



Short Paper

# Insights and Trends of Capstone Project of CS/IT Department of Bicol University from 2011 to 2019

Benedicto B. Balilo Jr.

CS/IT Department, Bicol University, Philippines  
bjbbalilo@bicol-u.edu.ph  
(corresponding author)

Ryan A. Rodriguez

CS/IT Department, Bicol University, Philippines

Jonathan Jaime G. Guerrero

Biology Department, Bicol University, Philippines

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## Abstract

*Purpose* – This study aims to provide a review of the thesis submitted by undergraduate students and provide sound inputs to academic programs which shall open new trends of researchable areas. This may also influence the research areas of the IT degree program once students started to propose capstone projects. More importantly, the output of this study shall give faculty members the insights of setting the capstone development projects and encourage them to introduce diverse applications of technology

*Method* – The samples of the study are the manuscript Bachelor of Science in Information Technology (BSIT) obtained from 2011 to 2019 with capstone details (i.e. name of a student, capstone titles, adviser, panel members). These manuscripts are extracted from the CSIT faculty department, faculty storage room, department computer, and main library of the University. A total of two-hundred seventy-three (273) manuscript titles were retrieved for analysis. The titles are converted into lowercase characters for easy categorization utilizing the features MS Excel transposition method and PivotTable. Special symbols like dash, colon, parentheses, slash, and apostrophe are removed to



provide a list of common words. The standard frequency count and categorization of capstone titles were used to count the number of thesis per year, filter and categorized the titles according to keywords.

*Results* –The study provided sound inputs to academic programs which shall open new trends of researchable areas. This may also influence the research areas of the IT degree program once students started to propose capstone projects. On the part of the faculty, the study provided insights into setting the capstone development projects and encourage them to introduce diverse applications of technology research.

*Conclusion* – The study exposed the challenges and opportunities of the BSIT thesis to many possible activities in terms of enrichment or pieces of training, exposure to current technology trends, and policy formulation. Students' awareness and exposure to various programming languages, database server applications, methodologies, and application types have dramatically changed over time. The proposed research area was geared towards the emerging trends in technology and computer. The BSIT program followed the suggested and recommended capstone project titles stipulated in the CHED Memo Order of 2012 and #25 series of 2015. The suggested capstone titles include software development, multimedia system, network design, and implementation, and IT management. Research topics are always a challenge not just for faculty and students but for the department program as well. One possible intervention to change the course of future research undertakings is to assess the human resource capability and review the curriculum.

*Recommendations* – The capstone project titles are inclined to system development. It is therefore recommended that it is better to encourage new concepts to system development but need to consider and explore the suggested project titles by CHED along with the areas of multimedia, network design and implementation, and IT management which include planning and security strategies. A follow-up study can be proposed to study the influence factor of students in the selection of programming languages, methodology, framework, and other parameters in implementing a capstone project.

*Research Implications* – Almost all developed capstone projects are inclined to browser-based application development and developed using PHP scripting language. The inclusion of information like tools and applications (including the versions) used in the development provides a general idea of the process. Discussion of current trends and potential researchable areas could be presented before the capstone project proposal. This would give students insights and probably room for opportunity to expose students to higher learning ability.

*Keywords* – grey literature, BSIT degree program, capstone project, CHED policy and standard

## **INTRODUCTION**

Institutions shared a significant role in producing a massive amount of knowledge every year. Bicol University (BU) is a regional state and research institution. In BU, the colleges are the big contributors of the manuscripts which are archived in the faculty room, libraries, and shelves which most of them are archived and piled in unnoticed locations.

The College of Science (CS) was established on September 10, 2004, under BOR Resolution 75, series of 2004. The college was formed to pool down the facilities and manpower skills for the development of higher learning and research in basic and applied sciences and mathematics. The BS Biology of BUCAS, BS Chemistry of BU-RSTC, and BS Computer Science of Computer Science Institute constituted the established Bicol University College of Science (BUCS). Today, BUCS has five (5) departments which are comprised of CSIT, Biology, Chemistry, Physics, and Mathematics department. The Computer Science and Information Technology (CSIT) department offered two (2) programs the BS in Information Technology (BSIT) and BS in Computer Science (BSCS).

Every semester, almost 500 students were enrolled in BSIT and BSCS programs. As of writing, there are two (2) blocks for BSCS and three (3) blocks for the BSIT degree program. These are the potential and initial figures to enroll for the thesis and capstone project. In the first semester, students enrolled in thesis and capstone projects submitted proposals as a requirement to take thesis 2 and capstone project 2. Considerably, several documents were submitted and circulated which can be found in the faculty room, libraries, and sometimes archive in a storage room. There are certain topics in academic pieces of literature which are generally scarce and grey literature becomes a major source of evidence (Zhang et al., 2021). These documents and materials have great value not just to authors but to the academe in general. And, these could be a source of new knowledge and an opportunity to improve the curriculum agenda of the institution.

