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International Conference on

Applied Sciences, Engineering, Technology
& Management Virtual Conference

12th & 13th June 2021

ICASETEM-2021

International Conference on Applied Sciences, Engineering, Technology and Management

ICASETEM-2021
Virtual Conference

Ghana
12th & 13th June, 2021

Organized by
Crown University Int'l Chartered Inc. Santa Cruz Province in Argentina South America partners in Ghana Benin Republic Togo India and Associates World Wide

In Association with
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Preface

The **"International Conference on Applied Sciences, Engineering, Technology & Management (ICASETEM) – Virtual Conference"** is being organized by **Crown University Int'l Chartered Inc.** in Association with **IFERP - Institute For Engineering Research and Publications** on the **12th & 13th June, 2021**.

Crown University Int'l Chartered Inc. has a sprawling student –friendly campus with modern infrastructure and facilities which complements the sanctity and serenity of the major city of Ghana.

The "International Conference on Applied Sciences, Engineering, Technology & Management" was a notable event which brings Academia, Researchers, Engineers, Industry experts and Students together.

The purpose of this conference is to discuss applications and development in area of "Applied Sciences, Engineering, Technology & Management" which were given International values by Institute for Engineering Research and Publication (IFERP).

The International Conference attracted over 50 submissions. Through rigorous peer reviews 13 high quality papers were recommended by the Committee. The Conference aptly focuses on the tools and techniques for the developments on current technology.

We are indebted to the efforts of all the reviewers who undoubtedly have raised the quality of the proceedings. We are earnestly thankful to all the authors who have contributed their research works to the conference. We thank our Management for their wholehearted support and encouragement. We thank our Principal for his continuous guidance. We are also thankful for the cooperative advice from our advisory Chairs and Co-Chairs. We thank all the members of our local organizing Committee, National and International Advisory Committees.

Acknowledgement

On behalf of Institute For Engineering Research and Publications (IFERP) and in association with Crown University Int'l Chartered Inc.. I am delighted to welcome all the delegates and participants around the globe to Crown University Int'l Chartered Inc. for the "International Conference on Applied Sciences, Engineering, Technology & Management (ICASETEM) - Virtual Conference" Which will take place from 12th & 13th June, 2021.

It will be a great pleasure to join with Engineers, Research Scholars, academicians and students all around the globe. You are invited to be stimulated and enriched by the latest in engineering research and development while delving into presentations surrounding transformative advances provided by a variety of disciplines.

I congratulate the reviewing committee, coordinator (IFERP & Crown University Int'l Chartered Inc.) and all the people involved for their efforts in organizing the event and successfully conducting the International Conference and wish all the delegates and participants.

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PAPERS

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Data Safety Using Attribute Oriented Cryptosystem and Blockchain System in Cloud Computing

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Abstract—Large surplus data warehouse and connectivity in system 4.0 atmospheres have problems of low reliability, expense and ease of corruption. To fix these problems, a stable data warehouse and improvement approach in a blockchain oriented system is suggested by that the decentralization, tamper-proof, live control and administration of warehouse systems so that the architecture supports dynamic warehouse, rapid re-engineering and upgrading of shared data in an industrial point data warehouse framework. Neighbourhood restored program system is utilized to update and save data among failed joints while maintaining confidentiality of user data. In other words, when the data stored is found to be corrupted, various neighbourhood revamp units created by vector program will concurrently and effectively re-engineer multiple mutual data warehouse joints. Depending on the exclusive chain warehouse configuration, such as the data agreement method and the smart contract, the warehouse configuration of blockchain shared coding not only easily revamps the neighbourhood restored programs in the blockchain and further reduces the operating cost factor in the data warehouse functions of industrial joints. The Output proves that the suggested approach raises the remodeling speed of multi-joint data by 9 per cent and the data warehouse speed rises by 8.6 per cent, suggesting increased protection and real-time functionality.

Index Terms— Blockchain system, shared warehouse, agreement method, neighbourhood restoration program, revamp speed

I. INTRODUCTION

The blockchain possess broker-free (P2P-oriented) characteristics, thus removing unnecessary payments by means of p2p communications without the permission of a third party. As the possession of communication data by several ways, creates hacking impossible, security costs are saved, communications are consequentially accepted and registered through huge contribution, and promptness is ensured. In addition, the program can be easily executed, linked and extended by means of an open source, and communication records can be freely used to make communications transparent and minimize regulatory prices. The blockchain is a standardized list that stores data and impossible to manipulate arbitrarily because the system participants save and check the blockchain. Each division is made up of a header and a body. The header have the hash values of the previous and existing divisions and nonce keys. The division data is checked in the database using the directory process. While the division does not has the next division hash value, it is added as a procedure.

Because the hash values saved in all the peer in the division are influenced by the values of the earlier divisions, it is very complicated to falsifie and change the recorded data. Eventhough data modification is feasible when 51% of peers are cut at the same time, the attack situation is technologically very complicated. Encrypted, key-oriented authentication and hash functions that can be deprogrammed are also utilized to offer blockchain safety. The ECDSA (Elliptical Curve Digital Signature Computation) electronic signature computation, which authenticates the digital signature produced during the communication between individuals, is utilized to demonstrate that the communication data has not been changed. While utilizing an anonymous public key as account details allows one to know who sent how much to another peer, it also maintains confidentiality because there is no way to find information pertaining to the owner. The hash function is utilized to authenticate that the division data having the communication details are not modified and to find the nonce value to get a new division, as well as to ensure the validity of the communication data during a bitcoin communication. The validity of communication information can be checked by public key-oriented encryption of the communication data hash value. In addition, using the root hash value that builds up the hash value of all the the communication data, it is simple to decide if the bitcoin data has been changed due to the root hash value is modified when the value is modified in the procedure.

There are several safety-enhancing studies using these blockchain characteristics are in process. The significant aspect of the blockchain is protection associated to the individual key used in encryption, as well as research on how to secure the individual key. An attacker is trying to "reuse attack" and other attacks to get a individual key saved on a peer's computer to hack the bitcoin. The attacker will hack the bitcoin so the data will leak because the attacker can get a individual key. To solve this issue, studies on the use of both hardware and software securities for the endorsement of communications are ongoing.

The rest of the article is described as follows. Section II describes the heritage of Blockchain warehouse system, and the present studies popularity of Blockchain warehouse system is described in Section III. The mathematical model and error-persistent shared warehouse configuration are provided in Section IV, the error-persistent dispensed garage and improvement computations are illustrated in Section V, and the statistics verification method is suggested in Section VI. The work is concluded in Final Section.

II. RELATED WORKS

Ketki R. Ingole (2018) identified blockchain system and few compelling unique applications in both the financial and non-financial sectors. Then we look at the difficulties ahead and market prospects in this crucial system that is going to revolutionize the digital environment. A blockchain is basically a centralized archive of documents or a public record of all communications or digital events that have been executed and exchanged by the parties concerned. Every communication in the public directory is checked by a vote of the majority of the participants in the program. And once reached, the knowledge could never be deleted.

Simanta Shekhar Sarmah(2019) assists prospective researchers in this area in the creation of new protected models. Blockchain system is a modern and influential financial system that fully transforms business communications. It is a decentralized system that embraces and employs a number of cryptography models.

III. HYPOTHESIS AND MODEL OF SHARED WAREHOUSE & IMPROVEMENT

Numerical Model

The source file M is partitioned as n data divisions and programmed as n joints, where all of them have divisions. This occurs in a (n;k;d) restored language. The DC data receiver has the option of recovering input data entirely through k joints. In the case of a futile joint, the new joint can change the joint by linking any d(d k) present joints and copying data from one system to another system division from each joint, known as a joint re-engineering. The bandwidth used for the joint revamp is defined as the revamp bandwidth and is denoted by and = d. The maximum minimum flow cut theorem suggests that the maximum flow and the minimum cutting scope of all separate source joints and data receivers are identical. There is also a need to define the minimum break.

IV. BLOCKCHAIN FOR ERROR- PERSISTENT SHARED WAREHOUSE AND IMPROVEMENT COMPUTATION

Error-persistent Shared Warehouse Computation

Error-persistent systems, unlike other systems, do not break down when a error occurs; instead, the system runs even in the presence of a error, but at a low throughput or high latency. In particular, Byzantine errors are present in the delivery systems. These errors are the result of misunderstanding between the system nodes. The origins of these errors / misinformation remain unknown to the members of the distributed systems.
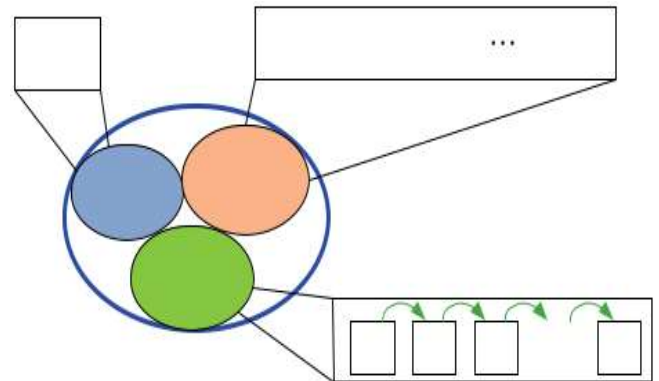

Fig. 1. Single error-persistent neighbourhood restoration program configuration

Therefore, in this situation, a node can behave oddly and send a special reaction to various nodes on the system, as a result of which it is difficult to identify this node as malicious or defective. Therefore, to make a decision on a defective node, honest nodes of the system come to an agreement, and a system that can draw an assumption that is not disturbed by a defect node can be called a Byzantine error-persistent device. Castro and Liskov have established an innovative approach to achieving agreement through shared systems that can handle defective nodes by duplicating nodes. But PBFT can only accept these nodes until the quantity of defective nodes is less than one third of all the nodes. System nodes reach a agreement on the decision by sending messages on the decision to each other. The more honest the nodes, the more stable the system is. Although more truthful nodes agree on a decision than errory junction points agree on a false conclusion, wrong information will be denied by the widely held.

Practical byzantine error tolerance computation in blockchain takes over several ideas from its version utilized in shared systems. The agreement is obtained, in this case, to decide the validity of a division. Nodes in the system distribute messages between each other to commit a division to the chain. Errory junction units may transmit tampered divisions, as a result, the division which is considered valid by several nodes

Efficient Blockchain oriented Improvement computation

1) Data Improvement for Single Joint Failure: When building the restored programs, data warehouse and joint revamp.

Computation 1 Shared warehouse restoration program building computation.

Input: Source file M, non-singular matrix U; V ;

Output: Coding matrix G;

1: Split source file M into n data divisions $X_i = x_{i1}; x_{i2}; ::::; x_{in}; i = 1; 2; ::::; n$;

2: for i   i; j   n do

3: Compute $A_{ij} = (V_i)^T U_j + c_{ij}E$;

4: end for

5: Compute $Y_i = X_1A_{i1} + X_2A_{i2} + ::: + X_kA_{in}$;

6: Record T_i to get coding vector $B_i = X_i; Y_i; T_i$;

7: Generate program $B = B_1; B_2; ::::; B_n$;

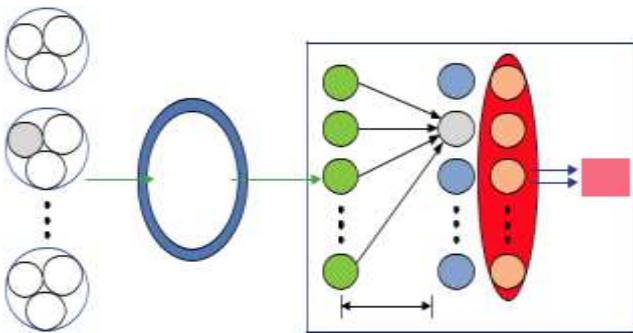8: return Coding matrix G.

Fig 2 Blockchain system corresponding to error-persistent neighbourhood restoration programs

When re-encoding data in joints, there is no encoding and decoding procedure to transfer data from one system to another system data, as well as a precise re-encoding of a single failed system joint by simple XOR procedure. We found that, by changing existing simple restored programs, we were able to recover the encoding type that could re-enprogram multiple failed joints precisely at the same time. When particular requirements are met, multiple joints in the link system will easily re-engineer various failed joints because of good neighbourhood re-engineering and decreased disk input / output operating cost so that they have a high functional application value.

If 1 Warehouse Joints are applied to the neighbourhood program to decrease the bandwidth operating cost when building high error-persistent neighbourhood restored program and limitless program, the data bits in the neighbourhood system program will remain constant and the test bits will be enhanced to l=2. The unregulated program (nL + l=2; k; d0min + l=2) relating to the neighbourhood program (nL; k; d0min) of the device is built. The least distance for the infinite program in the program is d0min + l=2. In comparison, the system's limitless program has a greater ability to rework broken joints.

Computation 2 Single joint failure improvement computation.

Input:

Coding matrix G, failure joint 1;

Output:

First division X_1 stored in joint 1 ;

Place other n 1 joints other than joint 1 by the third division of warehouse joints quickly;

2. Copy data from one system to another system its first division $X_2; X_3; ::::; X_n$;

3. Choose any existing joint j(j 6= 1)to copy data from one system to another system its second division Y_j;

4. The formula (14) is used to restore the first division X_1 in joint 1;

5. return First division X_1 in joint 1.

When one joint is affected, such as joint 1 is affected, this system is to be followed: to find the affected joint 1 via the blockchain system and unaffected joints, then to use all data except joint 1 in the system and to generate control domain Yi(i 6=2) of all other joints, we can retrieve data from joint 1. Pseudoprogram is shown in computation 2.

2) Data Improvement for numerous Joints Failure: targetted at minimizing the time of improvement and bandwidth operating cost of error joint re-engineering, the selection of re-engineering joints for error-persistent neighbourhood re-engineering programs, i.e. the optimum selection of re-engineering joints from surviving joints and the communication route from re-engineering joints to new joints, is investigated. Fig. 5 demonstrates the remodeling of a variety of failure joints, including the following steps: Step 1: We build a mathematical model of remodeling joint selection in a diverse cloud warehouse system, i.e., Pn minimize i=1 ci I in which ci is the copying of data from one system to another system cost of joint I and f 1; 2; L; ng is the copying of data from one system to another system sharing of the selected remodeling joint. When the error joint is situated in the system neighbourhood program portion of each neighbourhood program in the error-persistent neighbourhood restoration program, several neighbourhood renovation units may be present for each error joint and the renovation unit with the lowest renovation cost is taken into account.
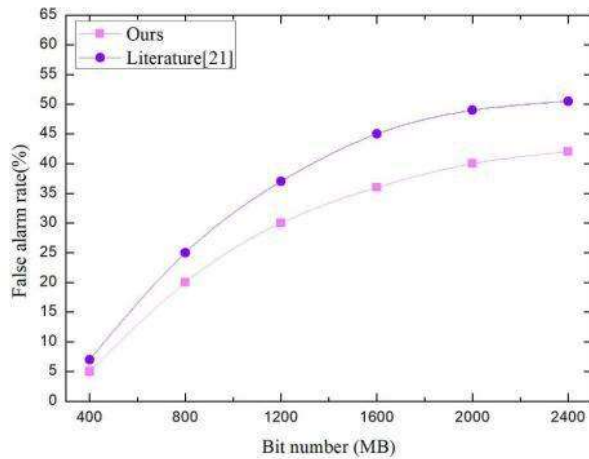
Fig. 3. Evaluation of the false alarm speed

Stage 2: We find all the limitations to be found in the selection of re-engineering joints, that is, the re-engineering and re-engineering time is greater than the data transmit time from any re-engineering joint to the new joint, the size of the re-engineering size restricts the broadcast speed from the re-engineering joint to the new joint, and the retention of the cloud warehouse joints of the mixed system.

Stage 3: We consider the optimum cost of the function Reduce Pn i=1 ci i. When the size of the industrial blockchain cloud warehouse system is low, the linear programming approach is used to optimize the collection of new joints, remodeling joints, and data transfer directions to obtain the best range. If the size of the industrial blockchain cloud warehouse system increases, the computational complexity of the linear programming approach rises. In addition, heuristic selection computations are considered to get an estimated optimum new joints, restored joints, and their broadcast routeways for restored reduction.

