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|  | **CAPSTONE/**  **THESIS A 2019-2020** |
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**iNFORMATION TECHNOLOGY (IT) Department**

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References:

1. AMAES Student Research Manual and Guide

**Bachelor of Science in Computer Science (BSCS)/ Bachelor of Science in Information Technology**

**Thesis A /Capstone**

**Guide**

**Capstone Project/ Thesis A. Guidelines**

**THE BODY**

**CHAPTER I – INTRODUCTION**

This chapter serves as a backgrounder for readers to have an overview of the study even without prior reference to other publications on the topic. The introduction is the first chapter of the thesis and must include the objective/s and justification of the study as well as the limitations set by the proponent. The introduction is the proper place to define any specialized terms and concepts used in the thesis. The Rationale/Background of the Study doesn’t require a heading since this can be the introductory paragraph of the chapter.

**STATEMENT OF THE PROBLEM**

The statement of the problem is the backbone of the proposal/paper. This is the main idea of the entire research project. This is a statement that you can prove with evidence/s. Well-constructed problem statements will convince your audience that the problem is real and worth having you investigates. Well-constructed problem statement defines the problem and helps identify the variables that will be investigated in the study.

From the topic chosen, the researcher must identify what are the unexplored areas about the topic. From here, he/she can now formulate a specific problem to study.

The research problem could be in a statement – thesis statement or statement of the problem – or in a form of a question – research question. This is based on new approaches to be tested and monitored, on-going programs to be improved, and phenomenon which need explanation and evaluation, knowledge gaps or unknown information, and/or conflicting data and research results.

A good research question is relevant and answerable. The research question must entail methodology that is feasible, which means that answering the question must actually be possible given resource constraints. It must be technically clear and specific. Vague and ambiguous words have no place in a research question. Similarly, words that are laden with subjective judgment and value (e.g. “good”, “bad”, and “important”) must not be included within a research question.

The research question may be one that tries to confirm previous research findings, or may be one that tries to explore new observations. It must state all the variables under study and must proposed the relationship between variables.

**PURPOSE/OBJECTIVE OF THE STUDY**

This section summarizes what is to be achieved by the study. This usually contains general and specific objectives. Research objectives are closely related to research problem.

Research is purposive and from the onset it must be clearly defined. The purpose of the research guides the researcher as to what approach to take, what method to use, how to analyze data, and how to frame the results.

The researcher should ask him/herself the questions:

1. Why are you doing the research?

2. For what end are you doing your research?

3. Who will benefit?

The researcher should always keep in mind the purpose of his/her research. For example:

- To explore, to describe, to explain, to predict, and to evaluate.

For example, if a researcher wanted to do research about the topic of intelligence, he/ she can have the following research problems:

1. To explore: what is intelligence?

2. To describe: what are the components of intelligence?

3. To explain: how is intelligence measured?

4. To predict: how does intelligence change as a person ages?

5. To evaluate: measuring intelligence in Grade 5 students

**SIGNIFICANCE OF THE STUDY**

This section describes or explains the potential value of the study and findings. It should be clear in here, the target audience for the study and how the results will be beneficial for them; the contribution of the research to the body of knowledge in the respective discipline; and the reason or reasons why is it necessary to conduct the study – timeliness or possible solutions to the existing problems or an improvements.

**SCOPE AND LIMITATION**

This section sets parameters of the study. The limitations or the weaknesses of the study are the inherent problems encountered by the researcher (that could be beyond its control) and discussing it can be very useful for readers in interpreting the results of the study.

**Definition of Terms**

**CONCEPTUAL FRAMEWORK**

The Conceptual Framework introduces or clarifies any theoretical models and situates the work within prior theory or research. As a framework, it organizes key ideas that shape the author’s thinking. It attempts to connect all aspects of inquiry and gives coherence to it. When purpose and framework are aligned, other aspects of the research such as methodological choices and statistical techniques become simpler to identify.

**REVIEW OF RELATED LITERATURE**

The review of related literature showcases previous studies and publications relevant to the thesis. This chapter gives light as to what motivated the proponent/s in pursuing the specific field of study.

The purpose of a literature review is to provide the conceptual or theoretical framework of the planned research and information about past researches that are related to the study. Thus, providing the context within which the research work is realized. Without a competent review of related literature, the research work is anchorless and difficult to situate in the academic arena.

**Kinds of Related Literature.** The first is Research Literature which pertains to published reports of actual research studies done previously. They may or may not be experimental in nature. These published reports are empirical in nature. The second kind of literature is Conceptual Literature which pertains to articles and books written by authorities giving their opinions, experiences, theories or ideas. They are not scientific studies. Usually they are concept papers or papers that present or explain a theoretical idea. They are not empirical, although they are treated as credible by virtue of the authority or knowledge of the author/s.

Related Literature can be taken from traditional libraries or Online/ Internet Databases. Other sources of related literature include interviews with authorities in the field concerned, archival videos or audio recordings, newspaper articles, etc. Whichever the source of related literature, the basic process of gathering information is the same.