The study aims to provide a review of the thesis submitted by undergraduate students and provide sound inputs to academic programs which shall open new trends of researchable areas. This may also influence the research areas of the IT degree program once students started to propose capstone projects. More importantly, the output of this study shall give faculty members the insights of setting the capstone development projects and encourage them to introduce diverse applications of technology

## **LITERATURE REVIEW**

Grey literature is unpublished studies and articles published outside the formal (published) reviews of a widely available journal. The difference between the two is that the former results are statistically significant of which the effect size is about one-third

larger than the unpublished studies. The important issue to be addressed is whether the evidence results from grey literature should be included and how it will be searched (Conn et al., 2003).

A student's research paper like the undergraduate thesis is one way of developing a research skill of an individual. The formal thesis is considered to be an integral component of the degree or course that a student accomplished. And, sometimes served as a testing method to examine the alignment of university, supervisor, and student expectations as regards their undergraduate subject learning outcomes (Stappenbelt, 2019).

Benefits are being acquired or learned during a review of a certain project, thesis, or any kind of existing research. Studies showed that there was an increase in student performance using rubric scoring categories associated with science literacy and critical thinking skills (Weaver, et al., 2016). However, there were observed benefits to students in using literature reviews used for database searching, citation searching, pearl growing, reference list checking, and the use of their literature. This shows the quality of data, especially in underserved area placements (Crampton, et. al., 2013). Consequently, the primary benefit of establishing an undergraduate thesis or program is to develop the international standard for the development of future undergraduate programs (Drain, et. al., 2017).

The citation analysis was reviewed in the study of Hoffmann et. al. (2012), in which analyzing the age of cited resources, and the researcher should calculate the citation age being an option instead of publication date. The studies that were reviewed defined aspects of the methodology, but others were considered to be more detailed. It also concluded that there are considering factors that should be carefully chosen and analyzed to meet the objectives in their research. In case the citation results come about are aiming to be utilized basically to improve local understanding, the researchers ought to select an approach that fits with local practice.

According to Agustin and Nanola (2013), the spatial and temporal distribution of crown-of-thorns starfish was manifested in real distribution because it was not subjected to human intervention. The use of a temporal scale fitted for the analysis of data where there was no significant difference observed during the sampling periods. The output should be in longer time of monitoring over their research. In this research, there is an observation done and there are numbers of transects, dates, and coordinates for each data of the Maritime Protected Areas (MPAs). The data was collected in two-year sampling periods which similar or related to this present research with a 7-year range of data gathering.

## **METHODOLOGY**

The College of Science (CS) was established on September 10, 2004, under BOR Resolution 75, series of 2004. The college was formed to pool down the facilities and

manpower skills for the development of higher learning and research in basic and applied sciences and mathematics. The BS Biology of BUCAS, BS Chemistry of BU-RSTC, and BS Computer Science of Computer Science Institute constituted the established Bicol University College of Science (BUCS). Today, BUCS has five (5) departments which are comprised of CSIT, Biology, Chemistry, Physics, and Mathematics department. The CSIT department offered two (2) programs the BS in Information Technology (BSIT) and BS in Computer Science (BSCS).

Every semester, almost 500 BSIT and BSCS students enrolled in the programs. The BSCS with two (2) blocks and three (3) blocks for the BSIT degree program. These are the potential and initial figures to enroll for the thesis and capstone project. In the first semester, students enrolled in thesis and capstone projects submitted proposals as a requirement to take thesis 2 and capstone project 2. Considerably, several documents were submitted and circulated which can be found in the faculty room, libraries, and sometimes archive in a storage room. These materials have great value not just to authors but to the academe in general. This could be a source of new knowledge and an opportunity to improve the curriculum agenda of the institution.

The initial list of BSIT capstone titles was obtained from the department faculty in charge. These include the list of titles from 2011 to 2019 with the name of students, advisers, and panel members. The manuscripts are gathered from the CSIT Faculty department, faculty storage room, and main library of the University. The titles from 2017 to 2019 were obtained from the electronic copy stored in the personal computer of the department. These manuscripts served as a baseline for analysis to compare and cross-check the proposed and actual titles. A total of two-hundred seventy-three (273 or 87%) manuscript titles were retrieved for analysis (Table 1).

Table 1. Total number of Capstone Project manuscripts retrieved

<b>Year</b>	<b># of Capstone Project Titles</b>	<b>Retrieved Count</b>
2019	16	30
2018	34	18
2017	30	27
2016	31	21
2015	30	29
2014	39	39
2013	37	35
2012	49	44
2011	48	30
<b>Total</b>	<b>314</b>	<b>273</b>

The titles are converted into lowercase characters for easy categorization utilizing the features MS Excel transposition method and PivotTable. Special symbols like dash, colon, parentheses, slash, and apostrophe are removed to provide a list of common words. The generated words become the basis to determine the word frequency count.