Computation 3 Numerous joints failure improvement computation.

When I joints are impaired in n industrial joints, it is advisable to conclude that joint 1 to joint I does not works. We will use the first divisions X_{i+1}; X_{i+2};; Xn of n I joints other than junction 1 to junction I and the second divisions Y_{j1}; Y_{j2}; Yji of any remaining j1; j2;; ji (jl > k; l = 1; 2;; I to junction 1 to junction i. Pseudoprogram is shown as computation 3.Input: Coding matrix G, failure joints 1-►i;

Output: First division X_1; X_2; ::::; X_i stored in joint 1 to joint i ;

1: Place other n 1 joints other than joint 1 by the third division of warehouse joints;
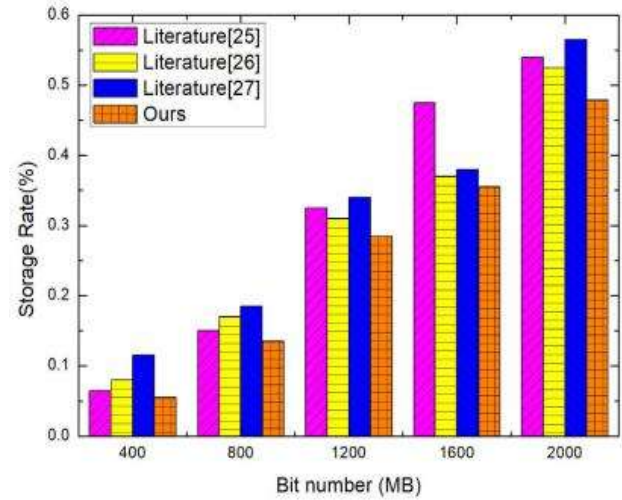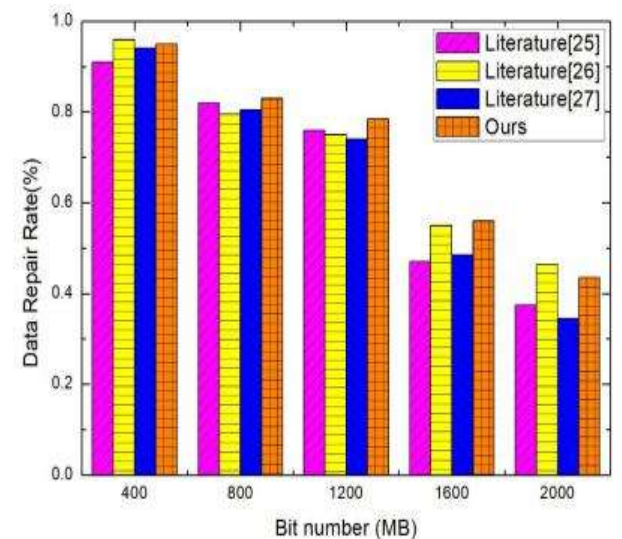

Figure 4

Figure 5

Above Figure 4 & 5, the analysis of data revamp speed and warehouse speed

2: Copy data from one system to another system its first division X_{i+1}; X_{i+2}; ::::; X_n;

3: Choose any surviving joints j_1; j_2; ::::; $j_i(j_l >$ k; l = 1; 2; ::::; i) to copy data from one system to another system its second divisions Y_{j1} ; Y_{j2} ; ::::; Y_{ji} ;

4: Use formula (10) to restore the first divisions X_1; X_2; ::::; X_i in joint 1 to joint i;

restore First divisions X_1; X_2; ::::; X_i in joint 1 to joint i

V. DATA RELIABILITY AUTHENTICATION METHOD

This segment utilises elliptical bilinear mapping to suggest a robust verification method oriented on a third party auditor (TPA). The device consists of three entities: participants, CSPs and TPAs. The form of touch shall be as

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follows. The client saves the enprogrammed file M and the digital labels to the CSP, and then the form of verification metadata is transmitted to the TPA. As a result, the TPA's reliability problems are dispatched to the CSP, which then transmits the TPA's reliability reaction. Hence, The TPA will submit the comparative results between the issues of reliability and the user's response. Atlast, the CSP offers input to the consumer to determine if the data is absolute or not.

VI. CONCLUSIONS

With the comprehensive creation of Industrial System 4.0, a range of new technologies will mainly affect how industrial data warehouse saves and communicate with improved but safe speeds, as the system indicates a significant chance of raising the few features of the suggested study. Owing to the individuality of the blockchain-oriented industrial system, data warehouse administration deals with big disputes. This article concentrates on data protection concerns in the industrial system and introduces a warehouse and re-engineering system for error-persistent data coding. This approach recognizes a high-precision, restored application in Industrial System 4.0. The restoration program has easy coding and a strong ability to regenerate neighbourhoodly. When data stored in a blockchain-oriented system is compromised, multiple data warehouse joints can be remodeled with high performance. In addition, a special connected warehouse mechanism consisting of a data agreement and an intelligent contract can be utilized to define easy neighbourhood program warehouse of adjacent saved data on a blockchain-oriented system. The results reveals that the suggested approach can decrease the speed operating cost of neighbourhood program in data warehouse and has excellent protection and reliability.

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Studying Novel Regime Framework of Plasma Instabilities in Tokamak Type Confinement– A Review

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Abstract—The novel regime framework theory presupposes that states are concerned with absolute gains, that is, states do not consider the gains or losses of other states in their utility analysis. model study is a mathematical method that attempts to predict future events or outcomes by examining trends that are likely to predict future results. A tokamak, a system in the form of a torus, uses a strong magnetic field to contain hot plasma. The tokamak is a type of magnetic confinement instruments which is created to form controlled fusion power (thermonuclear). Plasma is a gassy material composed of unrestricted charged particles, like protons, ions, and electron, which react extremely intensely to electromagnetic (EM) fields. Plasma instability is a region where disruption happens because of a shift in plasma characteristics (like magnetic field, electric field, temperature, density). In this paper, framework of ITER is reviewed for understanding plasma instabilities in tokamak type confinement leading to the study of energy confinement time.

Index Terms— Tokamak; Toroidal Field; novel regime framework; Plasma Instability; Rayleigh-Taylor (RT) Instability

I. INTRODUCTION

As the plasma consists of charged particles, magnetic fields can be used to restrain the plasma in directions perpendicular to the field of magnet. The simplest form of confinement system can be a long solenoid which will prevent particle movement in the direction perpendicular to the field of magnet, by making the particle gyrate around the axial field. The particle can still leak us from end limiting the confinement time. A simplistic way of preventing this axial leakage can be converting the long solenoid into a torus, thus making it endless. One would then think that particles, while gyrating around the magnetic field, will keep moving around the torus and will be confines.

A closer look at the magnetic field in such a toroidal system, however, reveals that the magnetic field in this system has gradients as well as curvature and net effect of these is that charged particles, in addition to gyration and axial motion also acquire a drift across the magnetic field. These drifts are in opposite directions for electrons and ions and result in setting up a vertical polarization electric field, resulting in plasma getting thrown out across the magnetic field in radial direction and the confinement is lost. A purely toroidal magnetic field system thus is not able to confine the plasma and some means to short circuit the polarization fields must be incorporated[i].

Addition of poloidal magnetic field in the toroidal field, causing in helical magnetic field to the toroidal field, resulting in helical magnetic field lines is one such technique, allowing the particle motion along the lines of field to short circuit this electric field. One such device, which deploys toroidal current for producing the poloidal magnetic field, is a Tokamak, first conceived in Russia. TOKAMAK[ii] is the acronym for Russian word "ToroidalnyaKameraMagnetnayaKatushka" meaning the toroidal chamber in magnetic field.

The term 'Tokamak' is used for axially symmetrical toroidal structures in which the hot plasma is contained by the help of the magnetic field of the current in which is circulating the plasma and in which the main magnetohydrodynamic instability is regulated by a very powerful longitudinal magnetic field parallel to the current. The amplitude of the longitudinal field, $H\theta$, must be several times stronger than the amplitude of the azimuthal field which is generated by the current , $H\varphi$. This represents the key distinction between Tokamak instruments and applications, such as the well-known English Zeta unit, with comparatively poor longitudinal fields.

In an annular plasma column and near its surface, the resultant magnetic field potentially has a basic helical form (Fig. 2). The cross-sections of the magnetic surfaces of a plane going through the system's main axis can be found to be circular in Tokamak systems during the first estimation. In reality, however an inspection of the equilibrium conditions for a plasma loop reveals that there is a visible shift in the shape of the magnetic surface with a reasonably high value of β $\varphi=8\pi p/H$ φ^2 (where p is the gas kinetic pressure of the plasma). It should also be mentioned that the magnetic field does not necessarily exhibit absolute axial symmetry in real Tokamak units.
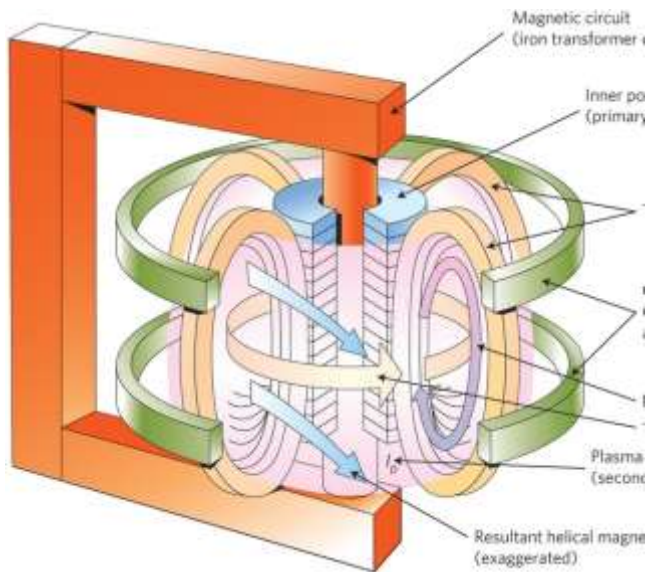
Fig. 1: Tokamak Schematics[1]

This field is generated by coils on the exterior surface of the toroidal chamber where the plasma loop is created. It should be noted that the clearances between adjacent coils must not be so narrow as they have to fit the diagnostic equipment and the pumping ports. The magnetic device, however also retains strong axial symmetry for a greater count of coils.

For systems currently in use, the ideal amplitude of oscillations in Hθ on the annular magnetic axis of the plasma loop is 0.5-1%. Since the Hφ/H ?? ratio is low (it is less than 0. 1 under standard laboratory conditions), the angles of rotational transition of the magnetic force field lines in Tokamak systems are often low and the field lines along the plasma circle are greatly expanded. Such a magnetic system should be extremely resilient against large-scale field resonance disruptions that can induce unwanted separation of the magnetic surfaces[3].
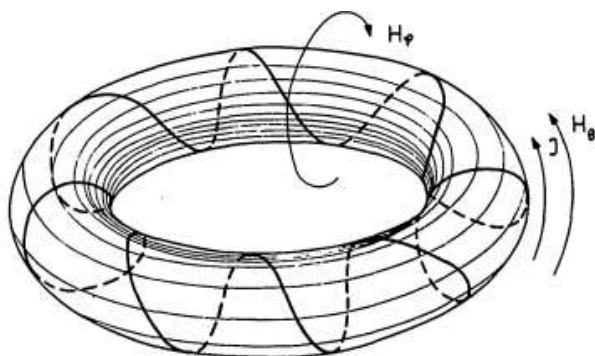
Fig. 2.: Helical structure of magnetic field in a Tokamak device[iii].

II. PREDICTIVE MODEL ANALYSIS

Predictive model analysis is a mathematical method that attempts to predict future events or outcomes by examining trends that are likely to predict future results, also called predictive modelling. The analyst selects and trains statistical models once data has been obtained, using historical data. Once this sample data is obtained by analysts, they must select the model which is suitable. Among the most basic kinds of predictive models are linear regressions. In essence, linear models carry two linked variables — one independent and the other dependent — and plot one on the x-axis and one on the y-axis. A best fit line is applied to the subsequent data points by the model.

This can be used by analysts to forecast the dependent variable 's possible occurrences. Such more complex predictive models include, to name only a few possible approaches, decision trees, Bayesian inference and k-means clustering. The neural network is the most dynamic field of predictive modelling. Models of predictive analytics (PA) have benefits and drawbacks and are applied perfectly to particular works. The main advantages of all models are that they are reusable and can be changed to have standard company laws. Using algos., a model can be reusable and learned.

The analytical models operate multiple algos. on the data set on which the prediction is intends to carry out. Since it requires teaching the model, it is a repetitive operation. Often, before one that fits business goals is identified, several models are used on the same data collection. It is necessary to mention that models of PA operate by a method which is iterative. It begins with pre-processing, and subsequently, followed by data preparation, data is mined to identify industry goals. Data is analysed, modelled, and eventually implemented once planning is complete. It is iterated on another time until the process is done.

III. PLASMA INSTABILITIES

Plasma (regularly ionised gas although look at Pseudo-plasma) is a gassy material composed of unrestricted charged particles, like protons, ions, and electrons, which react extremely intensely to electromagnetic (EM) fields. The charges those are free produce the plasma extremely conductive (electrically), as a result it can transmit electricity and MFs can be produced. It can affect the plasma to confine into filaments, produce particle beams, release a broad spectrum of radiation (light waves, radio waves, gamma, x-ray and synchrotron radiation) and develop similarly defined plasma cell regions (e.g., magnetosphere, interplanetary medium).

Because of its peculiar properties, plasma is generally known to be a different form of substance from liquids, gases, and solids, also referred to as the "4th state of matter"[iv], or just as the "1st state of matter"[vvi]. It usually gets the form of clouds or charged ion rays similar to neutral gas, but can also contain grains and dust, known as dusty plasm[vii]. Usually, they are produced by heating and ionising a gas, simply removing electrons from atoms, allowing free movement of positive and negative charges.

Over the last decade, the issue of plasma instability has experienced a growth that appears turbulent at first glance. This evident chaos is due to the exponential increase in the amount of instabilities that are known. Thirty-one plasma instabilities are identified in a recent analysis by Lehnert. Of these since 1958, all but eleven have been identified. Nevertheless, even with this raise in the number of identified instabilities, there has been a rise in awareness of the relationships between families of instabilities. For starters, with frequencies near the ion cyclotron frequency and its harmonics, there are a variety of instabilities.

Dividing volatility into two large groups will be convenient: (a) macroscopic and (b) microscopic. Macroscopic, or hydromagnetic, instability means that macroscopic portions of plasma are displaced. By the application of hydrodynamic calculations, they can be analysed scientifically. In other words, as an approximation, it is believed that all the particles in a given macroscopic volume perform the same average movement. The oldest and also the simplest to imagine is this class of volatility.

It is possible to describe microscopic or kinetic instabilities as those for which the variations in motion of different particles in the same volume are significant. For a theoretical study of this class of instabilities, the Vlasov equations are essential.

The Kelvin-Helmholtz instability: There are a variety of plasma instabilities that shares a close relaion to classical hydrodynamic instabilities. One of them is the instability of Kelvin-Helmholtz, which happens when there is relative motion divided by an interface between fluids. It is this turbulence that induces the growth of waves when a breeze blows through a body of water's surface. As plasma is circulating perpendicular to a magnetic field, a related instability exists. The magnetic field acts like a liquid with a $B^2/4\pi c^2$ mass density. The plasma/field interface is unpredictable.

The Rayleigh-Taylor (RT) instability: The Rayleigh-Taylor instability is another classical instability, which happens when a heavy fluid is protected by a lighter fluid against gravity, . When a plasma is supported by a magnetic field against a gravitational field, a similar instability exists. On the basis of the leading center motion of the ions and electrons, this instability is understood. The interface of plasma-vacuum , is assumed, to be sharp. The ions and electrons have the drift velocities. Under the influence of perpendicular gravitational and magnetic fields. They drift in opposing directions due to the fact that they have opposite charges. If the interface is disrupted, so ions and electrons collect and create an electric field on the interface.

In plasma, different kinds of instability can occur. These contribute to plasma depletion and a severe drop in containment time. Magnetohydrodynamic instability is considered the most serious of these. While there may be an equilibrium condition, it may not equate to the lowest energy available. Therefore the plasma finds a state of lower potential energy, much like a ball rolls down to the bottom when disrupted at rest on top of a hill (representing an equilibrium state); the lower energy state of the plasma refers to a ball at the bottom of a valley.