**Criteria in Selecting Materials for Related Literature**

**Up-to-datedness:** When referring to previous research works or publications, it is best to choose the ones that had been done within 10 years ago. The only acceptable reason to reference an older material is if said material is a “classic” or a work that is referenced often in research works because it is ground- breaking, innovative, or important.

**Suitability for specific requirements:** In general, only academic journals and publications such as books, indices, abstract and notes are acceptable reference materials. Magazine articles and other popular culture publications are less preferred. In recent years, websites have become acceptable, but only online databases, journals, and journal archives have the same value as printed journals and books.

**Authority:** Not all references are alike. Some are more respected in the academic community than others. As such, choose to reference these more respected materials, if possible. This means international journals over local journals, peer reviewed over non peer-previewed, indexed over non-indexed, and so on and so forth. The researcher must also be aware of which persons, organizations and figures are authorities in the field. Works published by these persons/organizations and figures are preferred reference materials.

**Sources of Information:** Primary sources are best and purest; they are the closest from the point of origin. Examples of primary sources -

- Experimentation

- Interview, questionnaire

- Doctoral dissertations

- Journals

- Letters, diaries, autobiographies

- Original creative work in art and literature

- Newspapers

Secondary sources, on the other hand, are reports of a person who relates the testimony of an actual witness or participant while, the tertiary sources are compiled from or based on secondary sources.

The researcher must read intelligently and directionally, with critical thought. Read and assimilate the pertinent ideas. While reading, take notes of quotes, statistics, research findings, that are directly related and may be incorporated into your research paper later on.

**Mechanics of Note-Taking.** After finding the information he/she wants, the researcher must take notes. Notes should be in a form that can easily be recalled and used in the future. There are four categories of notes:

1. Quotations – exact words of the author are reproduced

2. Paraphrases – researcher restates the author’s words in his/her own words

3. Summary – condensed form of the contents

4. Evaluation – researcher records own reaction

Always make sure that the sources are cited when you take notes.

**CHAPTER II – METHODS**

Methods is the chronological listing of steps and procedure/s used by the proponent/s. Methods used for gathering of data, laboratory and field experiment, theoretical and/or conceptual frameworks, as well as techniques employed in the analyses of data must be specifically listed. For the materials, exact technical specifications, quantities and sources must be included. It includes instrumentation (or the procedures used in developing an instrument to gather data) and the data collection (or the details on how the data will be obtained) – the method of investigation, i.e. questionnaires, personal interviews, focus groups, laboratory modeling, design techniques, etc.; the sampling methodology, i.e. size of sample, population, experimental and control groups, prevention of bias, etc.; and, the statistical methods used with explanation as to why you intend to use specific statistical methods.

**Research Design**

Research Design refers to the research strategy necessary to complete the research. He/she should be able to answer the following questions:

1. How will you do the research?

2. What is your theoretical thrust/ approach?

3. What kind of data do you want to get?

4. How will you get this data?

**Developmental Research .** This research is concerned with the Application of existing theories or body of knowledge in developing New products, system or procedures.

**Quantitative Research.** Quantitative research generates numerical data or data that can be converted into numbers. As such, you will use statistics to analyze the data. The aim is to classify features, count them, and construct statistical models in an attempt to explain what is observed. In this methodology, the researcher usually knows clearly in advance what he/she is looking for. The Researcher also tends to remain objectively separated from the subject matter. Some examples:

* surveys
* laboratory experiments
* formal methods such as econometrics
* numerical methods such as mathematical modeling

**Qualitative Research.** Qualitative research entails data that is more 'rich', time consuming, and less able to be generalized. Data is in the form of words, pictures or objects. The aim is a complete, detailed description. For example:

* ethnographies
* case study
* observations on stock market trends exploratory study on teaching IT to tribal peoples

This also includes:

Participant observation. This is appropriate for collecting data on naturally occurring behaviors in their usual contexts.

In-depth interview. This is optimal for collecting data on individuals’ personal histories, perspectives, and experiences, particularly when sensitive topics are being explored.

Focus group. This is effective in eliciting data on the cultural norms of a group and in generating broad overviews of issues of concern to the cultural groups or subgroups represented.

The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue. It provides information about the “human” side of an issue – that is, the often contradictory behaviors, beliefs, opinions, emotions, and relationships of individuals. Qualitative methods are also effective in identifying intangible factors, such as social norms, socioeconomic status, gender roles, ethnicity, and religion, whose role in the research.

Population, Sample Size, and Sampling Technique

Population. Novice researchers make the mistake of choosing a sample first before actually defining or identifying the population. This is not correct because they end up having to force their findings to fit into a population that they do not even know. It is best to define the population first, before even trying to choose a sample from it.

Population definition is a two-step process:

1. Identify target population

2. Construct a sampling frame

The target population is the population to which you want to generalize your findings. The sampling frame is set of all cases the sample is actually drawn from.