The standard frequency count and categorization of capstone titles were used to count the number of thesis per year, filter and categorized the titles according to keywords. The study used the clustering technique to facilitate easy sorting, classification, and dividing the manuscript titles based on the types of methodologies, applications, and programming used tools and research venue of the study. The results of which shall include major research trends, capstone focus anchored on CHED memo, duplication of research (whether in an agency or the system itself), research not conducted by the program, research done but languages were not taught during the academic requirements, and proposed researchable areas.

A total of two thousand eight hundred and forty-one (2,841) words were counted in six hundred ninety (690) distinct words, numbers, and special characters (dash, ampersand, and colon). Two thousand two hundred and two (2,202 or 78%) words were considered for analysis and pivot table and six hundred thirty-nine (639 or 22%) words were considered as noise values or have different meanings which shall not affect the cleaned list of words. These noisy values include the terms for, and, of, v, the, a, one, and others. Table 2 presents the top 10 keywords and noisy values.

The presence of noise values in an environment under analysis may affect the data collection and data preparation processes. The noise values removed are "for", "and", "of", "v", "the", "rov", "a", "ro", "in", "an", and others.

## RESULTS AND DISCUSSIONS

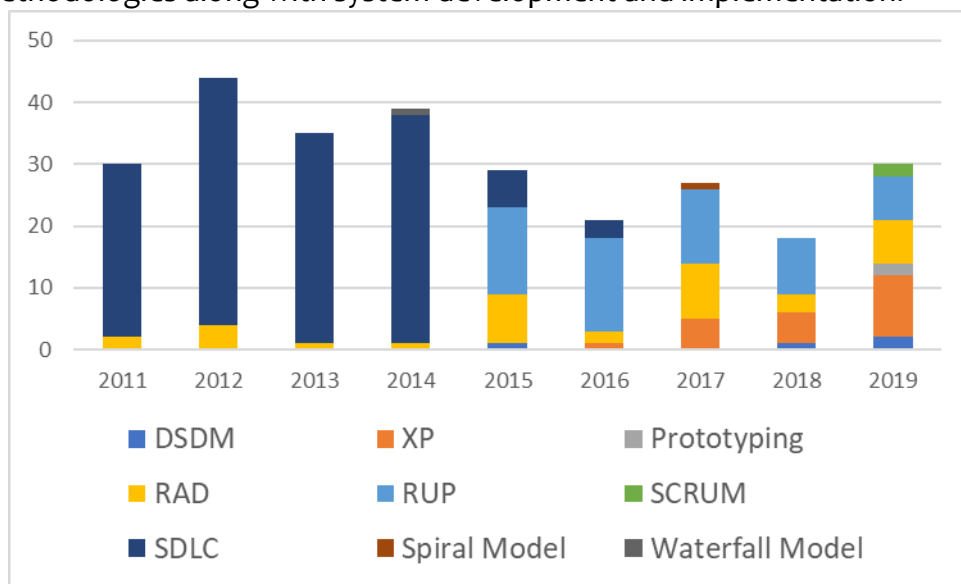
The results of the study were anchored on data preprocessing techniques. These techniques are used in many machine learning applications which consists of data cleaning, data integration, data transformation, and data reduction to speed up the data preparation process (Sivakumar & Gunasundari, 2017). The capstone project titles are transformed into a cleaned dataset before text and statistical analysis (Malley et al., 2016).

The raw data was cleaned and noisy terms were removed to capture the terms with importance and value for analysis. Some of the popular terms used are “system” which was used 258 times in the manuscript titles. This was followed by the terms *management*, *information*, *monitoring*, *office*, and *web-based* with 94, 75, 66, 61, and 60 frequency count, respectively. In this study, noisy values are terms that are not primary needed data for analysis but were mentioned in the thesis titles. The ten (10) most mentioned noisy terms came from a preposition, conjunction, character, adjective/adverb, symbol, and abbreviation. The preposition ‘for’ topped the list with one hundred eighty-seven (187) count. This was used to indicate the connection that the study was designed for a specific agency, organization, or company. Examples are ‘*BUCAL Deans Office*’, ‘*COA RO V*’, ‘*FavorPls delivery system*’, ‘*MDRRMO: LGU Daraga*’, and others.

In general, the results seem to show that the capstone project titles are within the recommended occupational and career path for the BSIT program focused on software/system development with emphasis on IT infrastructure or IT Management project aligned with CHED policies, standards, and procedures related to BSIT capstone project suggested areas. These areas include software development, multimedia systems, network design, implementation and server farm configuration and management, and IT management. The majority of the titles are focused on software development which includes software customization, information system development, web applications development, and mobile computing system (CHED, 2015).

### Common Methodologies

In early years there are only two (2) methodologies are known or used by students in implementing capstone projects (Figure 1). Twenty-eight (28) out of 30 students used Software Development Lifecycle (SDLC) methodology and two (2) used Rapid Application Development (RAD). These were the years students are a novice and learning the cycles of the methodologies along with system development and implementation.