Turbulence grows in the search for the lower power state, leading to increased diffusion, increased electrical resistivity, and significant losses of heat. Circular plasma currents must be held below a critical value called the Kruskal-Shafranov limit in toroidal geometry, or an especially violent instability can arise consisting of a set of kinks. While it seems nearly difficult to have a fully reliable structure, substantial progress has been made in developing systems that remove large instabilities.

In the electron cyclotron resonance (ECR) ion source, plasma instability plays a significant role in the development of strong heavy ion beams in high charge states for particle accelerators. ECR sources' geometrical and operational limitations impede ion trapping for a reasonable amount of time to get completely ionized with optimum effectiveness. In the last six decades, plasma instabilities have been experimentally studied in Q-machines and theoretically by different groups worldwide, but there are few studies in the literature to study them in depth according to the various tuning parameters of ECR ion sources by means of Fourier beam intensity analysis.

IV. LITERATURE REVIEW AND RELATED WORK

Avinash et al., who performed an experiment on RT instability in dusty plasma, recorded RT instability around an equal mass plasma, nonuniform pair-ion plasma. This work was based on the notion that the stability of a laminated dust cloud floated in the feebly and robustly coupled dust regimes in anodic plasma. Avinash et al., based on their work, concluded that the elasticity of the tightly coupled dust sets a threshold for the instability of the RT. Some of these studies have documented reductions in the RT instability growth rate. In these investigations, however, dust dynamics have been overlooked. The Taylor instability is a type of the RT instability which may arise as soon as a light fluid is accelerated into a heavy fluid [viii].

L. E. Thode et al. has explored the two-stream (2S) instability of plasma heating by relativistic electron rays. They demonstrated that a single parameter might determine the level of saturation of the wave EF because of a 1-D model of the 2S instability among plasma and a relativistic electron beam. In support of this model, they have done mathematical simulation tests. Guided by the main spectrum, unusual heating of the electrons through parametric instability was noticed [ix]. 2S plasma instability in the ionosphere as a cause of anomalies was studied by Farley et al. A concept of the 2S ion wave instability in plasma was established by carrying into consideration both the effect of the presence of a uniform MF and collisions of neutral particles with electrons and ions.

The Kelley et al. study recorded opinions of fluctuating Electric Fields and variations in density of plasma during a large magnetospheric substorm in the zone E of the earth's auroral ionosphere. In a frame of reference set to the earth, it was discovered that the waves moved with no dispersion at a velocity of about 500 m / sec. This was steady with an interpretation of the acoustic wave for the occurrence and implies that the wave is stabilized at a speed lower than the electron streaming velocity by nonlinear effects. During a large magnetospheric substorm, studies of fluctuating EFs and plasma density variations were made in the E zone of the auroral ionosphere of the planet. The variety of altitude, dependency on polarization, wavelength, and amplitude of the variations were in perfect alignment with this instability theory.

Moreover, concurrent measurements of plasma density and fluctuations in the EF permitted the real part of the dispersion relationship to be calculated at low frequencies. In a frame of reference static to the earth, the waves were observed to spread without dispersion at a velocity of about 500 m / sec, a finding steady by an acoustic wave explanation for the phenomenon and suggesting that nonlinear effects calm the wave at a velocity lower than the streaming velocity of the electron [x]. The theory of the two-stream instability in a collision less plasma was first discussed by Buneman [xi] and later in more complicated forms by several other authors[xii xiii xiv xv]. These discussions are applicable in a magnetic plasma to a situation in which a relative drift velocity exists between ions and electrons parallel to the magnetic field.

A similar theory was developed for a collisional magnetized plasma in which a differential drift velocity exists between ions and electrons perpendicular to the magnetic field [xvi xvii xviii]. Lee et al.[xix] extended these calculations to the short-wavelength regime and showed that for high plasma density (n_o 10^5 cm^{-3}) and large relative drift velocity between ions and electrons (v_o $3(KT/M_i)^{0.5}$) the instability shifts to smaller wavelengths and higher frequencies.

Roberts et al. have brought out measurements of 2S instability following the action of the phase-space limits. This study was based on phase-space fluid of constant-density and incompressible. Because of the condensation of holes, which function like gravitational particles to a good approximation, the production of large-scale nonlinear pulses was documented.[xx]

Following the pattern, Hoshoudy et al. [xxi], by considering the combined effect of the vertical and horizontal MF, investigated RT instability in laminated magnetised plasma. The linear growth rate was observed by resolving the linear MHD equations in a typical way for plasma through an exponential density distribution restricted among 2 rigid planes. In the presence of the combined influence of vertical and horizontal Magnetic Field, the RT instability of laminated plasma has been studied.

Davidson et al. [xxii] explored the impact of finite plasma beta upon lower hybrid drift-instability (DI). In order to derive the local dispersion relationship for lower-hybrid-DI in a completely self-stable way, containing the related finite-beta effects, this study discussed two aspects, transverse EM disturbances and nonresonant and resonant electron orbit alterations. Recent attention has been given to the lower hybrid DI such as a method for irregular transfer throughout the post-implosion and implosion stages of quickly pulsed theta pinch experiments, including a method for generating flute disruption throughout the implosion.

Jackson et al. [xxiii], in Maxwellian plasma, examined drift instabilities. This analysis was based on the stability of two Maxwellian plasma components with different drift velocities, which was carried out by means of a dispersion relationship graphical solution. Like a role of wavelength and the critical drift velocity such as a function of temperature ratios, they achieve the optimum growth rate for electron-proton plasma. The stability of two Maxwellian plasma components which have distinct drift velocities is studied by means of a graphical solution of the dispersion relation.

One More such research was accomplished by Ellis et al. [xxiv], where weakly ionised argon plasma was tested for collisional DI. The oscillations were characterised as collisional drift waves in this study using an analogy of mode attributes with theory. Ellis et al. proposed, built on their discoveries, that the local slab model is a bad option for demonstrating these non-local cylindrical experiments. Experimental and theoretical findings were presented related to the instability of collisional drift of poorly ionised plasma. The drift instability has been observed in many devices both linear and toroidal, and in both the collision less and collision dominated regimes. The instability amplitude can attain very high levels and in many cases drift waves lead to anomalous transport of plasma across magnetic field lines. The ubiquitous appearance of this mode and its deleterious effect on plasma confinement have made it a prime candidate for both theoretical and experimental study.

Toroidal momentum (TM) pinch-velocity (PV) was researched by Peeters et al. [xxv] due to the Coriolis drift (CD) impact. This research focused on little-scale toroidal plasma instability. A simplified fluid model was used to precisely measure the magnitude of the pinch and illustrate the physical mechanism and gyro-kinetic calculations. The effect of the "Coriolis drift" on little-scale instabilities in toroidal plasmas is seen in this work to produce a PV of TM. In the absence of an external source, the total toroidal angular momentum in a tokamak is a retained in quantity. Radial transport describes the rotation profile that is of concern since an E X B shear is related to a radial gradient in the toroidal rotation that can stabilize turbulence and thereby increase confinement. Moreover the resistive wall mode can be stabilized by a toroidal rotation of appropriate magnitude.

V. CONCLUSION

Followed by a detailed literature review, we observed that a substantial part of the instability analysis was conducted out on plasma models by considering the presence of ions, electrons, and dust grains that were negatively charged. Some interesting findings may result in an improved model with the inclusion of neutral grains and the impact of their collisions with other grains. The analysis of the instability of the RT type offers valuable information on the stability state of plasmas in curved MFs. The most potent kind of MHD instability in non-uniform plasmas is the RT-like instability led by actual field curvature

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Detection of Pneumonia from Digital X-Ray Imaged Thru Transfer Learning

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Abstract—The COVID-19 pandemic placed healthcare systems of every country under immense pressure. Diagnostics and treatment are pushed to its limits as medical frontliners struggle to manage the huge influx of incoming patients with respiratory symptoms. This study aims to assist diagnostics through pre-assessment of X-ray images to detect signals or features that strongly correlates to pneumonia. Specifically, we will train classification neural network on top of various pre-trained Deep Classification Models through existing X-Ray images with and without pneumonia. These models include VGG16, InceptionResNetV2, and MobileNetV2. To test the detection accuracy of each trained model, 25% of the training data will be separated, and will be evaluated after the model has been trained with the remaining images. All images in the dataset are pre-classified, and we will be able to generate accuracy metrics from the evaluation.

Index Terms— Deep Learning; Image Processing; Imaging; Diagnostic

I. INTRODUCTION

The COVID-19 pandemic is pressuring national healthcare systems throughout the world in unprecedented scales. The flow of incoming symptomatic patients has been steadily increasing and will remain so for the next few years. Fast diagnostics are of utmost importance for decision making especially with limited medical resources such as isolation rooms and ventilators. This study aims to assist in pre-assessment of the presence of pneumonia from X-Ray images to give doctors a tool for managing which patients should receive priority care.

In this paper the researchers used Python and Keras with Tensorflow backend. The base models were downloaded from the Keras Applications repository, without the default top layers. New fully connected layers with a softmax endpoint were added as the final layers, and trained over Google Colab. The script consists of hyperparameters that can be fine- tuned to observe any improvement of the loss minimization, resulting to higher validation accuracy.

II. DESIGN AND APPLICATION

A. Methodology

Due to the COVID-19 virus, the researchers found it best not to gather images themselves from medical institutes. Kaggle is a community of data scientists sharing codes, models, and data, for the purpose of general advancement in the field of Artificial Intelligence. Labeled X-Ray images with pneumonia classification are available from the site, generously provided byPaulMooney[3]. The researchers used this as the training data.

Train on Google Colab

Google Colaboratory allows researchers to utilize Google's Graphics processing Units ,GPUs and Tensor processing Unit, TPUs to train deep learning models, especially for people who do not have access to computers with gaming grade graphics. GPUs are used for training because of its high performance and distributed computing capabilities, allowing for simultaneous batch computation of gradients, weight and biases, allowing for faster training times especially with models with complex architecture.

Setup Google Colab to Use GPU

By default, new Google Colab scripts are assigned only a CPU. In order to utilize GPU for deep learning training:

• Click Runtime > Change Runtime Type

• Under Hardware Accelerator, select GPU or TPU

The GPU and TPU options should have the same performance. According to the Google, TPUs are just GPUs that are dedicated to serve Machine Learning purposes. In our study, we have selected GPU as our hardware accelerator.

Linking Google Drive to Colab Script

To use Google Colab, the script must be written on Jupyter notebook format. Files are accessed through Google Drive. To link a Colab script to a folder in Google Drive, the following code should be inserted:

from google.colab import drive

drive.mount('/gdrive')

%cd /gdrive/<Folder Name>

After executing the cell that contains the code snippet above, Google will ask for an authorization code. A link will be provided where you need to login the Google Account of the drive you want to access. After successfully logging in, a code will be shown like the following snapshot:
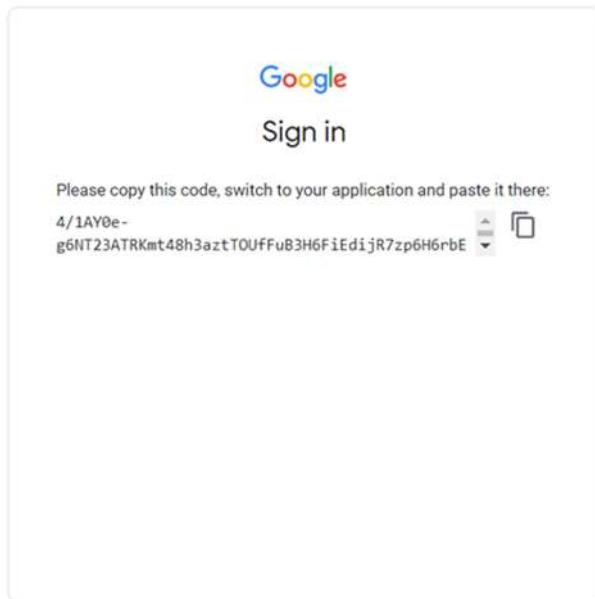
Fig.1. Image: Authorization Code

Splitting the Dataset

The researchers set aside a test dataset to evaluate the trained model later. This will show an unbiased metric on how well the model can classify an XRay image with pneumonia. Standard test split varies from 20% to 30%. The researchers used 25% as the split percentage.

Downloading Models from Keras Repository

The Keras website shows its available pre-trained classifier models in their repository (https://keras.io/api/applications/). The researchers picked 3 models based on model sizes. They have settled with the following models:

- VGG16 - (528 MB)
- InceptionResNetV2 - (215 MB)
- MobileNetV2 - (14 MB)

Keras allows downloads and caching straight from the script.

Modifying the Models

The deep models come with their own classifier layers that were trained to recognize images from its training source, which is commonly ImageNet. These fully connected layers are replaced and trained over the X-Ray dataset.

The base model layers are frozen so that the weights and biases of their neurons remain unchanged while training. This is essential to retain the feature extraction capabilities of the deep model. Only the appended classification layers are unfrozen for classification purposes.
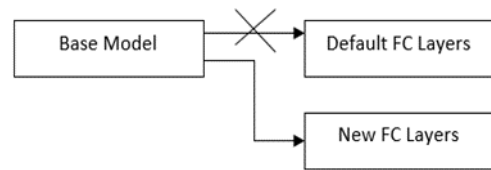

Fig.2. Appending New Fully Connected Layers for Classifying Pneumonia

Adjusting Hyper Parameters

With the script in place, initial hyper parameters are set, and adjusted every end of training in the attempt to improve the validation loss without overfitting. These hyper parameters include:

- Layers To Unfreeze – number of layers from the base model to unfreeze if required
- Neurons – number of neurons in each fully connected layer before the softmax layer
- Learning Rate – the learning rate while training
- Max Epochs – an upper limit of how many epochs the training should run
- Batch Size – the number of samples to use for training at an iteration
- Fixed Step Size – number of batches to use for each epoch. If useAllSamples is true, the number of steps will equate to using all samples, depending on batchSize
- Use All Samples – whether to use all training samples.
- Patience – number of epochs to wait where the validation loss is not decreasing before stopping training

Train and Monitor Loss and Accuracy Curves

There will be two objectives to training the base model with a new classifier:

- Minimize the validation loss
- As a result of a small loss, ensure the validation accuracy is high (preferably > 90%)
- Keep the distance between the training loss and validation loss small to prevent overfitting
- Stop the training when the validation loss does not improve within a number of epochs

Test Model with the Test Dataset

The model's accuracy can be evaluated by testing all the samples in the test dataset. Because the samples are labeled, we can compute the overall accuracy by checking how many times the model classified the sample. For further inspection of metrics for each class, we can generate a Confusion Matrix and an Accuracy Metrics report. These can be provided by the Scikit Learn Metrics module.
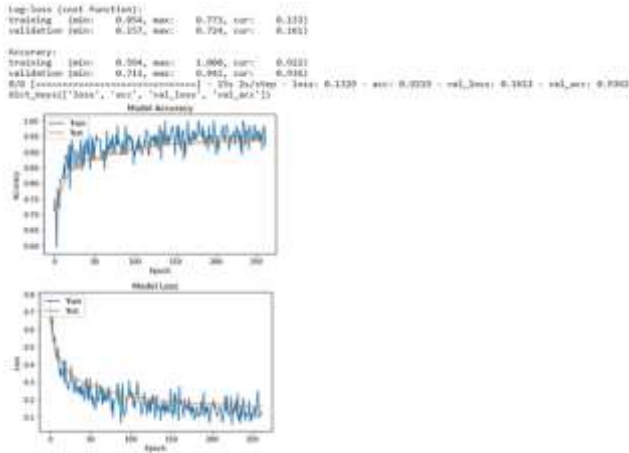
B. Results and Discussion

Fig.3. Image: VGG16 Training Results

```
RANK 1 Accuracy Against Test Data: 94.40 %

CONFUSION MATRIX:
[[ 340   56]
 [  26 1043]]
['NORMAL', 'PNEUMONIA']

CLASSIFICATION REPORT:
              precision    recall  f1-score   support

           0       0.93      0.86      0.89       396
           1       0.95      0.98      0.96      1069

    accuracy                           0.94      1465
   macro avg       0.94      0.92      0.93      1465
weighted avg       0.94      0.94      0.94      1465


OUTPUT DISTRIBUTION:
NORMAL: 24.98%
PNEUMONIA: 75.02%
```