For example, the researcher wants to study the academic performance of all ABE and AMACC students in the Philippines. The target population is “all ABE and AMACC students in the Philippines.” The sample you want will draw from a sampling frame. Where will you actually get your students? Maybe you should get the names of all the students enrolled from the school registrars. Then the sampling frame is “the list of registered students from the school registrar.”

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**Sampling**. refers to the subject as the unit of analysis. In order to get findings, what or who is the researcher going to study? All researchers want their research to be applicable to the whole population. However, most of the time, studying a whole population may not be convenient or feasible. Imagine if a researcher wanted to study the population of all Filipinos in the Philippines. The practical resources are limited, and research accuracy may be compromised by the sheer number of possible distractions and errors possible. It would be easier, practically speaking, to study a smaller group. The smaller group is called a Sample. How will you choose the members of this smaller group?

We assume that members of a population share common characteristics and properties. This assumption makes sampling possible. We study a smaller group that represents the larger group. The Sample should represent the Population.

It is more advisable and wise to use a sample instead of attempting to study the entire population. Not only it is practical but also accuracy of research may be compromised when the whole population is studied.

Sampling Designs. Sampling design refers to how a sample is selected, or how subjects are chosen. It is the template of the process of actually choosing your sample. The two general sampling designs: Probability Sampling and Non probability Sampling.

1. Probability Sampling. Probability sampling is usually more acceptable and preferable, although it is not always feasible. It is called "probability" sampling because all elements of the sample are randomly chosen. This randomization is called random selection where each element or member of the population has the same probability of being chosen.

For example, your population is "my basketball team." Your basketball team Is composed of 10 members. Each member should have an equal probability of being chosen. Each member should have a 1 in 10 or 10% chance or probability of being chosen.

There are many advantages of using probability sampling. The two major advantages of probability sampling are:

a. Removes investigator bias - the choice of sample is purely by chance. The researcher cannot pick and choose arbitrarily.

b. Laws of mathematical probability may be applied to estimate the accuracy of the sample - because of the statistical soundness of the sample, it is possible to compute for sample error and sample precision.

**Probability Sampling Methods**

a. Simple random sampling – every member of the population have the same chance of being selected.

b. Stratified random sampling – population is divided into strata, then simple random sampling is done in each strata. Strata means two or more mutually exclusive groups based on relevant variables. For example: male/female; married/single/separated; occupation.

c. Cluster sampling – when the population is too large, it is broken down into groups called clusters. The clusters are then randomly sampled. Then simple random sampling is done in each cluster.

d. Systematic sampling – selecting every Kth member from a complete list of the population. Example: every 10th name in a list from the school registrar.

2. Nonprobability Sampling. The sample selection process has no randomization. The researcher has the prerogative of choice. There is arbitrary selection. However, its disadvantages are:

**Advantages:**

a. Good for small samples

b. Good for archival/ historical research

c. Good for getting a general idea of trends and ideas

d. Good for small populations (less than 100)

Disadvantages:

a. Vulnerable to investigator bias – because choice is left to the researcher, there is a possibility of biases and preferences influencing which elements will be included. This may influence the resulting data.

b. Cannot estimate sampling error or precision – nonprobability sampling does not have the ability to compute for sampling error.

**Nonprobability Sampling Methods**

a. Convenience sampling – researcher selects sample that is conveniently available; less representativeness. Example: mall- goers; classmates

b. Purposive sampling – researcher relies on expert judgment to select a sample population. Example: in-patients with a specific disease

c. Quota sampling – a form of purposive sampling; population is divided into strata. Then a quota is set for each strata. Nonprobability sample selection from each strata follows the quota. Example: ten students from each program

**Other Sampling Designs**

1. Combined probability and nonprobability sampling - a combination of probability and non-probability sampling. Perhaps using purposive sampling a cluster at one stage, then randomly sampling the cluster.

2. Referral sampling - the subjects refer other subjects for sampling

**Factors Determining Sample Size**

1. Population heterogeneity – degree of dissimilarity among cases with respect to a particular characteristic. A highly heterogenous population is a highly variable or dissimilar population. The more heterogenous the population, the larger the required sample size.

2. Desired Precision – How statistically close together do you want the observations to be? Most researchers will recommend a minimum sample size of 100.

3. Sampling design – some sampling designs yield better precision

4. Available resources – limited resources must enter into the decision of sample size

5. Complexity of analysis – the more complex the relationships under investigation, the larger the sample size.

**Description of the Respondents**

The respondents are described as a small group or as a big group. Characteristics may include sex, age level, socio-economic status, marital status, level of intelligence, education, type of community (urban or rural, barrio or town), ethnic group, and other characteristics sought by the researcher to describe his respondents. These characteristics of respondents could be presented in table form.

**Research Instruments**

Instruments are used for gathering or collecting data including the tools used to measure the variables. This means, for example, detailing the survey used, own or modified, or an adopted questionnaire with proper acknowledgement.