**Figure 1.** Common Methodologies Used from 2011-2019

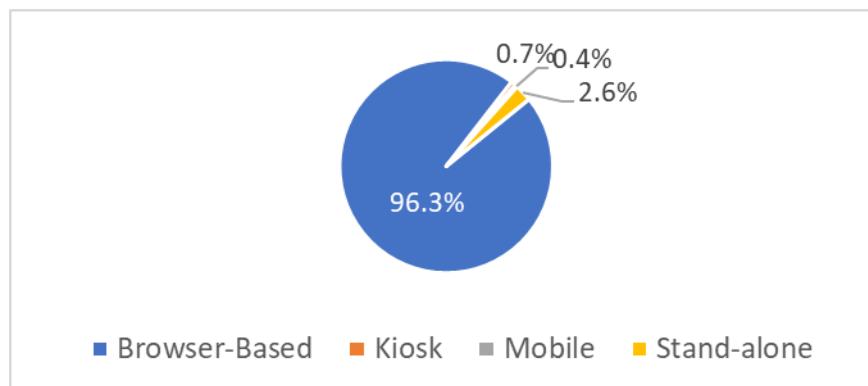
In nine (9) years students are exposed to different methodologies and these can be attributed to the goals of the faculty development program. On March 16, 2012, Bicol University (BU) and the University of the Cordilleras (UC) entered into a memorandum of agreement (MOA) to offer a Master in Information Technology (MIT) program. The UC as delivering HEI and BU as the host institution and act as sending the institution of the faculty scholar to the Off-Shore Program. The BU-UC Offshore program caters to faculty members who are regular members of the institution within the Bicol region (BU BOR, 2016). Six (6) BU faculty members availed and took the opportunity of the program. As part of the University's strong commitment, more faculty members were granted to enroll in Masteral and Doctoral degree programs.

During this period, new knowledge was introduced and opened the room to explore other areas, especially software engineering. The influence of acquiring new knowledge was extended to other faculty members. In the process, new methodologies were introduced to the classroom and at some point, the usual practice became more effective and advanced. As a result, aside from the SDLC and RAD methodologies, others became familiar such as DSDM, XP, RUP, Spiral model, Prototyping, SCRUM, and Waterfall model.

It seems that the University's commitment, support and focus towards faculty development reaping the investments as these faculty members have now reinstated and taking the lead in setting a new direction by instituting changes in the department undergraduate and master thesis policies. It is by these benefits that by sending faculty members to diverse HEI learning environments and the greater exposure to academics the greater advantage for the University. Today, students are already benefiting from the learning experiences of other institutions in the country like the University of the Philippines (Diliman), De La Salle University (DLSU-Manila), Technological Institute of the Philippines (TIP-Quezon City), and University of the Cordilleras (UC) in Baguio City.

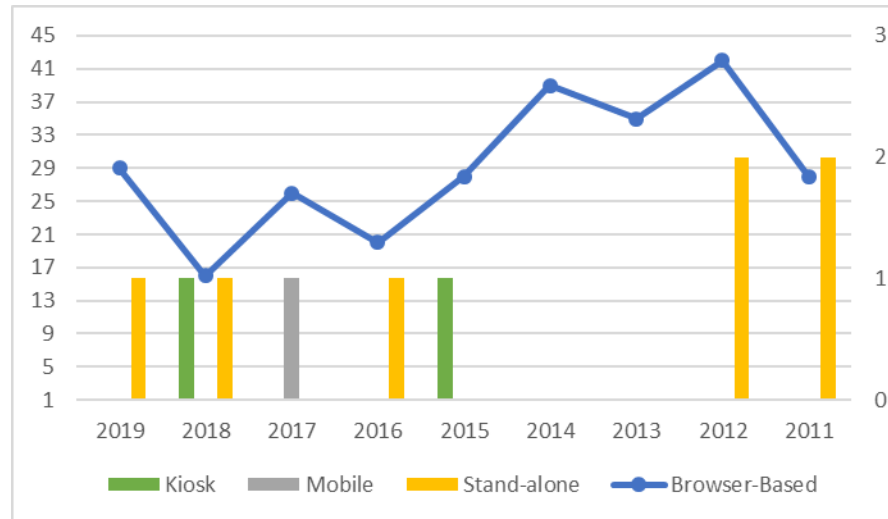
### **System Application Type**

From 2011 to 2019 there are four (4) capstone project applications that were classified which are browser-based, stand-alone, mobile, or kiosk. It was observed in Figure 2, a browser-based application was preferred as an application type for the development of the capstone project. There were applications implemented in kiosk, mobile and stand-alone which was observed in moderation.



**Figure 2.** Most preferred application-based type from 2011-2019





**Figure 3.** Type of System Application from 2011-2019

In the years 2013-2014, it was seen in the graph that these years focused on the implementation in a browser-based application. This seems to show that browser-based application is popular, easy to use in a project-based application.