Fig.4. VGG16 Confusion Matrix
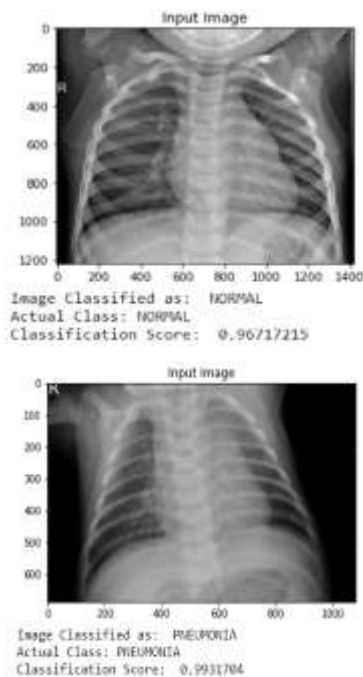
Fig.5. Classification on Different Classes using VGG16
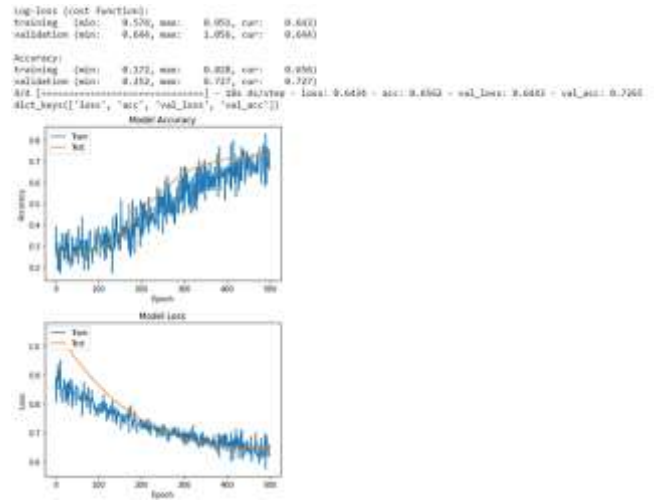
Fig.6. InceptionResnetV3 Training Results

```
RANK 1 Accuracy Against Test Data: 71.88 %

CONFUSION MATRIX:
[[   2  394]
 [  18 1051]]
['NORMAL', 'PNEUMONIA']

CLASSIFICATION REPORT:
              precision    recall  f1-score   support

           0       0.10      0.01      0.01       396
           1       0.73      0.98      0.84      1069

    accuracy                           0.72      1465
   macro avg       0.41      0.49      0.42      1465
weighted avg       0.56      0.72      0.61      1465


OUTPUT DISTRIBUTION:
NORMAL: 1.37%
PNEUMONIA: 98.63%
```

Fig.7. InceptionResnetV3 Confusion Matrix

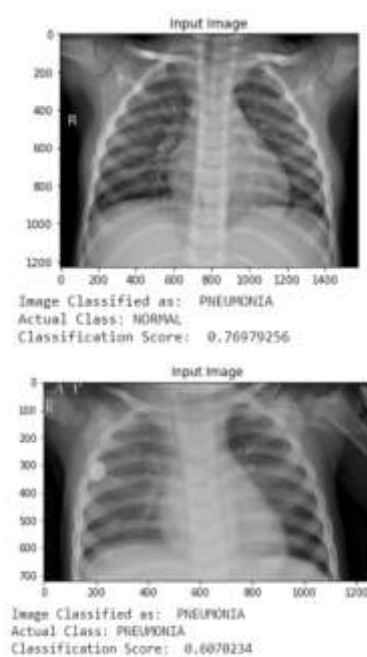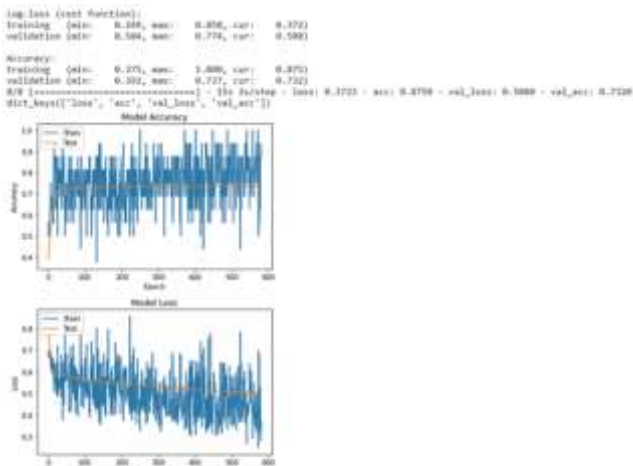**Fig.8. Evaluation on Different Classes InceptionResnetV3**

Fig.9. MobileNevV2 Training Results

```
RANK 1 Accuracy Against Test Data: 72.76 %

CONFUSION MATRIX:
[[   1  395]
 [   4 1065]]
['NORMAL', 'PNEUMONIA']

CLASSIFICATION REPORT:
              precision   recall  f1-score   support

           0       0.20     0.00      0.00       396
           1       0.73     1.00      0.84      1069

    accuracy                          0.73      1465
   macro avg       0.46     0.50      0.42      1465
weighted avg       0.59     0.73      0.62      1465


OUTPUT DISTRIBUTION:
NORMAL: 0.34%
PNEUMONIA: 99.66%
```

Fig.10. MobileNevV2 Confusion Matrix


```
Image Classified as:  PNEUMONIA
Actual Class: NORMAL
Classification Score:  0.7131231
```



```
Image Classified as:  PNEUMONIA
Actual Class: PNEUMONIA
Classification Score:  0.7607296
```
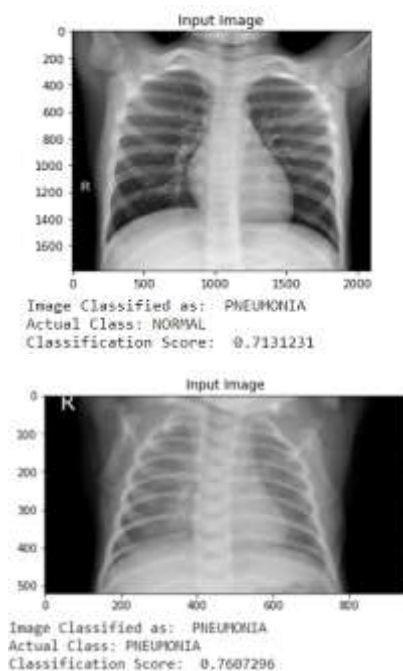
Fig.11. Evaluation on Different Classes using MobileNetV2

Usually normal x-rays have clear defined outlines throughout the lung cavity, and the cardiac boundary region is well defined. Another identifier for a normal chest x-ray is the lower left and right pointed extremities of the lungs can be clearly seen. Pneumonia presents different artifacts and features within the x-ray images. The most common feature is cloudiness in certain regions or within the overall lung cavities. The cardiac region's boundary is blurred, indicating that the cavity contains fluid.

It can be seen that the VGG16 model works well in finding these features to contrast the normal x-rays against those with pneumonia. Through visual inspection, these features are very subtle and are difficult to differentiate with an untrained eye. It is due to this fact that the other two models did not performed well. Both InceptionResnetV3 and MobileNetV2 were unable to find any correlation between the presence of pneumonia and the respective images.

TABLE 1: SUMMARY OF ACCURACY WITH THEIR CORRESPONDING MODELS

Deep Model	Macro Average Recall	Overall Accuracy
VGG16	92 %	94.4 %
InceptionResnetV3	49 %	71.88 %
MobileNetV2	50 %	72.76 %

III. CONCLUSION

It was found that the different Deep Classifier models do not produce the same performance when used in applications beyond classification with significant visual differences. With the classification of the presence of pneumonia, the x-rays show only subtle differences where only a trained professional can correctly differentiate and analyze. These subtle differences are generally not observed by majority of Deep Learning classifiers as they are optimized to look for visually significant difference.

The VGG16 model however were able to localize on the subtle features and the classifier layer were able to converge generally well at over 92% macro accuracy. Newer models seem to give more importance to generalization and perform better on visually different classes with wider variation (to best classify the ImageNet repository).

With this finding it is encouraged to find similar applications where the differences between classes are minimal. Transfer learning does not require the feature extraction layers to be retrained on the application dataset,only the classification layers, making training cost effective and fast.

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Agritourism Management Practices in Nueva Vizcaya, Philippines

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Abstract—This study intended to assess the agritourism management practices in selected municipalities of Nueva Vizcaya as basis for making a five-year development plan. The profile of agritourism industry, the extent to which agritourism management services and activities are being practiced, and analysis of difference among indicators of services and activities were considered. An adopted questionnaire was used to gather data which were analyzed using percentage and frequency distribution, weighted mean, Analysis of Variance (ANOVA), and T-test at 0.05 level of significance. Results showed that there is a scarce number of agritourism sites particularly farm resorts and day farms which provide health and wellness activities. Tourist arrivals started to increase in 2011 as reflected in the demand of food services, accommodation facilities, and tourist attractions. Agritourism management practices were generally met with some specific activities on agritourism products, visitors facilities and services, accessibility of the sites, community participation, human resource development, local benefits, safety/security, green practices, and cultural preservation. Analysis of the different components of agritourism yielded significant differences when classified according to location except for visitors' facilities and services while there are no significant differences in the components of agritourism along local benefits. A five-year development plan was developed to further enhance agritourism management in the province.

Index Terms— Agritourism, Agritourism Management Practices

I. INTRODUCTION

An increasing number of people are now looking for an escape from the humdrum of city life to be with nature, resulting to agri-destinations which are gaining popularity among tourists nowadays. However, most agricultural lands have been restructured into housing or manufacturing sites. Despite this, local farms are looking into development of agricultural attractions that would entice people to experience the peaceful but energized farm environment (http://pubs.ext.vt.edu). Entertainment on the farm is typically referred to as "agritainment" (agriculture plus entertainment) or agri-tourism. While the term "agritourism" appeared in global literature in the last twenty-five years and had been practiced in different countries, the term is not that popular in the Philippines, but the concept is being practiced in most parts of the country. This includes all activities related to providing services such as agri-accommodation-accommodation industry, agri-food and beverages- food and beverage industry, agri-recreation-recreation, agri-relaxation-relaxation, agri-sport-sport, and agri-therapy-health care and rehabilitation.

Agritourism farms in the Philippines allow visitors to view the growing, harvesting, and processing activities of locally grown foods, such as corn, coconuts, sugar cane, and pineapple. Often the farmers provide a home-stay opportunity and general education on the workings of the farm. Philippine tourism development today has taken a major leap forward by incorporating agricultural and environmental activities into its programs that would encourage active involvement and participation of people and their communities known as agritourism and eco-tourism. Of the two, agricultural tourism does not ring a bell to almost a majority of Filipinos and is almost unheard of among the people of Nueva Vizcaya, although they are practicing it in principle.

At present, agritourism is now seen as an opportunity that would contribute to the economic development of the Philippines in the long-term, would bring revenue and create a more ecologically sustainable environment. It would also generate employment in rural areas, where the employment is often most needed to avoid excessive migration and slum-formation in urban areas.

Thus, there is a need to look into the profile of agritourism industry in terms of location, category, farm-based activities, farm-based services, tourism arrival, accommodation facilities, food service facilities and attractions. In addition, to evaluate the extent and level to which the following components of agritourism are being practiced in terms of agritourism products, visitors' facilities and services, accessibility of the sites, community participation, human resource development, local benefits, safety/security services, green practices, and cultural preservation with the end in view of coming up with a development program to further enhance and strengthen what it has.

The result of this study would support the Strategic Plan of Nueva Vizcaya which focuses on agricultural development as one of the 13-point agenda for the development of Agritourism in the province.

II. STATEMENT OF THE PROBLEM:

This study was conducted to assess the management practices of agritourism services and activities in selected sites in the Province of Nueva Vizcaya.

Specifically, it sought to answer the following questions:

- What is the profile of agritourism industry in terms of location, category, farm-based activities, farm-based services, tourism arrival, accommodation facilities, food service facilities, and attractions?

- What is the extent and level to which the following components of agritourism are being practiced in terms of agritourism products, visitors facilities and services, accessibility of the sites, community participation, human resource development, local benefits, safety/security services, green practices, and cultural preservation?

- Is there a significant difference among the components of agritourism in terms of Location and category?

- What are activities to further enhance the development of agritourism management practices in the selected agritourism sites in particular and in the Province of Nueva Vizcaya in general?

III. METHODOLOGY

The descriptive-survey method was utilized to capture the extent to which the practices of managing agritourism industry were satisfactorily met. The Provincial, Municipal Tourism, and Agriculture Officers, the agritourism operators, and the travel and tour operators in the selected municipalities in Nueva Vizcaya served as respondents. A questionnaire based on a similar study was used to gather data and the Executive Order # 292 from Department of Tourism (DOT) . The study made use of the percentage and frequency distribution, weighted mean, the computer-aided Analysis of Variance (ANOVA), and the T-test in the analysis and interpretation of data.

IV. RESULTS AND DISCUSSION

In the data analysis, Bambang has the most number of Farm Resorts (52.38%) and Kasibu has the most number of Day Farms (38.46%). Most of the farm-based activities are Farm Tours/Educational Tours (43.4%). The most commonly provided agritourism services in the selected areas are restaurants (22.2%). However, Health and Wellness (15.6%) activities were scarce.

There was a decline in the tourist arrival in 2010 (36,225) due to turnover of responsibility from Local Government Unit to the Provincial Tourism Division wherein LGU was not able to maintain its records. In addition, the decline was not due to any untoward incident or negative event but rather a technical incapability or incapacity of LGU. However, it started to increase in 2011 until 2018.

When classified by domestic and foreign tourist arrivals, there was a consistent increase in tourist arrivals from 2011-2014 except for 2015 and 2017. In terms of demand, food services, accommodation facilities, and tourist attractions in the selected areas of study were in demand.

The following components of agritourism which include agritourism products, visitors facilities and services, accessibility of the sites, community participation, human resource development, local benefits, safety/security services, green practices and cultural preservation are being practiced. The presence of agritourism products (3.72), which is essential in promoting the industry was relatively high. In terms of agritourism facilities, there is a need for proper information and other mechanisms such as enough space for parking, available and accessible transportation, signages, information center, restrooms and others.

As to accessibility to sites and general upgrading of transport services, there is an indication for more improvement on road access, road map, tour guide orientation. Thus, a safe and accessible environment is identified to be one of the best management practices according to the Agricultural Marketing Resource Center of Iowa State University.

The community participation in agritourism activities was seen as significant in the development of agritourism. Good community relations with vital roles of the indigenous and academic communities may provide opportunities for business and employment to individuals in the community.

The extent to which human resource development in terms of staff and personnel display of courtesy and helpfulness, eagerness to undertake professional development and demonstration of sensitivity to indigenous cultures and heritage were highly practiced.

For local benefits, it has a great advantage and favor to the local residents especially on employment.

On safety and security services, the indicators were met considerably and were being observed. However, agritourism sites authorities or operators put security or safety of the clients or patrons at high level of concern but the necessary standard mechanisms were limited to some degree on programs pertaining to security, health/first aid/rescue services, waste management/ and disaster / emergency management and therefore needs to be strengthened. Green practices were satisfactorily met particularly on environmental issues.

Cultural awareness and sensitivity amidst progress were perceived to have satisfactorily met in terms of cultural preservation.

Generally, the respondents rated high in terms of agritouirism products(2.97), local benefits(2.78), cultural preservation (2.71), accessibility (2.70) and community participation (2.70) and the rest of the criteria also exceeded the required mininum mean to pass the criteria. It is an indication that there is great possibility for agritourism development in the areas under study and eventually to the whole province as well.