**Data Collection or Data Gathering Procedure**

Whatever type of research investigation one may choose to undertake, there is a need to collect data with which to test the hypothesis. The acquisition of data is done through the use of a variety of methods, procedures, tools, or techniques which have been developed over the years. It is believed that each data gathering procedure or device has its own particular weakness or bias; therefore, it is better to use multiple methods or tools, supplementing one with others to counteract bias and generate more adequate data.

**1. Observation Method**

Observation is an activity of a sentient living being (e.g. humans), which senses and assimilates the knowledge of a phenomenon in its framework of previous knowledge and ideas. Observation as a data collection method is one of the oldest forms of studying behavior. It is non-experimental, meaning there is no manipulation on the part of the researcher upon the environment or its elements.

Observation requires a researcher to be professional, directed by a purpose, systematic, and focused. Recording observations is also vital. Complete, accurate and thorough recording is the basic required output of observation.

**Types of Observation**

a. Naturalistic Observation. This means watching and recording behavior in its natural setting. The researcher places him/herself in the environment where the behavior of interest is naturally taking place.

b. Participant Observation. In participant observation, the observer is part of the scene being observed. He/She places himself in the environment, and in fact participates.

Participant observation can either be obtrusive or unobtrusive. Obtrusive means that the researcher is a visible or a noticeable addition into the environment while unobtrusive means that the researcher is invisible or unnoticeable, trying to blend in seamlessly into the environment without being noticed.

Recording Observations. The researcher/observer should record data as soon as possible to avoid distortions during recall. Data can be recorded using checklist, scorecard, and/or rating scale.

Standards for Observers. Observation should be carefully planned and systematic. Before actually doing an observation, the researcher must already know what type of observation he/she will do and plan for contingencies.

In terms of assigning value to observed data, the principle is “the whole is greater than the sum of its parts.” Each observed instance contributes to a bigger picture and this bigger picture is more telling than the individual details. While observing, the researcher must suspend judgment. Do not confuse fact from your interpretations or assigned meanings. The objectivity of a researcher’s observation can be checked and verified through comparison with other judges, and/or repetition.

Perhaps of equal, if not greater importance to all of these, it is vital that observations are recorded as accurately and completely as possible.

Strengths of Observation Method. Observations are a good way to start a research project. It can serve to set a preliminary context that the researcher can use as guide for the rest of the research process. The Observation Method allows a researcher to witness events and behaviors in their natural setting.

Limitations of Observation Method. Conclusions about cause-and-effect relationships cannot be drawn from Observation Method data. It is also time- consuming and takes up resources. Researchers may have to wait for some time to observe the behavior or phenomenon of interest.

**2. Case Study Method**

A Case Study is an in-depth, longitudinal examination of a single instance or event, called a case. The case may be a person, a program, an event, etc. Typical data collected might include historical data, records, repeated observations, interviews with involved parties, and the results of various tests. It is a non-experimental method.

Standards for Case Study. Case studies can be either single or multiple-case designs. This means that the subject being studied can either be a single element or case, or many elements or cases. In either design, it is best to use multiple sources.

In order to facilitate data analysis later on, the observer should establish a unit of measuring data. The unit of measurement could be in the form of words, images, statements, etc. Simply put, the unit of measurement means what the observer is looking for and actually recording. Then, the observer should also develop a criterion for interpreting the findings. How will the findings be scored and interpreted? This is a question the observer should be able to answer.

Strengths of the Case Study. Using the Case Study Method is useful when researchers want to get a detailed contextual view of an individual's life or of a particular phenomenon. It is also used when researchers cannot do experimental studies for practical or ethical reasons.

Limitations of the Case Study. Conclusions about cause-and-effect relationships cannot be drawn from Case Study Method data. A Case Study usually involves only a single individual or just a few and therefore may not be representative of the general group or population. In addition, most of the gathered data is retrospective, or simply recollections of the past. Therefore, there might be doubts as to accuracy and thoroughness in detail.

**3. Questionnaire**

A questionnaire is a self-report data collection instrument. This means that the respondents, as we call the participants in this method, are the ones who have to answer the questionnaire by themselves. The questionnaire may contain questions that are open-ended or closed-ended.

Open-ended questions do not give options that the respondent must choose. Instead, the question ends with a blank which the respondent must fill in, or the answer required may be in a narrative or essay form. Closed-ended questions give options that the respondent must choose. It can also be called a forced-choice item or question.

A third alternative is to put an "Others" choice which the respondent may choose. This is a compromise between open-ended and closed-ended items. The "Others" choice is included in a closed-ended question in order to give allowance to answers not provided in the choices.