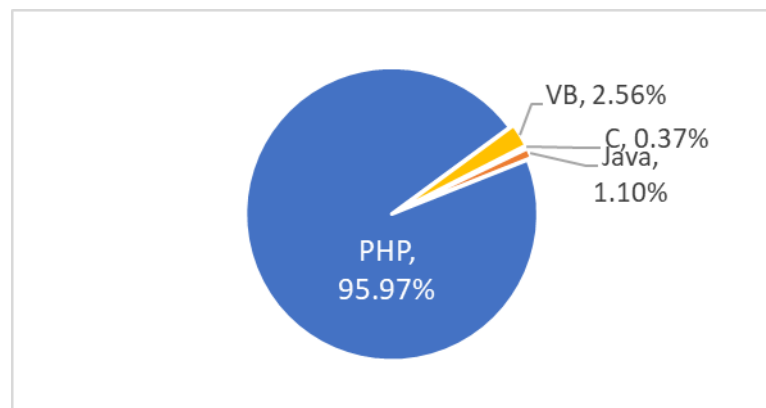
The browser-based or “web-based” structure is a network structure model which unifies the web browser (as the client-side) to integrate the core features of the system function to the server (Zhand & Wei, 2018). And, on the part of the student, this method is the easiest way considering the available resources which can be downloaded from the net. In just a minute of installing the downloaded application, it would be easy for the other resources (i.e. API’s, applets, plugins) to be integrated to develop a fully functional application. Sometimes, it is most practical to download a web template then create a new one. This was observed in many years in which students used frameworks and development tools such as Dreamweaver, Bootstrap, CodeIgniter, Photoshop, jQuery, and many others to develop the project.

### **Programming Language and Databases Used**

Programming language is a systematic notation that a machine can perform to solve the tasks. In Lestal's (2020) online article, the programming language was already used since 1843, when Lady Lovelace Augusta worked with Charles Babbage and wrote the algorithm to compute the Bernoulli numbers using the analytical engine. The development of the modern computer provides a great stimulus describing higher computational processes. In modern days, application language may be a procedure, functional object-oriented, or scripting language. Many applications can be used by non-programmers simply with drag-drop and computer-aided features.

Programming language is essential in the development process especially in implementing the capstone project. PHP is a popular scripting language preferred mostly

by students in developing the capstone project (Figure 4). It is not surprising students are more familiar with using free and opensource CSS bootstrap than using Model-View-Controller (MVC) frameworks for the project. PHP is considered easy and popular because of its unique features. The advantage of CSS bootstrap gained popularity to students because of embedded features to be responsive, mobile-responsive, and contains CSS and JavaScript-based design templates which are easy to manage and tools for faster front-end development (Bootstrap, 2019). The main purpose of PHP is for web development. It provides libraries that interact with databases and web servers. And, it can be used in many frameworks such as Laravel, CodeIgniter, Symfony, Zend Framework, CakePHP, Yii, and many others.