There was a significant difference in most of the components of agritourism when classified according to

location except Visitors' Facilities and Services ($F-value = 0.277, \ p-value = 0.842$). Meaning that the abundance of agritourism products and the extent of services as well as activities pertaining to accessibility of the sites, community participation, human resource development, local benefits, safety and security, green practices, and cultural preservation were assessed to be significantly not the same in terms of satisfying or meeting the indicators in the three identified agritourism sites or areas of study. It implies that the assessment of the respondents on the agritourism components may be too high or too low in terms of location. However, the assessment of respondents on visitors' facilities and services component was not significant. It means that the assessment of the respondents on said component is generally the same. Further statistical analysis reveals that the most abundant in agritourism products is Sta. Fe ($Mn = 3.30$) and the least abundant is Kasibu ($Mn = 2.58$). With regards to Accessibility of the agritourism sites, Community Participation, Human Resource Development, Local Benefits, Green Practices, and Cultural Preservation, Sta. Fe surpassed the other towns in terms of the extent to which the indicators were met. In contrast, Bambang is lagging behind the other towns in terms of the extent to which the indicators were met in the areas of Accessibility of the agritourism sites, Community Participation, Human Resource Development, Local Benefits, and Cultural Preservation. Moreover, Kasibu has the lowest in terms of the extent to which the indicators were met in the area of safety and security services ($Mn = 2.35$).

There was no significant difference between the categories of agritourism and the extent to which the indicators were met in the identified components of agritourism except for local benefits component. Thus, whether it is a day farm or farm resort, the extent to which the indicators were met are almost equally satisfied. Nonetheless, the difference between the two categories regarding the extent to which the indicators were met in terms of local benefits is significant. This denotes that the services or activities, which were provided in the agritourism sites which would have brought on economic advantage, were not of the same level.

V. CONCLUSIONS

Bambang has the greatest number of Agri-tourism sites and Farm Resorts while Kasibu has the greatest number of Day Farms. Most of the farm-based activities that take place in the Agro-tourism sites in selected areas are Farm Tours/Educational Tours. Restaurants are the most commonly provided tourism related service in the area while Health and Wellness activities are scarce. There is an increase of local and foreign tourist arrival. Food services, accommodation facilities, and tourist attractions are in demand. The management practices of agritourism industry are generally met with some specific activities/services that need improvement. The assessment of the different components of agritourism varies in the selected areas of study. However, there is consensus in the assessment with regards to category.

The study stresses the need for the Province of Nueva Vizcaya to come up with a development plan designed specifically to strengthen or enhance the present agritourism practices and address the identified weaknesses.

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Scrum Method Implementation for Project Management in a Construction and Installation for One of Automotive Factory Facility in Indonesia

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Abstract—In 2020, the development new automotive factory and facility in Indonesia is constrained by Covid-19 pandemic that disrupts the finishing schedule of development which is planned by using the waterfall method in project management. This research aims to reach the finishing schedule of development of the new factory and facility planned in 2019 and running production in earlier 2022. The methodology of this research is using the scrum method. Then, the result of this research could be recommendations for selecting the appropriate project management concept used in the construction of an automotive factory and can achieve predetermined targets for mass production after finish development.

Index Terms— Scrum method, Waterfall method, Product Backlog Complexity Level, Product Backlog Rating

I. INTRODUCTION

Lockdown policy was then modified in such a way by various countries. Some apply in full, partially, or locally and to a minimum. Indonesia itself modifies it under the name Large-Scale Social Restrictions (PSBB) which are enforced per region, either province or district/city based on the severity of the outbreak whose assessment is determined by the central government through the Ministry of Health. Next, this large-scale social restriction also affects various activities that have been planned by industry players throughout Indonesia, one of which is the automotive manufacturing industry located in Delta Mas, Bekasi Regency, which has plans to build new factory facilities. Using the classic project management approach (waterfall) method, the company has planned to build a new factory starting in 2020.

The classic project management approach can be characterized by standard, sequential, and division of labor approaches with detailed planning. By harmonizing existing standards. The project will likely be successful and a high level of efficiency will be achieved. In the special case, namely for the design of a factory, the project management activity can be carried out with several step-by-step approaches that have been proposed at the start of the project. As a result, project objectives must be defined in the planning phase, and changes (e.g. customer demand) are not expected during the project. take place because it will have the potential to change the plan that was agreed upon in advance and will lead to relatively large change efforts. (Julia-Anne Scholza, Felix Sieckmanna, Holger Kohl, 2020).

This will certainly be in contrast to the existence of regulations on limiting social activities that have been issued by the government through the Minister of Health Regulation (PMK) No.9 of 2020 concerning PSBB Guidelines, namely limiting human movement and limiting the movement of transportation so that the project management approach must keep up with the changes. existing facilities, so that they can achieve the set targets and do not make PSBB an obstacle to completing the construction of the new factory.

II. LITERATURE REVIEW

Project activity can be defined as a temporary activity that takes place in a limited period of time, with the allocation of certain resources, and is intended to produce products or deliverables whose quality criteria have been clearly defined. The scope of these tasks can be in the form of building factories, manufacturing new products, or conducting research and development. From the above definition, the main characteristics of the project are as follows (Iman Soeharto, 1999);

• Aims to produce a specific deliverable in the form of a final product or final work

• In the process of realizing the scope above, the total cost, schedule, and quality criteria are determined.

• Is temporary in the sense that his age is limited by the completion of his duties. The starting and ending points are clearly defined

Meanwhile, according to H. Kerzner, 1982, the definition of project management is planning, organizing, leading, and controlling company resources to achieve predetermined short-term goals. Furthermore, project management uses a vertical and horizontal hierarchical system approach. The project management concept is (H. Kerzner, 1982);

• Using the notion of management based on the function as a whole

• Activities that are managed in the short term, with goals that have been outlined specifically.

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• Using a systems approach (system approach to management)

• Has a horizontal hierarchy in addition to a vertical hierarchy

2.1 Classic Project Management

The classic project management approach can be characterized by standard, sequential, and division of labor approaches with detailed planning. By harmonizing existing standards. The project will likely be successful and a high level of efficiency will be achieved. In the special case, namely for the design of a factory, the project management activity can be carried out with several step-by-step approaches that have been proposed at the start of the project. As a result, project objectives must be defined in the planning phase, and changes (e.g. customer demand) are not expected during the project. take place because it will have the potential to change the plan that was agreed upon in advance and will lead to relatively large change efforts. (Julia-Anne Scholza, Felix Sieckmanna, Holger Kohl, 2020).

2.2 Scrum Project Management

For projects in dynamic environments - where changes are unavoidable during project implementation - and for projects whose objectives cannot be clearly defined at the start of the project, alternative project management approaches are available. Firm agility demonstrates the ability to proactively prepare for uncertainty, enabling the firm to respond quickly to changes throughout the value chain to realize business opportunities [9]. Agile project management is thus characterized by an iterative and adaptive approach, relying on short customer-oriented feedback loops, self-organizing in interdisciplinary teams, and formal and informal communication. The ability to deal with complexity, uncertainty, and change is one of the core strengths of an agile project management approach. Particularly for the Learning Factory design, the approach mentioned above by Tisch roughly proposes an iterative loop. However, this mainly overcomes deficits in the design of the learning infrastructure, modules or situations, but does not change requirements by the target group of learners. The "Agile learning framework" proposed by Longmu & Höhne uses methods from the SCRUM approach to address uncertain learning objectives, although this is only concerned with organizing the learning process by learners, not planning the learning environment itself.

III. METHODS

Scrum was first introduced in Takeuchi and Nonaka's article entitled "The New New Product Development Game and published by Harvard Business Review (HBR). In that article, Takeuchi and Nanaka surveyed several companies in Japan, among others; Fuji Xerox, Canon, 3M, and Honda. The survey was conducted to see how these companies can successfully produce new products with excellent product quality. (Ikujiro Nonaka, Hirotaka Takeuchi. 1986)

Takeuchi and Nanaka found that these companies used the same approach in developing their products. The Scrum method was first used in software development started by Jeff Sutherland, Easel Corporation. The Scrum method was first formulated and presented to the Object Management Group in with the paper title "Scrum Development Process".

• Product Backlog

The Project Owner collects and collects all system requests and requirements, such as features required and/or system non-functional requirements. After the goal has been determined, all these requests and needs are divided into small parts where each small part must have value and are worthy of being developed.

• Backlog Refinement

The backlog must be properly and properly maintained by the Scrum Team for planning so that the Sprint can run smoothly. The things that must be done in maintaining the backlog include carrying out the estimation process and need a breakdown. This is done so that the Sprint conditions (1-4 weeks) are met. Therefore, it is very helpful if the team allocates a special time each week to do Backlog Refinement, while also planning.

• Sprint

Sprint is a time-box that contains the work period during which the sprint focuses on product delivery based on items selected from the Product Backlog. In a Sprint, always set the time for work consistently and a new Sprint starts as soon as possible after the existing sprint has been completed.

• Daily Scrum

Every day, the Scrum Team must hold a meeting (meeting) for a maximum of 15 minutes. This is done with the aim of synchronizing progress, identifying problems and solving problems in doing the job.

• Sprint Review

Every Sprint always ends with demonstrating and presenting the features that have been worked on. This is done to ensure that these features can work properly. It is recommended that the Sprint review be carried out in small teams, before the product is demonstrated and presented to a large team (product owner, customer and company management).

• Sprint re perspective

In the Sprint re perspective, the Scrum Team reflects on how jobs went in the previous Sprint. The hope that you want to achieve in the Sprint re perspective is that there will be improved actions so that the next Sprint can be done

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even better. These improvements must be implemented in the next Sprint.

IV. RESULT

The activity plan of development new facility will shown by picture below,
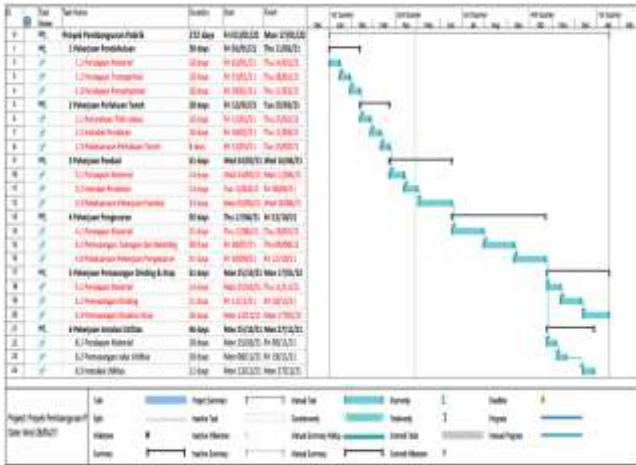
Figure 1.1 Activity Plan Development New Factory

Figure 1.1 describe about planning activity start from preparation until finishing. Almost all activity are critical shown by red color.

1. Product Backlog

Activity	Code	Duration (Day)	Weigth (W)
PBL1 Preliminary	A	30	0.1
PBL2 Soil Treatment	B	30	0.2
PBL3 Foundation	C	60	0.3
PBL4 Concrete Casting	D	90	0.2
PBL5 Wall and Roof	E	30	0.1
PBL6 Installation Utility	F	30	0.1
Total		240	1.00

Table 1.1 Product Backlog Activity

Table 1.1 show all of activity in product backlog, so that we can calculate product backlog rating by using equation below,

PBR $\quad = Product\ Backlog\ Rating$

$$PBR = \frac{\sum_{i=1}^{i \in N} PCL_i * TAR_i}{PCL_i}$$

where ;

$$PCL_i = \frac{\sum_{i=1}^{i \in P} FP_i * W_i}{\sum_{i=1}^{i \in P} W_i}$$

PCL $\quad = Product\ Backlog\ Complexity\ Level$

FP $\quad = $ PCL Factor

W $\quad = Weight\ of\ product\ Backlog, 0 < W \leq 1$

$$TAR_i = \sum_{i=1}^{i \in T} \frac{FT_i}{T}$$

TAR $\quad = Test\ Assessment\ Rating$

FT $\quad = $ TAR factor

T $\quad = $ Quantity of TAR factor

All PBL should calculate Product Backlog Rating, so that ;

- *Product Backlog Complexity* PBL1

$$PCL_1 = \frac{\sum_{i=1}^{i \in P} FP_1 * W_1}{\sum_{i=1}^{i \in P} W_1}$$

$$= \frac{0.05\ x\ 0.05}{0.05}$$

$$= 0.05$$

$$PCL_2 = \frac{\sum_{i=2}^{i \in P} FP_2 * W_1}{\sum_{i=2}^{i \in P} W_1}$$

$$= \frac{0.1\ x\ 0.05}{0.10}$$

$$= 0.05$$

$$PCL_3 = \frac{\sum_{i=3}^{i \in P} FP_3 * W_1}{\sum_{i=3}^{i \in P} W_1}$$

$$= \frac{0.8\ x\ 0.05}{0.15}$$

$$= 0.267$$

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$$PCL_4 = \frac{\sum_{i=4}^{i \in P} FP_4 * W_1}{\sum_{i=4}^{i \in P} W_1}$$

$$= \frac{0.9 \ x \ 0.05}{0.20}$$

$$= 0.225$$

$$PCL_5 = \frac{\sum_{i=5}^{i \in P} FP_5 * W_1}{\sum_{i=5}^{i \in P} W_1}$$

$$= \frac{1.0 \ x \ 0.05}{0.25}$$

$$= 0.2$$

Result of PCL for PBL 1

$$PCL_i = \frac{\sum_{i=1}^{i \in P} FP_i * W_i}{\sum_{i=1}^{i \in P} W_i}$$

$$= 0.158$$

Then, TAR for PBL 1 is ;

$$TAR_1 = \sum_{i=1}^{i \in T} \frac{FT_1}{T}$$

$$= \frac{0.5}{3}$$

$$= 0.167$$

$$TAR_2 = \sum_{i=2}^{i \in T} \frac{FT_2}{T}$$

$$= \frac{0.7}{3}$$

$$= 0.233$$

$$TAR_3 = \sum_{i=3}^{i \in T} \frac{FT_3}{T}$$

$$= \frac{1.0}{3}$$

$$= 0.33$$

TAR Result for PBL 1 is ;

$$TAR_i = \sum_{i=1}^{i \in T} \frac{FT_i}{T}$$

$$= 0.243$$

Product Backlog Rating

$$PBR = \frac{\sum_{i=1}^{i \in N} PCL_i * TAR_i}{PCL_i}$$

$$PBR = \frac{\sum_{i=1}^{i \in N} PCL_1 * TAR_1}{PCL_i}$$

$$= \frac{0.1584 \ x \ 0.243}{0.1584}$$

$$= 0.244$$

So that, by using PBR equation, we can calculate all product backlog rating for all activities product backlog.

PBL	PCL	TAR	PBR
PBL 1	0.58	0.24	0.24
PBL 2	0.59	0.18	0.76
PBL 3	0.74	0.18	0.82
PBL 4	0.92	0.17	0.75
PBL 5	0.43	0.20	0.95
PBL 6	0.18	0.20	0.88

Table 1.2 Calculation Result of Product Backlog Rating

Table 1.2 show calculation result of product backlog rating from list product backlog from all activities of project.

V. CONCLUSION

From Product Backlog Rating Equation, we can find which activities with higher result. That item higher give more impact for finishing project activities. From table 1.2 we can find that Product Backlog 5 (Wall and Roof Treatment) have high score because of this activity has more complicated and several task of finishing project. That project can continue for installation equipment while Product Backlog 5 is finished.

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Development of Arduino-based Physics Laboratory Experiments for Computing Programs

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Abstract—The developed Arduino-based laboratory experiments is an attempt to suggest a supplementary laboratory experiments for teaching and learning Physics. The laboratory experiments were designed to augment the deficiency or absence of Physics laboratories and/or tools and equipment. Using the computers, Arduino boards, and electronics components, students can perform at least twenty (20) physics experiments, specifically on circuit, electricity, sound, and light. Arduino microcontrollers can be converted as data acquisition devices, power supply, analyzer, measuring device and learning materials.
On the other hand, Physics laboratory manuals of the experiments developed were digitized and brought in internet space through the use of Google Sites. The name of the website is AB Physics RLab which stands for Arduino-Based Physics Remote Laboratory. Using this site, both teachers and students can view, access, and download the learning materials through the aid of embedding the Google Drive and Google Suite on the website.
The developed Physics laboratory experiment successfully passed the unit, integration, and system and acceptance testing. 207 evaluators from 5 tertiary institutions in the Province of Cavite, Philippines evaluated the project. The project got an overall mean of 4.63 for the quality of the hardware used in the project, 4.64 for the internet-based manual and 4.68 for the quality-in-use of the project. The result of the evaluation showed that in all criteria the project has a descriptive rating of excellent. Therefore, the project can be used as an alternative instructional material in teaching-learning Physics II for students under computing programs.