Principles of Questionnaire Construction. When we construct our questionnaires, there are several guidelines we must follow. These are:

a. Your test items or questions must be in line with the objectives of your research.

b. Your participants or respondents come from different backgrounds. They may have different comprehension skills or verbal abilities. They may come from different cultures and use a different language. Your questionnaire must be created with these differences in mind.

c. It is better to use words, sentences and phrasing that your respondents can easily understand. As much as possible, refrain from using idioms and figures of speech that are not familiar. Do not use jargon or complicated vocabulary.

d. Your items should be as simple as possible. One question will lead to one answer. The choices should be clearly presented, with no overlapping in concepts.

e. Do not use “leading” or “loaded” questions. Never construct questions that point the respondent to a desired answer. Be objective and neutral in how you ask your questions.

f. Avoid double-barreled questions. One question should only ask for one answer. Do not ask for complicated answers or answers that require the blending of ideas.

g. Double negatives are misleading and ambiguous. Do not use sentences like "I do not dislike ice cream." This is a double negative statement. Instead, say "I like ice cream."

h. When constructing closed-ended items, make sure that the choices given do not overlap in ideas. Each choice must contain its own idea, independent of the other choices.

i. Use multiple items to measure abstract constructs. When you want to measure abstract ideas such as "love" or "hate" use many items in order to come up with a complete picture. Flesh out the different components of this abstract construct, and ask questions for each.

j. Questionnaire must be easy to use. The questionnaire should not be bulky, too long or too thick. The respondents should easily be able to use it.

k. Pilot-test your questionnaire. A pilot-test means running the questionnaire as "practice" before the actual testing. This is to find out which items are effective and which are not. Also, you will find out how long the questionnaire takes to answer. All of this is important when you want to manage your resources for the actual testing.

Strengths of Questionnaires. Questionnaires have many advantages. It is the best measure to use for attitudes and other cognitive processes. Because each questionnaire can be cheaply reproduced many times, it is relatively inexpensive. It can also be administered one-on-one or to whole groups at a time. Respondents can quickly answer and return the questionnaires once answered. If the questionnaire uses control numbers and does not ask for the respondent’s name, the respondent will probably be more honest as it is anonymous. For data analysis, it is easy to encode and compute data from closed-ended items.

**Weaknesses of Questionnaires.** Questionnaires also have weaknesses. A conscientious researcher needs to have the questionnaire validated. He must make sure that the questionnaire is short enough but also can completely measure what it seeks to measure.

Questionnaires are especially liable to response sets and reactions of social desirability. Data from open-ended items can take a lot of time and effort to encode and analyze.

4. Interview Method

An interview is a questionnaire asked in a one-on-one situation. The researcher becomes the interviewer, and the respondent becomes the interviewee.

Some requirements on the part of the researcher:

The Interviewer should establish rapport and asks interviewee a series of questions in a polite and professional manner.

The Interviewer must be non-judgmental. It is possible for follow-up questions to be asked, when applicable.

The Interviewer should also record interviews by taking notes, using recorders or video cameras.

**Strengths of Interviews.** An interview is best done when the data needed are personal opinions, attitudes, qualitative ratings, etc. These are products of a non- observable cognitive process. Interviews can provide in-depth information and allows for probing and follow-up questions.

Weaknesses of Interviews. Because of its one-on-one nature, doing interviews with many respondents can become expensive and time-consuming. It is also vulnerable to reactive effects. This means that the respondents may give inauthentic responses as a response to the unusual setting. The respondents also know that they are not responding anonymously.

5. Testing Method

Using testing as data collection method entails using tests. There are different types of tests that can be used. They can be broadly classified as either standardized or non-standardized.

Standardized Tests

a. Achievement Tests

b. Aptitude Tests

c. Benchmark Tests

d. Personality Measures

Non-standardized Tests

a. Projective Tests

b. Teacher/Student-Constructed Tests

Test Construction. Oftentimes it is preferable to construct or make your own test. These are the important elements of test construction. The researcher must make important decisions regarding each element.

Reliability refers to the consistency of a measure. Standardization is one way to increase a test’s reliability. Standardization is the process of establishing routine procedures that are applied to any and all testing situations. It also refers to the uniformity of conditions across all testing situations. Testing situations must be standardized, but there is more to standardization than this alone. Each test copy must have the same instructions, content and scoring criteria. Finally, test administration must also be standardized. This means that the procedure for giving out the test, giving instructions, and later collecting the tests must be uniform across all testing situations.

**Reliability and Validity.** Some examples of reliability are:

a. Inter-Rater Reliability – Used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon.

b. Test-Retest Reliability – Used to assess the consistency of a measure from one time to another.

c. Parallel-Forms Reliability – Used to assess the consistency of the results of two tests constructed in the same way from the same content domain.

d. Internal Consistency Reliability – Used to assess the consistency of results across items within a test.

e. Construct Validity – Refers to how much it measures what it is designed to measure.

These are a few of the kinds of construct validity:

a. Face validity – if at first glance of a non-expert judge, the test seems to measure what it intends to measure

b. Content validity – if the test contains all of the pertinent components of the variable it wants to measure

c. Criterion-related validity – the test is compared to another, valid, test to see if it measures the same thing

There are two types of criterion-related validity. These are:

a. Convergent validity – does the test and another test "converge" in terms of the measure?

b. Discriminant validity – does the test and another test (that measures the opposite) diverge on important points?