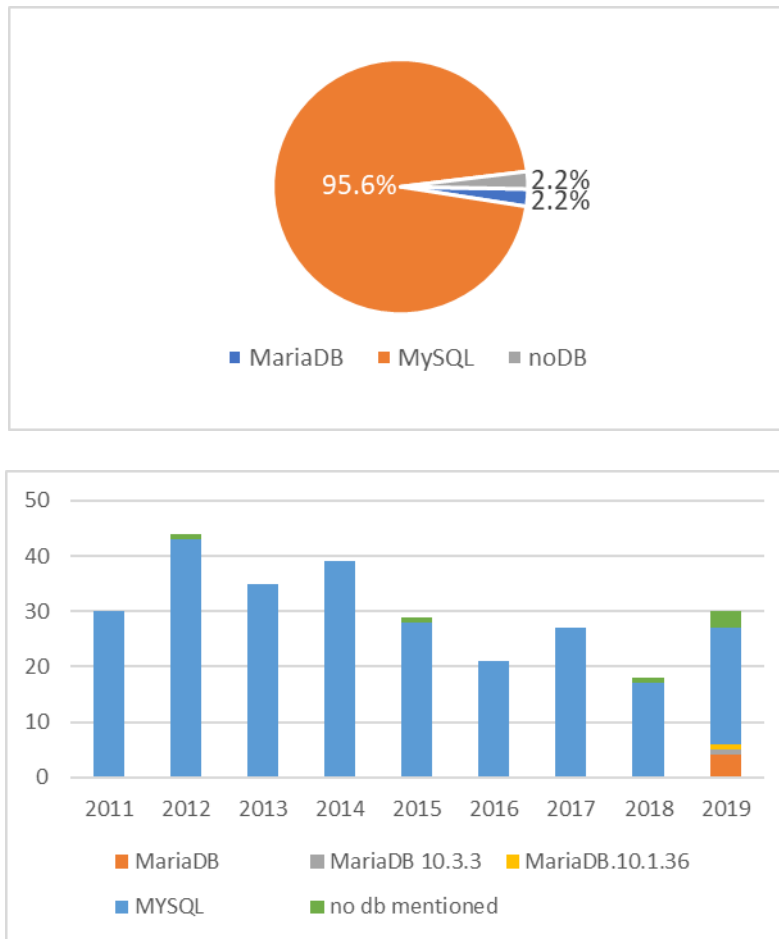


**Figure 4.** Most Preferred Programming Languages Used from 2011-2019

Some used C language, Java, and Visual Basic as appropriate programming languages for the project. However, these languages were used in limited projects. These projects are LAN-based applications such as face recognition application, employee and payroll system, procurement, admission, and enrolment system.

The PHP language has a great advantage in web development. Thus, some factors may shape the development process like accessibility, flexibility, efficiency, user-friendly, cost-effective, and sustainability (Hajat, et al., 2017). The consideration of which would improve the understanding of the primary steps in developing the system features and user interaction. The same analysis was also observed in the use of the database in designing the project application.

The majority of 96% of the developed application used MySQL as a database server (Figure 5). Some students used MySQL and the enhanced version MariaDB. MySQL is an open-source and compliant SQL relational database management system (RDMS) with two editions; the community edition which uses the GPL license version 2 and the enterprise edition. It was supported by different technologies such as PHP, Java, Python, and Perl (Converse, et al., 20014). MySQL was developed by MySQL AB with developers Michael Widenius (Monty), David Axmark, and Allan Larsson to provide efficient and reliable data management.



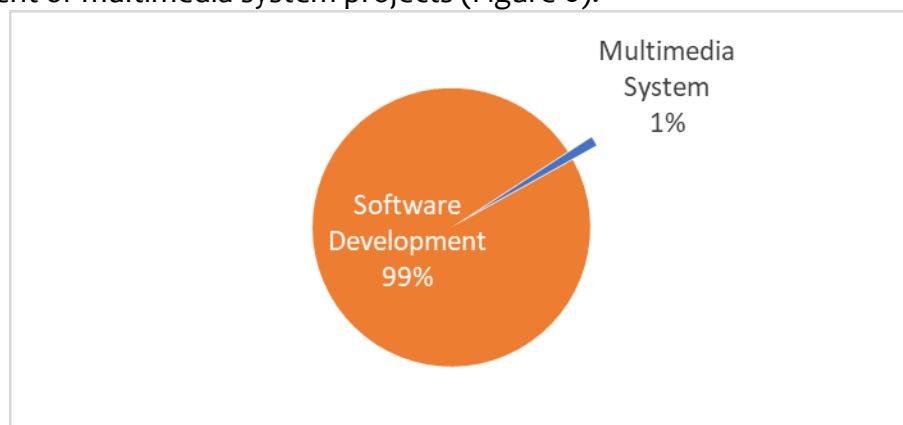
**Figure 5.** Database Used from 2011-2019

In 2008, the company was acquired by Sun Microsystems and later acquired by Oracle Corporation in 2009. MariaDB is based on the open-source MySQL code and a replacement of MySQL created by former developers of MySQL (including Monty). MariaDB has similarities with MySQL. The downloaded packages may be different but the installed files and binaries are the same and they are installed in the same location as with MySQL. MariaDB offers features that MySQL does not. These features include ease of use, performance, better testing, and fewer bugs and warnings. In January 2010, MariaDB 5.1.41 was officially released as a release candidate (RC) for active testing (<https://downloads.mariadb.org>). In the study, MariaDB was used and mentioned in 2019 as the database server. It may seem that students are using the MySQL installed packages and binaries but may be running in the MariaDB environment. This may be because the SQL language and commands are the same including the configurations files and location of the packages.

### **Researchable Topics**

Per the provisions of R.A. 7722 or the 'Higher Education Act of 1994' mandated CHED to define policies, standards, and guidelines for Information Technology Education (ITE) degree programs. In CHED CMO 25 series of 2015 provided the minimum standards and other requirement prescriptions. Thus, it also defined the general provisions and researchable areas for capstone projects.

Software development, multimedia systems, network design, and implementation, and IT Management are among the suggested areas for capstone projects. Based on the analysis of the raw data it reveals that most of the areas implemented are in software development or multimedia system projects (Figure 6).



**Figure 6. Research Area implemented**

Ninety-nine (99%) percent was implemented in the area of software development, 262 projects are related to information system (IS) development and web applications, and 8 projects in software customization. Almost all projects are client-based and presented for review and acceptance. Some of the clients include government line agencies, institutions, the business sector (public and private), cooperatives, religious institutions, and private organizations. It was also observed that a minimal or 1% project was implemented in the area of a multimedia system.

The trend in Science and Technology (S&T) topics is rapidly changing all the time. These changes are influenced by the accumulative innovation and technology revolution. In today's era, traditional objective-driven research has been transformed into a data-driven empirical study (Zhang et al., 2016).