Index Terms— Scrum method, Waterfall method, Product Backlog Complexity Level, Product Backlog Rating

I. INTRODUCTION

Physics is the foundation of all-natural sciences. It is the science of matter, energy, space, and time. Physics is progressing constantly and covers topics from man-made to natural, from the very small to the very large, from designing and fabricating new instruments to observe and utilize properties of these objects to formulating theories to explain their properties [1].

In tertiary education in the Philippines, physics is a two-part science course composed of lecture and laboratory classes which enable student to learn both theory and practical application through experiments. L.M. Brown & R.T. Weidner [2] contrasted theory and experiment. Theory is the formulation of a unified conceptual framework that play essential and complementary roles in the advancement of physics while experiment is the observation of phenomena under conditions that are controlled as precisely as possible.

Ideally, "Teaching physics is doing physics" [3] and it is "best taught by experiential learning through the use of hands-on activities [4]. For it is believed that "Effective teaching and learning of science involves seeing, handling, and manipulating real objects and materials" [5].

However, it is reported that "facilities and equipment in the universities in the Philippines is generally old and many are malfunctioning" [6]. Additional challenges schools are facing are 1) lack of laboratory equipment/apparatus 2) insufficient laboratory conditions which limits the teacher to perform a simple laboratory facility and 3) short period of time for the use of students [7].

To address these problems, some teachers in physics instruction include demonstrations, simulations, or computer-aided instruction. Some use low technology and improvised devices to perform hands-on activities [8]. Others use toys and common things to perform experiments. However, the National Research Council [9] claimed that "students achieve a degree of scientific literacy but not functional literacy due to less conduct of scientific investigation and hands-on activities".

Modern technology, such as modern instrumentation can definitely improve learning through hands-on activities [10]. Recently, the use of microcontrollers has been much simplified by the development of the famous Arduino microcontroller. This open-source low-cost microcontroller is widely used by the maker community. These boards can be used as a low-cost data acquisition card. Many student labs have been rethought using this technology. Using Arduino boards allows students to build low-cost setups, such as a computerized mirror system for optical setups, or a giant stopwatch and data logger.

The low cost and flexibility of Arduino are not its only advantages. Arduino is available in the market, easy to purchase, compatible to most of operating systems and modular in nature. In terms of pedagogy, such an engaging environment is ideally suited to a project-based learning framework. Many problem-based learning examples were implemented in high-school. In comparison, fewer cases of project-based student labs have been reported at the university level. Some rare universities have fully integrated problem-based learning as the core of their pedagogy. Several parameters reduce the appeal of a

project-based approach in physics curricula at university level.

II. BACKGROUND OF THE STUDY

The developer is a graduate of electronics technology and currently teaching information technology, computer technology, computer science and other related science courses for around 5 years now in a state university and a local college. In the second semester of the academic year 2016-2017, he introduced the use of Arduino microcontroller as laboratory experiment materials in learning Computer Organization and Architecture subjects. On successive years, he also integrated Arduino Microcontroller in teaching Digital Design, Logic Circuits and Switches, Basic Electricity and Electronics and C# Programming. Currently, he is incorporating Arduino in teaching Artificial Intelligence and General Physics II.

In both schools where the developer is teaching, there are no Physics laboratory facilities available. The setup in conducting physics laboratories is that lecture rooms are utilized as the laboratory rooms and the students are the one who bring materials for the particular experiments. Since there is no available Physics laboratory tools and equipment for executing laboratory experiments, common things and toys were used for laboratories to have simulation of experiments. For example, in learning the sound, cups and strings experiment is being utilized and for learning electricity, batteries and bulb wired on illustration boards.

Although the experiments are hands-on, the learning is still in the concept - physics. Students learn the behavior of certain quantities only but not able to measure, correlate actual readings and explore those physics quantities.

Due to these reasons, the developer integrated the Arduino microcontroller in teaching physics and used the computer laboratory as a physics laboratory. However, the conduct of the physics laboratory using microcontroller still need enhancement since it is in its initial stage. The enhancement would bring the learning materials online such as laboratory sheets, supplementary activities, basic configuration, e-books, source codes, and step by step procedures which will be available anywhere and anytime to the students and teachers.

Objective of the Study

The general objective of this study was to develop an Arduino-based laboratory experiments for computing programs.

Specifically, this aimed to:

1. Design laboratory experiments on General Physics II with the following features:
   a. Arduino-based Physics laboratory exercises on circuit, electricity, sound and light;
   b. Program-based Physics laboratory experiments; and

   c. Internet-based laboratory manuals;
2. Develop the Arduino-based physics laboratory experiments for computing programs as designed;
3. Test the Arduino-based Physics experiments and internet-based manual through:
   a. Unit testing;
   b. Integration testing;
   c. System and acceptance testing; and
4. Evaluate the hardware and software of the project using ISO 9126 and quality-in-use of the design project using ISO 25010.

III. MATERIALS AND METHOD

This section discusses the research design, theoretical framework, instructional design model and conceptual model of the study utilized in the development of Arduino-based physics and internet-based manual. Include also are testing and evaluation procedures conducted in the study.

Research Design

The study utilized developmental research with descriptive-evaluative analysis. Developmental research is described as the studies that involves the production of knowledge with the ultimate aim of improving the processes of instructional design, development, and evaluation [11]. Such research is based on either situation-specific problem solving or generalized inquiry procedure. While descriptive-evaluative is explained as the process and impact of the development and implementation of a system. The findings are often contextualized within the implementation environment [12].

Theoretical Framework
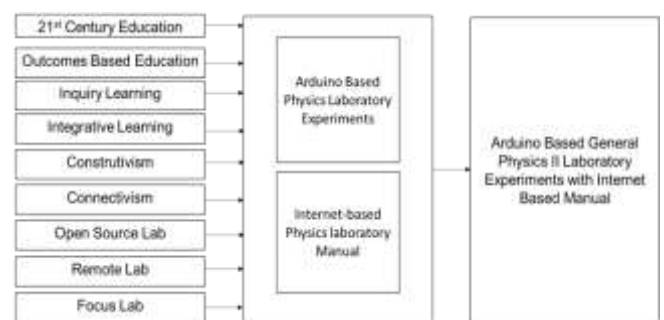
Fig.1 Theoretical Framework of the Study

As shown in fig. 1 is the theoretical model which is the basis on developing the study. In this study various educational frameworks on how to conduct different teaching strategies and learning facilities, including education theories and different types of 21st century laboratory rooms are considered. In order to apply this learning/teaching strategies together these education strategies.

Instructional Design Model

Fig. 2. Modified Successive Approximation Model II

The modified successive approximation II (SAM II) is the developmental model used by the research. Following the iterative design phase does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software and hardware, which can then be reviewed in order to identify further requirements. This process is then repeated, producing a new version of the output for each cycle of the model [13].

The developer started designing the physics experiments through making one component at the time working. Right pin configuration, codes and program syntax are considered first.

The second and third subphases are the prototyping and analysis and unit testing. The basic idea in the prototype and unit testing model is that instead of freezing the requirements before a design or coding can proceed, a throwaway prototype is built to understand the requirements. This prototype is developed based on the currently known requirements. Quick designing an experiment is based on the questions, "What are the available components?", "Is components are properly working?" and if the answer is positive the developer proceeds on to next step. Building experiments, testing the experiment, refining the experiments, quick design again and cycling this process until one experiment meet most of the requirements. By using this prototype, the developer gets an "actual feel" of the system, since the interactions with the prototype can enable the developer to better understand the requirements of the desired system. Prototyping is an attractive idea for complicated and large systems for which there is no manual process or existing system to help determine the requirements.

On the iterative development phase of modified SAM II, the develop, integration/acceptance testing and integration are included. In this stage each experiment is being developed aligned with the requirements to show, simulate, and visualize physics phenomenon, theory, or theorems. On this stage also where the drafting of laboratory experiment guides is to be made and digitizing a web-based platform version of manual. At the moment when the development of the experiment does not comply with integration testing, the process could be back to the iterative design phase in order to fix errors.

Within the iterative design phase and iterative development phase are the four testing procedures were administered such as unit testing, integration testing, and system and acceptance testing.

Evaluation is the final stage that is being conducted to ensure the system's software quality characteristics in terms of functionality, reliability, compatibility, usability, efficiency, sustainability and portability and hardware quality characteristics in terms of functionality, aesthetics workability, durability, economy, and safety. Lastly, evaluate and validate the whole instructional material developed in terms of functionality suitability, performance efficiency, compatibility, usability, reliability, maintainability and portability.

Conceptual Model of the Study

Figure 3 shows the paradigm of the study wherein the figure presents the different inputs needed for the system to function with all the processes involved in the "Development of Arduino Based Physics Laboratory Experiment with Internet-based Manual for Computing Programs" which is the output.

Fig. 3. Development of Arduino Based Physics Laboratory Experiment with Internet-based Manual for Computing Programs Conceptual Model

Knowledge Requirement

This includes the knowledge of the developer to develop this project. In order for a developer to complete this project he should be familiarized with Physics, different education pedagogies and facilities, Arduino programming,

application and prototyping and software and hardware evaluation instruments. For the physics knowledge requirement, the developer sought after different syllabi, workbooks, articles, journals and videos in order to understand the various physics laws, theorems and principles to be applied on the development of this project. And to integrate microcontroller to learning and teaching physics laboratory, proficiency in Arduino programming should be possessed by the developer.

Software Requirement

Arduino is a multiplatform microcontroller that can launch on Linux, Mac and Windows operating systems. Also, it can program with various programming languages such as machine, assembly, C and other high level languages. For this project, modified C language will be using an Arduino Sketch, the official integrated development environment of Arduino. On Arduino Sketch, where coding will be implemented and the display of data presentation will be also presented on the same software. While the 2-D graphical representation of data will be displayed on Processing Software.

For the development of internet-based manuals or websites where the teachers and students may access, the Google services will be used such as Google Sites, Google Suite and Google Drive. The Google Sites will be the web developing tool to utilize, Google Suite for forms, instructions, presentations and other reading materials, and google drive for the storage and databank of files, source code, videos, sample projects and schematic diagrams. Table 1 shows the software to be used in the developing the laboratory experiments and internet-based manual.

Table 1. Software used in Developing Arduino-based Physics Laboratory Experiments

Description/Specification	Version
Sketch IDE	1.8.5
Processing IDE	3.3.6.
Google Chrome	64.0.3282.186
Fritzing	0.9.3.
Google Drive	-
Google Sites	New
Aduinodroid	V2.0

Hardware Requirement

The main microcontroller to be used in this project will be Arduino UNO Atmel 328. This microcontroller will serve as the brain of every physics laboratory experiment output to be made. Along with Arduino UNO, the input devices to be utilized will be tactile switch, 50K Ohms potentiometer, tactile push button, and ultrasonic sensor. For output devices 16x 2 LCD, RGB LED, active buzzer, speaker, and computer monitor. The table 2 shown below are the materials to be utilized in the development of the project. And the table 3 are the miscellaneous materials to be in the development of the project.

Table 2. Materials used in Arduino based Physics Laboratory Experiments.

Qty	Unit	Description/Specification	Item
25	pieces	Arduino UNO	Microcontroller
3	packs	Male to male	Jumper Wires
40	pieces	Female to Male	Dupont wires
40	pieces	Assorted Color	LED
12	pieces	400 points	Breadboard
12	pieces	USB	Cables
20	Pieces	Tactile Momentary	Button
1	piece	180 Degrees	Servo
3	pieces	Ultrasonic	Sensor
1	Set	Assorted	Resistor
1	piece	RGB	LED
1	piece	8 ohms	Speaker
2	pieces	Piezo	Buzzer
1	piece	Sound	Sensor
12	pieces	Acrylic	Platform
8	pieces	16 x 2	LCD

Table 3. Tools and Equipment Used in Developing Arduino-based Physics Laboratory Experiments

Qty	Unit	Description/Specification	Item
1	pc	Core i3	Laptop
1	pc	5 Volts	Powerbank
2	pcs	9 Volt	Power Supply
4	pcs	AA 1.5 Volts	Batteries
1	set	Hand Drill	Drill
1	set	Convertible	Saw
3	pcs	VOM	Multitester
1	pc	Pocket	Wifi
1	pc	Mobile with internet connection	Phone

System Architecture of the Arduino-based Physics Laboratory

As shown in figure 10 the input devices to be utilized are keyboard, tactile switch, potentiometer, wire, and ultrasonics sensors. While monitor LCD, LED buzzer and speaker will be output devices. Most components are connected with Arduino UNO and some data will be presented on screen through the aid of Arduino Sketch, Processing and liquid crystal display. Arduino Sketch and Processing applications are open source programs which have multiple installers available online that are compatible with Windows OS, Linux OS, and Mac OS.
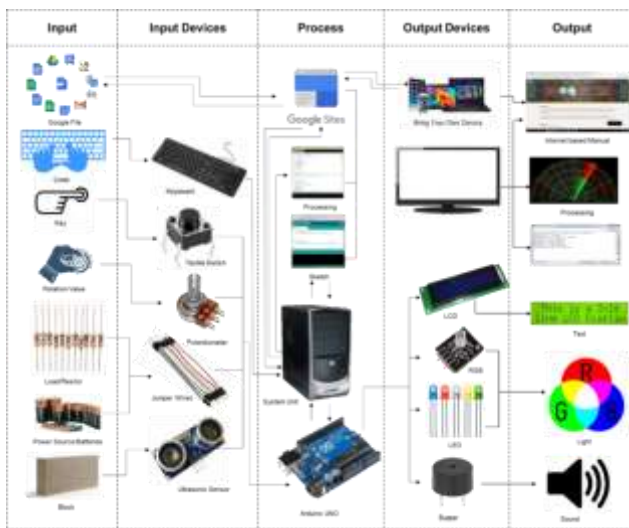
Figure 10. System Architecture of the Arduino-based Physics Laboratory

Arduino microcontrollers can be powered by 5v to 12v power supply. Usually power from the USB port supplies the Arduino. However, in times that computers are limited, students can upload the program to Arduino and once uploaded they can power the devices using power bank, 9v battery, 4-packed 1.5 AA or AAA battery set, mobile phones power supply via on-the-go cable, mobile phone charger or generic multiple output DC power supply.

The Arduino boards are placed inside acrylic glass enclosures in order to protect the students in possible electrical ground. Protocols on safe circuitry construction and warning notes are included in the internet-based manual. And last, the Arduino board has the automatic cut-off mechanism when the circuit connected to it is shorted.

Testing Procedures

To determine whether the laboratory experiments function as designed, 4 testing main stages were done. These are unit, integration, system and acceptance testing. In unit testing, the developer tested 13 components /modules with default codes and modified codes uploaded. The developer had checked the appropriateness of pin configuration and correctness of responses of each device/module to every set of code uploaded to them. Integration testing conducted by the developer in every prototyped experiment. This testing procedure is conducted to check if each feature in every experiment is conforming as programmed/expected. For system and acceptance testing procedures, the researcher's test cases. Black-box testing was performed by the proponent in system testing while ad hoc testing was conducted in acceptance testing. The developer sought the help of a physics teacher, an information technology teacher and a software engineer to perform acceptance testing.

Evaluation Procedures

ISO 9126 and ISO 25010 standards were adopted to evaluate the hardware used, internet-based manual and quality-in-use of the project. Physical appearance and content validation of three evaluation instruments were validated by a registered psychometrician.

The evaluation of the project was conducted at Cavite State University Trece Martires City Campus, Tanza Campus, General Trias City Campus and Indang Campus and at City College of Tagaytay. Letter for the conduct of the study was sent and approved by the deans and chairpersons of the campuses and departments. The target respondents were the computing students, Physics professional and experts, and information technology professional and experts.

IV. RESULTS AND DISCUSSION

This section includes the project description, structure, capabilities and limitations, and results of the conducted evaluations.