Strengths of Testing

a. Highly objective

b. Can be administered to groups

c. Inexpensive

d. Perceived anonymity high

e. Easy analysis

Weaknesses of Testing

a. Difficult and time consuming test construction

b. Obtaining tests may be expensive and difficult

c. Necessitates expertise in tests’ particulars such as scoring and interpretation

6. Experiment Method

Experimentation is used to prove causality. It is the only method that can do so. It also compares two or more variables to test a hypothesis. A hypothesis is a suggested answer to a question/problem. There are two hypotheses in experimentation. The first is Null hypothesis. Null hypothesis suggests that there is no significant relationship between the variables. The second is Alternative hypothesis. The alternative hypothesis suggests that a significant relationship exists between the variables.

**Experimental Variables.** In experimentation, there are four variables involved. The Independent variable is the variables that is controlled or selected by the experimenter. The Dependent variable is the observed phenomenon. The Controlled variable is kept constant to prevent their influence on the effect of the independent variable on the dependent. When the Extraneous Variables are not controlled, they interfere with the result.

**Experimental Conditions.** In experimentation, there are two conditions that create two groups. The controlled condition creates the control group. Control group is the baseline group, where no manipulation of variables is done. The experimental condition creates the experimental group. This is the group where the independent variable is manipulated.

Strengths of Experiment

a. Cause and effect can be established

b. Control of variables

c. Can be replicated

d. Easy analysis

Weaknesses of Experiment

a. Artificiality

b. Demand characteristics - are all the cues which convey to the participant the purpose of the experiment

c. Unrepresentative sampling

d. Control of variables may be difficult

e. Ethics

f. Cancels out individual differences

**Statistical Treatment of Data**

The kind of statistical treatment depends upon the nature of the problem and the data gathered.

The statistical manipulations organize raw data systematically; its techniques help the researcher in determining the validity and reliability of his research instruments and give meaning and interpretation to data; and statistical treatment is used to test the hypotheses, which are to be accepted and rejected.

**Statistical Tests and their Uses:**

1. Chi Square. Chi Square is used to test independence of group membership. It is applicable find the independence between two (2) nominal variables. Before using Chi Square, the researcher must ensure that variables are nominal or ordinal, that the observed frequencies should be greater than 5, that the sample must be randomly drawn from population and that the data consists of raw frequencies. The variables themselves must be independence of each other mutually exclusive and exhaustive.

Researchers might prefer to use chi square because does not require large sample size and does not require normality of the sample scores. It also has fewer assumptions and is, in general, much easier to learn and apply. However, it is less powerful compared to ANOVA and it is difficult to test complex hypothesis with it.

2. Factor Analysis. Factor analysis is the statistical computation used in order to reduce a great number of variables/factors. The goal is to end up with a smaller number of variables/factors that encompass all the original variables/factors. It can be used to establish construct validity of instruments. The specific process is called Confirmatory Factor Analysis (CFA). It can also be used to flesh out factors, especially in exploratory researches. This is called Exploratory Factor Analysis (EFA).

Before either CFA or EFA can be done, it must be assumed that the data possesses normality, linearity, factorability of R, absence of multicolinearity and singularity. There should be a large enough sample size and an absence of outliers among the sample.

3. Regression. Regression is used to determine the degree of how one variable affects another. It measures how strong or weak the relationship between two or more variables. A regression equation can explain the relationship of several IV’s on one DV. The IVs that have the weakest relationships can be omitted as extraneous variables. The regression equation can serve as predictive equation on how the DV changes as IVx changes. As such, it can be used for model building and testing. In order to perform regression, variables must be at the continuous level.

Sample must have no outliers. Data/variables must have normality, linearity, homoscedasticity, independence of errors, and absence of multicolinearity.

4. T-Test. T-test can determine whether there is a significant difference between two groups. It is used for interval and/or ratio level data. Assumptions are: data has normality, homogeneity of variance, the DV is continuous while the IV is discrete.

5. Analysis of Variance (ANOVA). To test hypotheses that are more complex than what the t-test can handle, ANOVA can be used. It is used to test differences between more than 2 groups. It is also used to test differences in 2 or more IVs. ANOVA can only be used on interval or ratio level of data. Groups must be equal in size. Data must have normality and homogeneity of variance.

6. Frequency and Percentage Distribution. Used to determine the percentage usually for data on profile (e.g. level, age, gender, etc.).

7. Mean. Used to get average or central value (e.g. level, extent, status, etc.).

8. Pearson-Product Moment. Used to find the degree of the association of two sets of variables, X and Y or to test the significant relationship between the two variables.

9. Multiple Correlation. Used to test if the independent variables have influence on the dependent variables.

10.Multiple Regression. Used to predict, singly or in combination, from among the independent variables the dependent variables.

**CHAPTER III – RESULTS**

This chapter presents the data gathered and the information obtained from them. Results and analyses in the form of figures, tables, graphs and text are found in this chapter. The discussion part is a presentation of the principles, relationship and generalization evidenced by the results. If applicable, the results need to be compared and interpreted with previously published works. Implications as well as possible practical applications must be mentioned.