The BSIT curriculum exposed students to many research areas aside from the suggested topics. Additionally, students were given the freedom to make research proposals guided by respective content and programming advisers. Some of the possible research areas are presented in Table 3.

These are just suggested research areas for consideration. The entirety of the process depends on students' skills and ability how to design and implement the project.

The majority of the projects are technology-enabled collaboration students collaborate to achieve the desired objectives (Cheng et al., 2017).

For example, students with knowledge and skills in OOP programming can explore the potential research areas such as synchronization problems and applications using OOP analysis like greedy and brute-force algorithms (Aravind, 2011). The area of human-computer interaction has opportunities along with context-aware computing, virtual/augmented reality, digital design and fabrication, human-robot interaction, human vision simulation, and tools for non-programmers (HCI, 2021).

**Table 3.** Potential research topics based on BSIT curriculum

Subjects	Potential research areas
Object-Oriented Programming (OOP), Data Structures & Algorithms	applications using Object-Oriented analysis, solutions for synchronization problems (multi-core processing, mutual exclusion), greedy algorithms
Human-Computer Interaction	digital design and fabrication, human-centered AI, wearable computing, Virtual Reality, Collaborative and Learning Solutions, Modelling and Visualization, and Instructional Tools and Materials
Information Assurance and Security	web security, intrusion detection, wireless network reliability, cryptography, privacy in the online network, virus and malware, security policy, ISO policies, and standard
Web Systems and Technologies	Web service computing, enterprise environment solutions, network-based computing
Networking Management and Administration	network simulation management which includes planning and security strategies
System Integration and Architecture	Web services and system integration

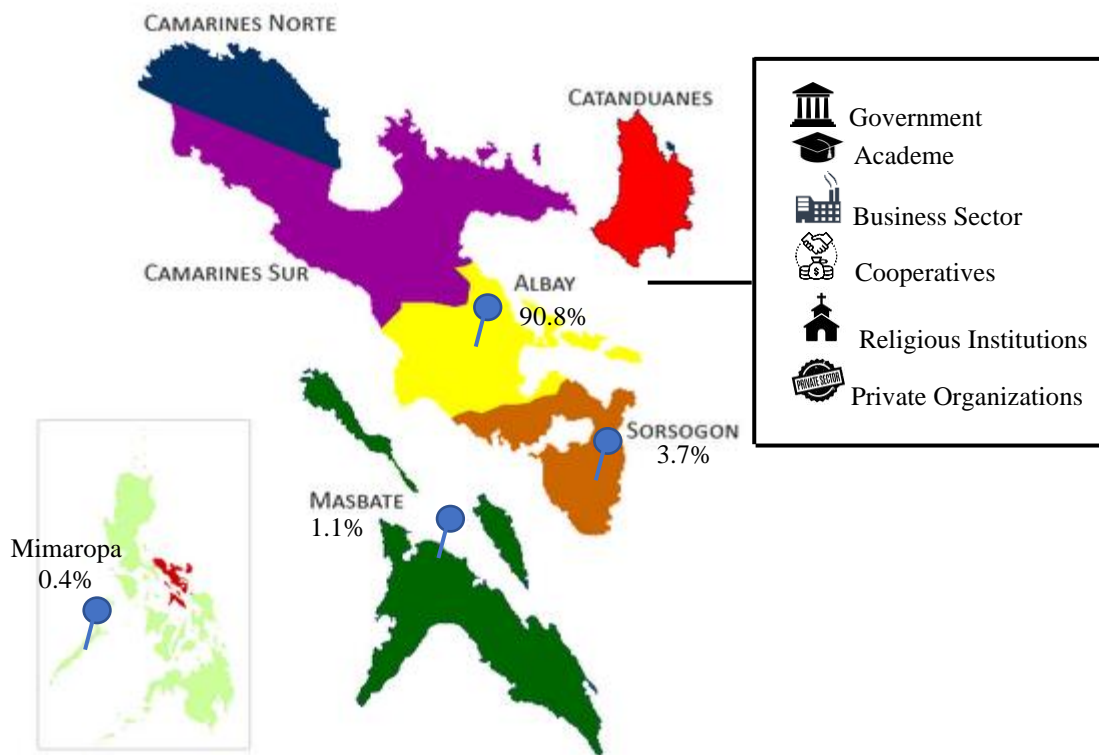
For the web systems and technologies, the implementation of reducing the scale of impact of SARS-CoV-2 (COVID-19) is feasible. Contact tracing application is very much helpful yet concerns users' privacy. Still, it helped prevent infections and is a valuable health-public tool (Lewis, 2021). The Department of Interior and Local Government (DILG) called upon Local Government Units (LGU) and the general public to patronize StaySafe.Ph apps for digital contact tracing. The application was developed by Multisys Technologies Corporation with PLDT-Smart Group and the Interagency Task Force on the Management of Emerging Infectious Diseases (IATF-MEID) and the National Task Force on COVID-19 (DILG, 2021).