Project Description

The developed Arduino-based general physics II laboratory experiments cover the areas of circuits, electricity, sound, and light. There are at least 20 laboratory activities that the students may construct in order for them to learn and observe physics laws/theories on hand-on activities. This instructional material is designed for computing students under the programs of computer science, computer engineer, computer technology and information science and information technology. It is intended to be used by the schools which have limited laboratory tools and equipment and yet there is computer laboratory that can be utilized.

This research project is created as a supplementary laboratory course in teaching and learning Physics using an Arduino microcontroller. With the use of this low-cost microcontroller coupled with a computer system, students will be able construct circuitries that will serve as data acquisition devices, measuring devices, power supply devices, simulators, visualizers and events as real-life gadgets.

Project Description

This project was developed as designed to have two main components such as the Physics laboratory experiments with Arduino-based devices and the AB Physics RLab website for internet-based manuals. This laboratory experiment is planned to be held in a computer laboratory room. Computers in computer laboratory rooms and personal devices of students such as laptop, Macbook, iPad, tablet and mobile phone are to be used in doing experiments. Arduino upgrade kit is what the developer recommends for the future users of this laboratory course. Arduino Microcontroller will serve as data acquisition device, measuring device, power supply devices, simulator, visualizer and even as real life gadgets. All actuators,

sensor, input/output devices and miscellaneous materials needed for this course are already included in the said kit.

This laboratory experiments as shown in table 4 is a four-unit laboratory class in teaching and learning electrical circuits, electricity, sounds and light. It has 5 activities and 1 unit project in every unit which are a total of 20 activities and 4 unit projects. There are a total of 24 devices can teachers/students construct and integrate Arduino in conducting laboratory experiments.

Table 4. Arduino-based General Physics II Laboratory Course Outline and Devices

Unit	Topics	Arduino-based Devices
I. Circuits	1. Electrical Conductivity	-Conductor Detector -Electrical Conductivity Meter
	2. Electromagnetic Field Force	-Electromagnetic Field Force Detector
	3. Circuits	-Direct Current Electrical Circuits
	4. Boolean Logic	-Logic Gate Simulator
	5. Electromagnetic Control System	-Boolean Algebra Control System
	Unit Project Number 1	-Game Buzzer
II.Electricity	6. Resistance and Resistance Color Coding	-Ohmmeter
	7. Voltage and Kircchoff Voltage Law	-Voltmeter
	8. Electrical Current and Kircchoff Current Law	-Ammeter
	9. Ohm's Law, Power Law, and Mesh Law	-Ammeter -Voltmeter -Ohmmeter
	10. Capacitance	-Capacitance Meter
	Unit Project Number 2	-LED Flasher
III. Sound	11. Sound and Vibration	-Sound Activated Light System
	12. Sound Waves	-Computer-based Oscilloscope
	13. Frequency, Hertz, and Notes	-Minipiano
	14. Speed of Sound	-Sound Navigation and Ranging System
	15. Ultrasonic Sound	-Radio Detection and Ranging System
	Unit Project Number 3	-Sound-based Alarm System
IV. Light	16. Light Energy	-Automatic Light-Activated Electrical System
	17. Lumens and Lux	-Luxmeter
	18. Additive Color	-Color Mixer
	19. Active Infrared Light	-Infrared Light Transceiver System
	20. Passive Infrared Light	-Passive Infrared-based Motion Detector
	Unit Project Number 4	-Hybrid Light System

Fig. 4. Conductor Detector

Figures 4 shows the conductor detector. It is a device with LED light and buzzer. It is used to detect conductor materials by touching its two probes to solid or liquid materials. It will light and buzz if probes are touching conductors such as metals and water and remain idle if touching insulator materials. In this activity, students will be able to understand the conductivity of solids and solutions, distinguish whether a material is insulator or conductor and identify the electrical conductivity of certain solutions.

Fig 5. Conductor Meter

Figure 5 shows the conductivity meter is a device that measures of conductivity of solutions. It is made up of an electrical plug with built-in wire and an improvised water proof thermometer. Using this device electrical conductivity, ppm and temperature of solution can be measured. Solution to be tested in this activity are tap water, distilled, sugar solution, and salt solution. Students will learn the various conductivity levels of solutions, distinguish the good and bad conductor solutions and

associate the relationship of temperature and electrical conductivity.

Fig. 6. Electromagnetic Field Force Detector

Figure 6 shows an Arduino microcontroller as an electromagnetic field force detector. This is a device that has five pairs of different colors LEDs and an antenna. The LEDs will light up according to the intensity of the magnetic field detected. Colors white, blue, green, yellow, and red are the colors of the LEDs. When the electromagnetic field is detected as weak, cold colors will light up and if the electromagnetic field is stronger, warm color LEDs will also light up. In this set of experiments, learners will be able to identify the nature of electromagnetic force, discover the electromagnetic force phenomenon in electrified materials/bodies, and associate the relationship of electricity and magnetism.

Fig. 7. Series and Parallel Circuits

Figure 7 shows two types of circuits such as series and parallel circuits. In this activity students will learn the components and nature of electrical systems. They will be oriented with simple, series, parallel, and complex circuits. They will be able to construct open, closed and shorted circuits. Furthermore, they can also attach different loads such as LED, buzzer and dynamo in the circuits.

Figure 8. Boolean Logic Simulator

Figure 8 is 4-input, 1-ouput Boolean Logic Simulator. In this activity, students will be able to understand the different logic gates such OR, AND, NOR, NAND, XOR, and XNOR gates. This Boolean logic simulator can display 2-input, 3-input, and 4-input Boolean equations with single output. The attached LCD display will show the Boolean

equation and truth table of the present state of the system. Students are expected to record the data from each logic gate combination and write the relationship of each gate in statement form.

Figure 9. Electromagnetic Field Control System

Figure 9 shows the sample of electromagnetic field control systems. In this experiment, students will learn the practical application of Boolean logic, implement Boolean algebra, construct circuits with relay and button switches and control digitally two electrical circuits. Learners will be asked again to write the truth table of every circuit and associate the responses load, relay and button switches. Learners may control two or more separate direct current-direct current circuit and direct current-alternating current.
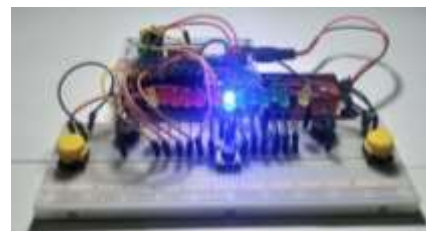
Figure 10. Game Buzzer

Figure 10 is the first unit project in this course, a 2-player game buzzer with reset. Students will be asked to apply the learning they garnered in this unit. The conditions of the 2-button game buzzer should be when one button is pressed the other button will be disabled. The buzzer will sound and the five LED lights on the corresponding side of the buzzer will light up and off for one second one by one. At the time that the last red LED lit up, the yellow LED and buzzer will turn on and off every half second for 3 seconds, and the device will go back to its default setting.

The teachers and students will be guided in constructing Arduino-based physics laboratory experiments through the utilization of internet-based manuals. In the AB Physics RLab website both teachers and students can access the materials of course such as syllabus, laboratory manual, software application installer, libraries, and basic Arduino programming and application. In it also teachers and students can interact from each other, post/submit course requirements, and publish online their works which their parents/guardian and other stakeholders might see.

As shown in fig, 11, AB Physics RLab has seven main pages such as Home, About, Program, Register, Experiments, Project Hub, and Contacts pages. Four of these seven pages aside from Program, Experiments and

Project Hub pages are single page sites. While the four not mentioned pages are multi-pages sites which serve as redirection pages to link to different subpages of the website. Program page contains the Course Syllabus, Mechanics and Frequently Asked questions subpages.

Fig. 11. AB Physics Remote Laboratory Website Hierarchical Input Process Output Diagram

Under Experiment Page, the 20 physics experiments and 4 unit projects all have their own respective intended learning objective, Overview, Procedure, Materials, Worksheet, and Discussion pages. Though the website is static in nature and not a learning management system, through the use of Google products such Google Forms, Google Sites, Google Classroom, Google Groups and Google Drive, users of the website can view, edit, add, delete, change and publish some pages of the websites. Under the Worksheet Pages Google Classroom and Google Sites are linked systems in order to view, edit, and submit necessary output in this internet-based manual.

On Project Hub pages the module is sectioned into six such as Gallery, Projects, Hardware, Software, Resources, Depository, and Credits. Portion of these sections teachers and students can view, edit, add, delete and publish some pages which they are authorized. General viewers or visitors of the website cannot view portions of the websites and cannot edit, add, and publish pages in websites.

Project Capabilities and Limitations

The capabilities of the Arduino-based General Physics II Laboratory Experiments are as follows:

1. It covers the laboratory experiments on circuits, electricity, sounds, and lights;
2. It is a microcontroller-based which the Arduino UNO can be converted to 20 physics data acquisition, visualizer, measuring, and simulator devices:

3. It is programming-based physics laboratory course which computing students can perform and develop more their core skills in programming, prototyping, and innovation;
4. Activities can be performed inside the computer laboratory room or online through the use AB Physics RLab website;
5. Activities are can be performed with the aid of personal computer, Mac computer, tablet, iPad, and mobile phones;
6. Experiments are all hands-on where students can get the first hand data, observe physically the physics laws/theorems and apply learnings in creating project;
7. Data can be displayed and streamed at serial monitor of Arduino Sketch, Processing application, liquid crystal display, third party visualizer and Microsoft Excel;
8. This course promotes creativity, collaboration, critical thinking and communication;
9. Its internet-based manual can be launched on most web browser such as Google Chrome, Mozilla Firefox, Internet Edge, Safari, and mobile phone and tablet internet browsers;
10. Experiment's devices are modular and programmable which users can use the materials in all topics;
11. Devices can be powered by USB ports of computer/laptop, mobile phone power port via on-the-go cable, cellphone charger, power banks, 9v battery, 4-packed AA or AAA batteries and generic multi volts DC power supply;
12. Teachers and students can interact from each other, post/submit course requirements, and publish online their works; and
13. Most learning materials downloadable.

However, the following are the limitations of the project:

1. This laboratory course covers only the general physics II. It did not includes the general physics I: mechanics and heat and other physics subfields;
2. The website is static websites and not a learning management system;
3. The AB Physics Remote Laboratory has no and not connected with database;
4. There are some devices not calibrated as commercially available devices; and
5. The abpphysicsrlab.com can run only online;

Evaluation Results

Faculty members of Department of Physical Science of Cavite State University- main campus, Department of Information Technology of Cavite State University Trece Martires City Campus and Tanza Campus, School of Computer Studies of City College of the Tagaytay are the Physics and IT professionals/experts who evaluated the quality of hardware used in the research projects, quality of internet-based manual, and quality in use of Arduino-based Physics laboratory experiments. Selected Computer Science, Computer Technology and Information

Technology students from schools stated beforehand are also the evaluators.

The developer conducted 13 demonstrations on how the Arduino based physics experiments are working. During demonstration evaluators are free to ask questions, navigate the devices, and use the websites. There are a total of 207 respondents as shown on table 5 that were clustered in three groups, Physics professionals/experts, IT professionals/experts and Computing Students.

Table 5. Frequency and Percentage Distribution of the Evaluators

Evaluators	f	%
Physics Professionals/Experts	9	4
IT Professionals/Experts	20	11
CS Professionals/Experts	3	1
Information Technology Students	71	34
Computer Science Students	82	40
Computer Technology Students	22	11
Total	**207**	**100**

The legend used for giving a numerical rating was presented in Table 6. While the legend used for giving a descriptive rating equivalent of every numerical average mean score is presented in Table 7.

Table 6. Grading System and Its Equivalent

Numerical Rating	Equivalent
5	Excellent
4	Very good
3	Good
2	Fair
1	Needs Improvement

Table 7. Descriptive Rating Equivalents

Numerical Rating	Equivalent
4.20-5.00	Excellent
3.40-4.19	Very good
2.60-3.39	Good
1.80-2.59	Fair
1.00-1.79	Needs Improvement

Based on table 8, the hardware used in the Arduino-based general physics II laboratory experiments was rated in all criteria "Excellent" with overall mean of 4.63. It suggests that Arduino microcontroller and all the electronics components used in the development of Arduino-based physics devices are suitable, functional and in high quality.

Table 8. Summary of Evaluation of Hardware Used in the Arduino-based General Physics II Laboratory Experiment

Criteria	Mean	SD	Descriptive Interpretation
Functionality	4.74	0.46	Excellent
Aesthetic	4.62	0.53	Excellent
Workability	4.61	0.55	Excellent
Durability	4.66	0.50	Excellent
Economy	4.57	0.54	Excellent
Safety	4.55	0.54	Excellent
OVERALL	**4.63**	**0.52**	**Excellent**

Based on table 9, the internet-based manual of Arduino-based general physics II laboratory experiments was rated in all criteria "Excellent" with overall mean of 4.64. the evaluators found that the website is well crafted, functional and usable for the conduct of the teaching and learning physics.

Table 9. Summary of Evaluation of Internet-based Manual of Arduino-based General Physics II Laboratory Experiment

Criteria	Mean	SD	Descriptive Interpretation
Functionality	4.67	0.51	Excellent
Reliability	4.56	0.56	Excellent
Compatibility	4.71	0.51	Excellent
Usability	4.70	0.5	Excellent
Efficiency	4.61	0.55	Excellent
Sustainability	4.61	0.55	Excellent
OVERALL	**4.64**	**.51**	**Excellent**

Based on table 10, the quality in use of Arduino-based general physics II laboratory experiments was rated in all criteria "Excellent" with overall mean of 4.68. This can be concluded that the developed Arduino-based general Physics II Laboratory Experiments can be used as alternative instructional material in teaching-learning Physics II for students under computing programs.

Table 10. Summary of Evaluation of Quality in Use of Arduino-based General Physics II Laboratory Experiments

Criteria	Mean	SD	Descriptive Interpretation
Functional Suitability	4.66	0.53	Excellent
Performance Efficiency	4.67	0.48	Excellent
Compatibility	4.68	0.49	Excellent
Usability	4.63	0.51	Excellent
Reliability	4.67	0.47	Excellent
Maintainability	4.70	0.46	Excellent
Portability	4.77	0.45	Excellent
OVERALL	**4.68**	**0.48**	**Excellent**

Among the ISO 9126 and ISO 25010 standards of evaluation, the Arduino-based General Physics II Laboratory Experiments had its greatest positive impact on functionality and durability for hardware used in the project, compatibility and usability for internet-based manual and portability and maintainability for quality-in-use of the project. This means that the Arduino technology can be used as materials in constructing physics devices for laboratory experiments and Arduino components used in

the project are highly durable and with excellent workmanship. While in internet-based manual, the evaluators are delighted that the users of the laboratory experiments can access the website and can program the devices by the use of most kind of devices and operating systems. In quality-in-use, aside from portability of software, the portability of hardware to be powered by various electrical source made the portability impactful for evaluators. Users can share computer for programming the devices and after the program is successfully uploaded to the device, users can use cellphone charger, cellphone power supply via on-the-go cable, 9v battery, 4-packed batteries, power bank, 12v power supply and multivolt power supply.

For comments, suggestions and remarks, according to the evaluators of the project will be more efficient and effective, if the following recommendations are be taken to consideration: Improve more user's experience of the Arduino-based Physics Remote Lab; Add step-by-step video tutorials of every experiments; Add more details of the concept of topics theoretically in order for the students gain more in depth knowledge of what they are doing in laboratory experiments; And implement the Arduino-based physics laboratory experiments in actual laboratory classes.

V. CONCLUSION

The developed physics laboratory experiments are suitable to be used as supplementary laboratory experiments for the schools that has limited science laboratory tools, equipment and room by converting computer laboratory room as science room and utilizing computers and Arduino microcontroller as physics devices. Laboratory experiments are modular and programmable which users can use the hardware materials in all Arduino-based physics devices construction. Also, in building the devices, users can use computer, tablet or mobile phone in programming the microntroller provided that the right software per operating system is installed. Data from Arduino-based physics devices can be displayed and streamed at serial monitor and serial plotter of the Arduino Sketch, Processing application, liquid crystal display and other data visualizer. Teachers and students can teach and learn physics in one full laboratory semester class with unit topics on circuits, electricity, sound and light. In each topic there are five hands-on laboratory experiments and one unit task project. Teacher can use Arduino-based Physics RLab for teaching physics laboratory class online. Students can perform the task anytime and anywhere as long as they have internet connection. Based on evaluations conducted which were participated by 207 evaluators in 5 tertiary institutions in Province of Cavite, the Arduino-based General Physics II for Computing programs is ISO9126 and ISO25010 standard compliant and can be used as supplement for teaching-learning general physics II.