**Data Presentation**

This section organizes the data into logical, sequential, and meaningful categories and classifications that is appropriate for study and interpretation. There are three ways of presenting data; textual, tabular, and graphical.

**Data Interpretation -** entails making sense of the results in order to support or disprove the hypothesis. There are two possible types of errors to be committed in interpretation. They are:

1. Type I or making a false positive

2. Type II or making a false negative

**Importance of Interpretation.** The interpretation of results is important when considering its implications both in specific and general cases. The researcher's conclusions may have impact not only on purely theoretical concerns but also on practical applications. He or she can therefore make informed and intelligent recommendations. The interpretation is also important as this is where generalizations are made. As discussed in the previous chapter, generalization is one of the aims of making research. Research should be applicable not only to the small sample involved, but also to the greater population. The researcher must also consider the meaning of the interpretation in terms of the research problem.

**Data Analysis**

When analyzing data, the researcher must decide if he or she will use qualitative or quantitative analysis. This choice is dictated by the methodology that the research follows.

**The following are the tools used in analyzing data:**

1. Qualitative Analysis. This produces a complete and detailed description of the data. Oftentimes, the results are presented in narrative form, or according to dominant themes. Results from qualitative analysis are not generalizable to a population, instead they are generalizable only to the phenomenon of interest.

Issues in Qualitative Analysis. Because qualitative results are not generalizable, it is very important to establish trustworthiness. This means that the results must be credible. It should have internal validity, or should show that the results are truly the intended results. It should also be transferable, or have external validity. This means the results can be transferred to a different setting. The results should also be dependable or reliable. Also, it is important to provide confirmability. This means making sure that each step of the process, from gathering raw data to data analysis to reduction processes and synthesis including structuring of categories and themes. Also, process notes should be included and instrument development information should also be included.

2. Quantitative Analysis. This uses statistical techniques. There are two basic types of quantitative analyses which complement each other and therefore are often used in conjunction with each other.

a. Descriptive Statistics. The Descriptive Statistics are used to describe the basic features of the data in a study. Results of descriptive statistics are the basis of quantitative analysis of data.

Its three aspects are:

Frequency Distribution – shows the number of observations falling

into each of several ranges of values. Frequency can be portrayed as tables, histograms, and polygons.

Measure of Central Tendency – one value that summarizes all the scores – Mean (the average of all the scores), the Median (the middle score), and the Mode (the most frequent score).

Measures of Variability – tell whether scores cluster together or are spread out.

- Range shows the distance between lowest to highest score.

- Standard Deviation is the summary of the distance of every score to the mean. In order to compute for the standard deviation (SD), the variance must be determined first. Variance is the average squared deviation of each number from its mean. SD is the square root of variance.

b. Inferential Statistics is used when trying to reach conclusions that extend beyond the immediate data alone. It relies on probability and statistical significance.

Probability is the estimation that an even is likely to occur. Statistical Significance determines exactly how small the probability that the result have come about by chance.

In Statistics "significant" means probably true or not due to chance. Thus, a significant result means that the result came about not due to chance. Significance levels show you how likely a result is due to chance. They are also called Alpha levels. An Alpha level of .05 reveals that the result has a 5% chance of being due to chance, or 95% chance of being not due to chance. An Alpha level of .001 says that there is a 1% probability that the result occurred by chance, and 99% probability that it did not occur by chance. Obviously, the lower the Alpha levels the better for the researcher.

**CHAPTER IV – DISCUSSION**

This chapter includes a summary of the main findings of the thesis, and states the deduction/s obtained. It also presents the significance of the study, and relates findings to the objectives and problems written in the introduction part of the thesis. Recommendation/s must be stated in this chapter. This part usually directs the reader to conduct further research on some specific areas related to the thesis topic. This chapter contains the Summary, Conclusion, and Recommendations.

**Summary**

This answers the general objective by discussing the findings across specific objectives. In doing this, cite previous studies and theories to support various arguments.

**Conclusion**

This succinctly/Concise answers the research question/s.

**Recommendations**

Any research must ultimately answer the question “So what?” This chapter directly answers this question on at least three levels. There are other possible implications and recommendations.

1. Theoretical Issues. This section explains 1) the theoretical value of the findings and 2) the soundness of the original study framework. It must chart future research directions on the same topic but use a different theoretical perspective. It may also offer a new theory—this is particularly important for a dissertation.

2. Methodological Issues. This section explains the soundness of the methodology as it was implemented. It discusses the implications of the methods, the units of analysis, sampling scheme, research instruments, and data gathering procedures on the resultant findings. It must chart future directions on the same topic but use a different methodology.

3. Practical Issues. This section describes the practical implications and applications of the findings. Examples include recommendations on improving media literacy and communication practice.

