33 | Strongly Agree |
| 8. Data/information is secured from accident, theft or vandalism. | 4.33 | Strongly Agree |
| 9. Data/information doesn’t store redundantly in multiple files and/or databases. | 4.25 | Strongly Agree |
| Overall Weighted Mean | | **4.36** |

Table 6 shows that the overall Information Input, Output, and Data storing of the College of Computer Studies Faculty and IT (Information Technology) Experts agree with the weighted mean of 4.36, in terms of the forms used were accurate in capturing data because forms don’t lack the required information which the user would fill – in and agree that the forms used to capture data was not redundantly saved because the system won’t allow it with the weighted mean of 4.42. The respondents and IT (Information Technology) experts agree that the required forms of the system do not lack to capture data with the weighted mean of 4.33, and agree that in terms of information the report contains complete information with the weighted mean of 4.42. The respondents and IT (Information Technology) experts agree that the report doesn’t contain too much information which is not needed with the weighted mean of 4.33, and agree that the reports doesn’t contain unnecessary and irrelevant information with the weighted mean of 4.33, and in terms of storing data the system provides accurate information with the weighted mean of 4.33. The respondents and IT (Information Technology) experts agree that the data/information is secured from accident, theft or vandalism with the weighted of 4.33, and agree in terms of data/information storing with multiple files and/or databases doesn’t store redundantly with the weighted mean of 4.25.

Table 7. Responses of the End – Users and IT Experts on PIECES Evaluation in terms of Economic Cost.

|  |  |  |  |
| --- | --- | --- | --- |
| Indicators | Weighted Mean | | Interpretation |
| 1. It is not expensive to operate the system. | 4.58 | Strongly Agree | |
| 2. Supplies and materials of the project is sufficient. | 4.75 | Strongly Agree | |
| Overall Weighted Mean | | **4.67** | |

Table 7 shows the overall Economic Cost of BASTON: An Arnis Web-based Scoring System with Mobile Support was rated and the respondents agree with the weighted mean of 4.67. The Respondents such as faculty and IT (Information Technology) experts agree with the weighted mean of 4.58 in terms of expenses in operating the system, and agree in terms of efficiency of supplies and materials of the project with the weighted mean of 4.75.

Table 8. Responses of the End – Users and IT Experts on PIECES Evaluation in terms of Control and Security.

|  |  |  |
| --- | --- | --- |
| Indicators | Weighted Mean | Interpretation |
| 1. Input data/information is adequate to operate the system. | 4.58 | Strongly Agree |
| 2. Data or information is secure for unauthorized access. | 4.42 | Strongly Agree |
| 3. Data privacy regulations or guidelines are not violated. | 4.33 | Strongly Agree |
| Overall Weighted Mean | | **4.44** |

Table 8 shows the overall Control and Security of BASTON: An Arnis Web-based Scoring System with Mobile Support was rated and the respondents agree with the weighted mean of 4.44. The Respondents such as faculty and IT (Information Technology) experts agree with the weighted mean of 4.58 in terms of operating the system the input data/information is adequate, agree that the data or information is secured for authorized access with the weighted mean of 4.42, and agree in terms of data privacy regulation or guidelines are not violated with the weighted mean of 4.33.

Table 9. Responses of the End – Users and IT Experts on PIECES Evaluation in terms of Efficiency.

|  |  |  |
| --- | --- | --- |
| Indicators | Weighted Mean | Interpretation |
| 1. Data is not redundantly inputted or copied. | 4.42 | Strongly Agree |
| 1. Data is not redundantly processed. | 4.42 | Strongly Agree |
| 1. Information is not redundantly generated. | 4.33 | Strongly Agree |
| 1. Effort required for tasks is moderate. | 4.67 | Strongly Agree |
| 1. Materials required for tasks are excessive. | 4.50 | Strongly Agree |
| Overall Weighted Mean | | **4.47** |

Table 9 shows that the overall Control and Security of BASTON: An Arnis Web-based Scoring System with Mobile Support was rated and the respondents agree with the weighted mean of 4.47. The Respondents such as the faculty and IT (Information Technology) experts with the weighted mean of 4.42 in terms of data inputted or copied and that the data is not redundantly processed with the weighted mean of 4.42, and in terms of generating information the respondents and IT (Information Technology) experts agree with the weighted mean of 4.33. The system required task effort is moderate with the weighted mean of 4.67, and agree in terms of the required materials are not excessive for tasks with the weighted mean of 4.50.

Table 10. Responses of the End – Users and IT Experts on PIECES Evaluation in terms of Service

|  |  |  |
| --- | --- | --- |
| Indicators | Weighted Mean | Interpretation |
| 1. The system produces accurate results. | 4.42 | Strongly Agree |
| 2. The system produces consistent results. | 4.42 | Strongly Agree |
| 3. The system produces reliable results. | 4.42 | Strongly Agree |
| 4. The system is easy to learn and use. | 4.75 | Strongly Agree |
| 5. The system is inflexible to new exceptional situations or change. | 4.58 | Strongly Agree |
| Overall Weighted Mean | | **4.52** |

Table 10 shows that overall Service of the BASTON: An Arnis Web-based Scoring System with Mobile Support was rated and the respondents agree with the weighted mean of 4.52. Agree in terms of result the system produces accurately with the weighted mean of 4.42, and the respondents and IT (Information Technology) experts were agree that the system produced consistent result with the weighted mean of 4.42, the agree when it comes with reliable result with the weighted mean of 4.42. The respondents and IT (Information Technology) experts were strongly agree that the system is easy to learn and use with the weighted mean of 4.75, and agree in terms of exceptional situations or changes in the system is flexible to deal with the weighted mean of 4.58.

Table 11. Grand Mean of the Responses of the End-Users and IT Experts on PIECES Software Evaluation for the Effectiveness, Efficiency and Usability of the developed BASTON: An Arnis Web-based Scoring System with Mobile Support

|  |  |  |
| --- | --- | --- |
| **Indicators** | **Weighted Mean** | **Descriptive** |
| 1. Performance throughout and response time | 4.46 | Strongly Agree |
| 1. Information input, output and data storing. | 4.36 | Strongly Agree |
| 1. Economic Cost | 4.67 | Strongly Agree |
| 1. Control and security. | 4.44 | Strongly Agree |
| 1. Efficiency | 4.47 | Strongly Agree |
| 1. Service | 4.52 | Strongly Agree |
| **Overall Weighted Mean** | **4.49** | Strongly Agree |

Table 11 shows the overall weighted mean of the evaluation conducted by the researcher to the end users. Based on Performance throughout and response time, information input, output and data storing, the control, security, and efficiency of the system and services, the respondents strongly agree that BASTON: An Arnis Web-based Scoring System with Mobile Support agree in effective, efficient and usable with the grand mean of 4.49.