The S&T has a broad research area and time is not enough to accomplish a full-blown project. But, the recent applications, accessibility to learning materials, guidance from advisers, and student research culture may change the course of future research areas.

### **Geographical Distribution of Developed Capstone Projects**

One of the requirements to be enrolled in the capstone project subject is the On-the-Training (OJT). The OJT is an immersion program where students will have the chance to be with the IT industry. This is the opportunity for the student to apply the skills, knowledge, and attitude learned in the school and the opportunity to experience the corporate environment (CMO. No. 25, 2015).

The selection of the venue or location of the capstone thesis depends on students' preferred on-the-job training venue. A Memorandum of Agreement (MOA) between the company and the Institution was executed stipulating the deliverables of the students. Some students preferred to accomplished their OJT within the region and others preferred outside the region (Figure 7).



source: [www.likesyou.org](http://www.likesyou.org)

**Figure 7. Geographical Distribution of Projects from 2011-2019**

In terms of the geographical distribution of projects, the majority (90.8% or 248) of the developed capstone projects were located in Albay with minimal from other neighboring provinces. The results could be attributed to the number of enrolled

students from 2011 to 2019. Summarizing the compiled reports of the BUCS Registrar's office, a total of 7,568 students enrolled in the BSIT program with 2,242 students enrolled in capstone thesis projects. From the results, Albay province has the highest (77%) number of enrollees or contributed 1,708 (76%) graduates compared to other provinces. Sorsogon being the adjacent province with accessible terrain has 1,050 (14%) students or has a total graduate of 326 (15%) for the last 9 years.

Second to Albay is Sorsogon with 3.7% implemented capstone thesis projects along with Masbate and Mimaropa with 1.1% (3), and 0.4% (or 1 project), respectively. Some manuscripts have generalized the titles by not (4%) including the locations of the project. The developed capstone projects were designed for government, academe, business sector, cooperatives, religious institutions, and private organizations. For the government, the agencies like DPWH, COA, CSC, CHR, and Philippine Coconut Authority (PCA) regional and provincial offices are some of the recipients of the developed capstone projects. The developed systems are in the areas of human resource management, inventory, and monitoring, supplies and equipment, document management, billing, and claims, among others.

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## **CONCLUSIONS AND RECOMMENDATIONS**

The study exposed the challenges and opportunities of the BSIT capstone project to many possible activities in terms of enrichment or pieces of training, exposure to current technology trends, and policy formulation. Students' awareness and exposure to various programming languages, database server applications, methodologies, and application types have dramatically changed over time. The acquired skills and knowledge helped them effectively prove they have achieved a competence level in the field. It may have been noted that applications are scattered in different public and private institutions. These applications are internet-based that if were given attention and considered by management could support achieving the organization's goal.

Many systems are developed but the majority seems to follow the concept of requirement and implementation. The student's thesis follows the agency or company where they have rendered the on-the-job pieces of training. These agencies and companies may have plans for system automation and computerization. Before the development, a student submitted a proposal (as thesis) to management and conducted interviews, surveys, and analysis of the organization's operations. Unfortunately, these weakened the purpose because at the end of the day these applications are just

applications that are sometimes taken for granted. Taking it into possible note, the application may serve as a baseline for future technology programs.

The proposed research area was geared towards the emerging trends in technology and computer. The BSIT program followed the suggested and recommended capstone project titles stipulated in the CHED Memo Order of 2012 and #25 series of 2015. The suggested capstone titles include software development, multimedia system, network design, and implementation, and IT management.

Research topics are always a challenge not just for faculty and students but for the department program as well. One possible intervention to change the course of future research undertakings is to assess the human resource capability and review the curriculum.

The capstone project titles are inclined to system development. It is therefore recommended that it is better to encourage new concepts to system development but need to consider and explore the suggested project titles by CHED along with the areas of multimedia, network design and implementation, and IT management which include planning and security strategies. A follow-up study can be proposed to study the influence factor of students in the selection of programming languages, methodology, framework, and other parameters in implementing a capstone project.

## **IMPLICATIONS**

Capstone projects are great contributors to government, academe, business sector, cooperatives, religious institutions, and private organizations. About 60% of capstone projects are directly linked or have produced information systems for the organization. These systems are presented with a panel of experts and tested with the concerned office or unit. And with these contributions, transactions and processes have become more manageable.

This development primarily influenced the ITE program directions, and the study laid down the areas of research opportunities, including the CHED capstone project suggested research areas. And, provide sound inputs to academic programs which shall open new trends of researchable areas. This may also influence the research areas of the IT degree program once students started to propose capstone projects. More importantly, this shall give faculty members the insights of setting the capstone development projects and encourage them to introduce diverse applications of technology

## **ACKNOWLEDGEMENT**

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