**OTHER SECTIONS**

**References**

This is a list of works cited, as well as works consulted but not cited (example, background reading not necessarily cited) in the construction of the research. The list of references is numbered and arranged alphabetically. References must be cited properly, both in the text as well as in the reference list at the end of the thesis. Anything that uses or refers to the ideas of another person must be properly acknowledged including direct quotations, paraphrased passages, author’s previous work and ideas and works done by others. For format on the writing of references, research papers in IT, Computer Science, and Engineering must use the IEEE citation and referencing style. Research papers in Business, Accountancy, Education, Arts and Sciences must use the APA citation and referencing style.

**Appendices**

An appendix or appendices, if any, should be after the references. Appendices include original data, preliminary tests, tabulations, tables that contain data of lesser importance, very lengthy quotations, forms and documents, computer printouts and other pertinent documents. Appendices should be arranged chronologically as they are cited in the main text. Use capital letters of the English alphabet to track appendices, and always begin with the letter A.

**Biographical Sketch**

This section gives the biographical information of the proponent/s. It should include name, educational background, professional work experience (if any) and such other matters that may interest the reader. It is strongly recommended that this be written in essay form rather than a mere resume.

**SAMPLE INTRODUCTION**

In today’s technology, web portal play a vital role in the society especially in ABC hotel in managing their customer and reservation system. ABC hotel was establisher on June 1990, at present they have 120 rooms and 50 employees. On the other hand, this research seeks to answer how a Hotel business industry can benefit from implementing an electronic point of sale and room availability management system. Furthermore, it seek to discover how that system can inform the decision making procedures of management regarding business functions such as booking, reservation, inventory control, customer service, sales projections, demand forecasts, marketing efforts, and seasonality of guest. Finally, the research explores how a new point of sale and inventory management system can benefit customers and improve the overall hotel services and amenities experience.

There are three main systems that can increase the profitability of a hotel business when updating from manual checkout processes. The first is a Point of Sale (POS) system, the second is a Room Inventory Management (RIM) system, and the third is a Customer Relationship Management (CRM) system. Updating POS and RIM systems are explored within the scope of this research. The initial POS system includes the technology used to complete and record hotel sales transactions on the sales floor. Typically it involves bar-coded key card, scanning devices, a checkout interface or terminal, and additional features. This recorded information enters a database which is either stored on a company server (normally bought as a software package) or stored on a cloud-based server (Software as a Service [SaaS]). A POS system is the foundation for the other two systems to function.

Room Inventory information collected by point of sale equipment is summarized into useful data by the Inventory Management system. The Room Inventory Management system tracks inventory levels for every item on the sales floor according to its stock keeping unit. It is able to produce accurate and current inventory counts based on sold and damaged items which is accessible from either a company computer (software package) or through a POS terminal (Software as a Service). An RIM system is highly recommended because consistent item tracking helps improve inventory decisions and reduce inventory costs. These two system work well together: demand planning from the POS system can coincide with inventory levels and ordering policies from the IM system to greatly reduce costs.

The third system is the Customer Relationship Management system. This system manages interactions with current and future customers at both Walk-in and Regular guest by creating individual customer accounts. Each account links customer information with past hotel reservation transaction collected at the POS system. This information is accessible at any time and is used for marketing campaigns, pre-registration email reminders, newsletters, etc. The CRM system is meant to better serve customers, increase customer willingness to pay, and retain customer loyalty. It helps to keep the customer satisfied after a hotel accommodation, services and provides detailed records of individual customer histories. Automated email reminders can be sent to customers after a reservation with specific care instructions and room availability amenities recommendations tailored to their accommodation. However, this system does not affect the core operations of a business, and should be viewed as an extra benefit as opposed to a fundamental need.

**Statement of the Problem**

This study aims to lessen the problems encountered in POS, ICM and CRMIS Transaction at Beauty Magic Marketing Region VIII, Leyte. Based on the results of the interview, it revealed from the questionnaires, and observation conducted, the following problems were identified:

1. What is the problem and issues encountered regarding the process and services of ABC Hotel?
2. What model to be used in developing the system?
3. What is the algorithm to be used in developing the system?
4. What is the extent of compliance of the proposed system in terms of the following software quality characteristics based on the ISO/CE 25010?
   1. Functional Suitability
   2. Reliability,
   3. Performance Efficiency,
   4. Compatibility,
   5. Usability,
   6. Maintainability and Portability?
5. What improvement can be incorporated to further improvement the proposed inter-branch Point of Sales System With Data Analytics?

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**Title Name**

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A Thesis A Project

Presented to

The Faculty of Computer Studies

ACLC College

Tacloban City

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science in Computer Science

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Researchers Name

December 18, 2019

**APPROVAL SHEET**

In partial fulfillment of the requirements for the degree, Bachelor of Science in Information Technology, this capstone project entitled “Title **Name”**, has been prepared by Reseachers Name.

IT Adviser

Approved by the Committee on Oral Examination with a grade of .

**CESAR A. SILAY, MSIT**

Thesis A Adviser

Member Member

Chairman

Accepted in partial fulfilment of the requirements for the degree, **BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY (BSIT)”.**

**CESAR A. SILAY, MSIT**

OIC-Dean

ACLC College

Tacloban City

Date of Oral Examination:

December 11, 2019