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Two Stages Anomaly Detection with Convolution Neural Network and Artificial Immune System

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Abstract— A report on the transport accident concerns that it is one of Malaysia's five leading causes of death. It can be evidently due to a speeding car does not follow road lines and drive recklessly. Many solutions attempt to detect car accidents or calculate car speed ranging from image processing, machine learning, and deep learning. One of the solution's abilities to recognize and classify road behavioral occurrences is an anomaly detection aspect. This paper addresses an integral version of the Convolution Neural Network and Artificial Immune System to detect and classify anomalies on the road. We utilize simulation data from a video game that imitates real-life CCTV cameras on the highway. The model of Convolution Neural Network performs object detection and negative selection method for anomaly classification. The findings demonstrate that the road line with anomalies can be detected and classified from most videos. The outcome is a baseline of more research in road anomaly detection to control accidents and support innovative city development and Industry Revolution 4.0.

Index Terms— Anomaly Detection, Artificial Immune System, Classification, Convolution Neural Network, Negative Selection

I. INTRODUCTION

A road accident is when one or more vehicles collide with each other or into another object that will or does not have casualties [1]. It does not know the victim's age. It can be from a young age until an older age. Usually, young people drive carelessly and exceeding the speed limit [2] or under the influence of drugs and alcohol [3]. While the older people often involve in reacting and acting speed on the road, for example, when making a turn [4], failed to obey to sign, failed to see improper object turn and changing lane [5]. In addition, the occurrence of road accidents every year was reported relatively high. For instance, the Road Transport Department of Malaysia stated that 548,598 of total road accidents occurred in 2018 for the whole country. In total, 15,341 accidents were recorded, and 261,790 fines were issued. 63.1% of delicate issues involved six major mistakes: using a mobile phone during driving, not obeying the traffic lights, driving past speed limits, using emergency lanes, cutting lines, and cutting on twin lines [6]. The statistic shows that in 2019, Malaysia had 567,516 recorded accidents, which increased by 18,918 from 2018 [7]. The accident divides into four types, accidents with death, accidents with severe injuries, accidents with minor injuries, and accidents without casualties. Five thousand seven hundred sixty-four cases of the accident had claimed 6,167 lives.

Many video footages on the internet show how the car behaves on the road; for example, some car drive faster than others, drive recklessly, and others. The car's anomaly on the road can be seen easily with the human eye since their behavior differs from anyone else's. For example, a speeding car does not follow road lines and drives recklessly. However, the computer does not see it the same as us. There are many attempts by researchers that try to detect car accidents or calculate car speed using various methods ranging from image processing to a recent method of deep learning. One of the findings stated a need to classify what type of anomaly happened [8]. Even though the anomaly detection method's performance seems improved, there is a need to improve its accuracy and test various data types. The most recent Bayesian formulation to minimize the accident detection time demonstrates an improvement in average detection delay and false alarm rate up to 65.2% and 87.2%, respectively [9]. Another one employed a deep convolutional neural network (CNN) for vehicle tracking using multiple-object tracking, demonstrates 92% precision, 94% recall, and 93% F1-score [10]. In addition, a lack of benchmark datasets established focusing on classifying the type of anomaly related to road accidents [11]. Hence, this paper focuses on using CNN and AIS to detect car anomaly detection, mainly on the road line using an imitation of actual data.

The remainder of the paper discusses in several sections. Section 2 highlights some related work. Section 3 explains the data preparation meanwhile Section 4 on CNN-AIS employment. Section 5 discusses the findings and finally a conclusion.

II. RELATED WORK

The car's movement on the road would include factors such as road condition, traffic condition, and driver condition. This paper most highlights road conditions in which specifically focus on road width. Road width could reflect the car speeding of a car driver. The experiment conducted on a simulated platform with four different types of roads has reported that the driver will speed up when the road is more expansive, and the car is close to the road edge but slow down when the road becomes narrow and the car away from the road edge [12]. The most important is how

the driver can detect the road lines and receive an alert in real-time or near real-time [13].

The image processing method used in vehicle speed detection considers a bounding box to detect car movement in a video platform [14],[15]. Gaussian Mixture Model subtracts the background to identify the object by creating a box in the video [14]. Fuzzy Logic is used to do anomaly road traffic. It offered excellent accuracy in detecting traffic anomalies in a less complex traffic environment. However, the accuracy gradually lowered when there are many vehicles and traffic is congested [15]. In another alternative, YOLOv3 and Faster R-CNN to detect vehicles from a birds-eye view using an Unmanned Air Vehicle (UAV) is reported good performance [16]. The dataset contains 270 images and 4,107 instances of cars, 218 images, and 3,365 instances allocated for training, and the rest 52 images of 737 instances of cars, are used for the test set. It was reported that YOLOv3 outperforms Faster R-CNN since Yolov3 can detect more instances than Faster R-CNN. Hence, this paper highlights the use of YOLO to assist the detection process.

III. DATA PREPARATION

This section explains the data acquisition data extraction and cleaning and data transformation steps. All steps are crucial to support the detection of line on the road.

Data Acquisition

This paper addresses the evaluation of CNN and AIS using the data of an imitation from a video game called *Grand Theft Auto V* (GTA *V*). It is in the form of video format. The video is recorded from the one-way highway with similar camera placement to real-life CCTV. The car movement behavior inside the simulated video game depends on the car's driver that typically called Non-Player Character (NPC). Usually, NPC drives inside the road line, under the road speed limit, and consistently in the right direction. However, if there is an obstacle in front of the NPC road line, they will stop for 1-2 minutes. If the obstacle still blocks the NPC after 1-2 minutes, NPC would attempt to use another road line. If a threat is targeted to the NPC, such as violence or gunshot, NPC will start panicking by avoiding or crashing obstacles in front and speeding up the car.

We focus on two types of car movement anomaly detection: cars outside or on the road line and cars moving in the wrong direction. The data is about 1,000 instances of typical car movement using a standard car behavior through video. Furthermore, GTA V can simulate road traffic similar to real-life road traffic. Most of it taken from a high place and angled to capture most of the road, as shown in Fig. 1. [17].

Fig.1 Example of CCTV view

The activity starts with the placement of CCTV. The next step is to search the proper place in the game to record the traffic that fulfills this requirement, such as a highway, one-way traffic, a good view, and vehicle using the road. The place chosen is a highway before entering Paleto Bay, as displayed in Fig. 2.

Fig. 2 Paleto Bay Highway CCTV view

The next step after identified the placement of CCTV in the game is to record the road traffic. The software used to record the traffic is Open Broadcaster Software (OBS). The output setting sets to produce video in MP4 format, 30 framerates, and resolutions of 816x460 pixel.

Data Extraction and Cleaning

The typical car behaviour data are collected from the video game are in video format with a duration of 8 hours and 2 minutes, MP4 format, 30 framerates, and resolutions of 816x460 pixel. When the data is collected, data extraction is initialized to collect meaningful data. YOLO is used to detect vehicles in the recorded video. Using the pre-trained YOLO model named YOLOv3-320 based on the COCO dataset and confidence level of 60%, an instance of 10,885 normal car movement behaviour was extracted. The data attribute extracted is the centre car position in pixels for every frame. Since the extracted data are raw, data cleaning must ensure the compiler can read the data. Car position data had its recorded location into one column and noise symbol like brackets ([]) and comma (,) as seen in Fig. 3. Using removes features included in Microsoft Excel, the car position data is separated by columns shown in Fig 4.

Fig. 3 Dataset before cleaning

Fig. 4 Dataset after cleaning

Data Transformation and Matching Process

After the data had been cleaned, it was time to read the csv file and process it into secondary data. For this prototype, the position and direction of the car are needed to classify it into normal and abnormal. For out of line detection, centre car position will be matched with generated stock detectors. There are 36,829 positions that the car moves inside the road line. The generated detectors generate with the total width x height of video resolution used during data extraction. In our case, the video resolution is 816 x 460 pixels which will create 375,360 stock detectors. After the matching process is done, the model now contains 338,531 numbers of abnormal position detectors. For direction, the centre car position will firstly need to be converted into a direction format. There are 6,133 directions that the car moves in the correct direction. The generated detectors generate 1,503,072 detectors from the first pixel position until the last pixel position using the mentioned formula. After the matching process, the model now contains 1,496,939 detectors of abnormal direction.

IV. PROPOSED HYBRID CNN-AIs

This section discusses the You Only Look Once (YOLO) as approach for object detection and the Artificial Immune System (AIS) for anomaly detection. YOLO is a real-time object detection algorithm [18]. It uses a different approach for detection task. They combined the separated component of object detection into one neural network. It predicts the bounding box of the entire picture feature. First, YOLO creates grids in the picture. Then each grid had five predictions on the bounding box and a confidence score of objects contained in the box. Thus, it will produce a bounding box that predicts if there are objects inside.

The bounding box will be thicker if the confidence score is high. At the same time, each grid will do a class probability map to predict what class of object inside the grid. After that, the confidence score of bounding boxes and the class prediction combines into a final score where it shows the probability of the object class. From there, we can set the threshold for object probability to detect the object we wanted. For the network design, they use CNN to pre-trained their model. The CNN will first extract the picture's feature, and then when passing into fully connected layers, it will predict the probability and coordinates. The network contains 24 convolution networks with two fully connected layers.

The AIS is a self-learning algorithm that aspired from the biological immune system. It was able to detect bacteria and viruses, thus improving the host immunity to avoid sickness. Researchers have proposed a negative selection of AIS with two stages, as shown in Fig. 5. It was adapted from [19]. The first stage is the training stage, where the algorithm will create an N detector with the standard and abnormal detector. After creating the detector, the standard detector is being labeled and then removed from the N detector. The detector of negative selection of AIS will be matured when all the standard detectors had been removed. The second stage, the detection stage. The earlier matured detector is being used to detect the abnormality on the sample data. If the data are inside in the abnormal data radius, the data will be abnormal. Otherwise, if the data outside the radius, the data is standard. Euclidean distance is used to calculate the radius distance. In summary, at stage 1, few steps were established in modeling the AIS are as follows:

i. Read and transform all vehicles' normal location and direction.

ii. Initialize the N detectors

For video with out of line detection, the width of height detectors is used for the video pixel; meanwhile, for the video with 20x20 pixels, it was initialized from (-20, -20) to (20, 20) coordinates.

iii. Once the immune system model is matured, remove

N detectors with the same vehicle location and direction.

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iv. Gain matured immune system model that detects abnormal vehicle location and direction.

At stage 2, few steps were established in detection the AIS are as follows:

i. Read the AIS immune system model

ii. Use YOLO to gain the center location and direction of the detected vehicle bounding box.

iii. Initialize radius around the location and direction value before comparing with the immune system model.

iv. If there are more than 50% detectors within the value radius, it will be declared as abnormal. Otherwise, it is normal.

The proposed detection solution is the hybrid of a model YOLO from the CNN and negative selection from the AIS. YOLO is chosen because it does better in detecting objects better and more accurately than Faster R-CNN [20]. For AIS, the reason is to experiment if AIS manages to detect anomalies of car movement.

Fig. 5 Process flow of the CNN and AIS

The overall structure of the system starting with choosing the video. After the video is selected, it will enter the YOLO module to detect cars. When the car in the video had been detected, it will take the detected car center position and join the anomaly detection module where the center position matches anomaly model detectors. A box around the center position will be drawn within a distance from the center position during anomaly detection using Euclidean distance. If the prototype detects more than 50% of detectors around the center position, it will be flag as abnormal. The result after the matching process will be shown in the video during execution and saved into .avi format. The standard car behavior data collected from the video game are in video format with 8 hours and 2 minutes, MP4 format, 30 framerates, and resolutions of 816x460 pixel. Data extraction to collect meaningful data. YOLO is used to detect vehicles in the recorded video. Using a pre-trained model of YOLO, named YOLOv3-320, based on the COCO dataset and confidence level of 60%, 10,885 normal car movement behaviour is extracted. The data attribute extracted is the center car position in pixels for every frame. Since the extracted data are raw, data cleaning must ensure the compiler can read the data.

V. COMPUTATIONAL RESULTS AND DISCUSSION

A total of seven videos were tested consist of three out of road line, one in the wrong direction, and three of them contain both out of line and wrong of line. We used a computer with CPU Ryzen 5 3600, RAM 16GB 3200MHz, GPU RTX 3080 for the evaluation performance. The parameter of a draw box size in several distances from the center position is considered. It was tested with values of 1, 2, and 3 pixels of the Euclidean. The acceptance criteria are based on the detection ability of the method to detect abnormal car movement as abnormal or normal. All results of the video detection and an average confidence score for YOLO detection are demonstrated in Table 1.

Table 1. Computational result for CNN-AIS

Video	Euclidean with 1 pixel		Euclidean with 2 pixels		Euclidean with 3 pixels		Average confidence score (%) for YOLO detection
	Out of Line	Wrong Direction	Out of Line	Wrong Direction	Out of Line	Wrong Direction	
Video 1 (Out of line)	✓		✓		✓		81.23
Video 2 (Out of Line, Wrong Direction)	✓	✗	✓	✗	✓	✗	77.61
Video 3 (Out of line)	✗		✗		✗		77.85
Video 4 (Wrong Direction)		✗		✗		✗	77.49
Video 5 (Out of Line, Wrong Direction)	✓		✓		✓		74.22
Video 6 (Out of line)	✓		✓		✓		68.83
Video 7 (Out of Line, Wrong Direction)	✓	✗	✓	✗	✓	✗	71.43

AIS has shown good performance in the detection. It was interesting to highlight that the out of road line detection, five out of six videos, can detect as an anomaly when using all the three values of the Euclidean pixels. Anomaly detections occur when the car drives at the edge of the left road and car's size and CCTV angle. Most of the confidence

scores of YOLO are more than 70%. Video 1 that has out of line demonstrated 100% of anomaly detection at the highest confidence score, 81.23%. The use of different Euclidean distance value does not much affect the result obtained.

In addition, a computational time for each video execution video is recorded. As seen in Table 2, the average time taken for the prototype finish execution is for Euclidean distances 1, 2, and 3 are 91 seconds, 152.7 seconds, and 247.7 seconds, respectively. The duration of the duration to finish execution is affected by the number of cars detected in a frame. If there are more cars in one frame, a longer time is required to finish the execution as the detection involves performing all detected cars in one frame. For this case, video 2 had a situation where three cars are detected in one frame than video seven, where it only had one car detected in one frame despite having the same video duration. None of the four videos that contain the wrong direction anomaly is detected by CNN-AIS. It might be affected by the data cleaning process where the data are not intensively cleaned or transformed. It would also depend on the exact position of trained video and sample video used in the same frame, and the Euclidian's distance value from each detector increases. Some problem was figured out from the findings. However, the use of AIS brings an advantage in the overall performance of the implementation of the CNN-AIS. The results could be improved by using more video datasets and different distance measurements.

Table II. Computational time

Video	Video duration (seconds)	Computational time (seconds)		
		Euclidean with 1 pixel	Euclidean with 2 pixel	Euclidean with 3 pixel
1	8	94	131	211
2	10	126	238	408
3	4	46	72	109
4	11	121	218	359
5	11	121	227	383
6	6	42	50	61
7	10	87	133	203

VI. CONCLUSION

The paper presents anomaly detection for car movement behaviors using a hybrid CNN-AIS. It is focused on anomaly detection on the road using a car movement video dataset. The performance of the method attempts to produce a good solution for the detection. Distance measure in a Negative Selection of the AIS can assist in anomaly detection. The memory pattern in AIS allows its pattern recognition capability using the video datasets. Concerning the CNN-AIS, it is found workable for outline and wrong line detection on the road. In future work, evaluation on the CNN-AIS to detect a real-time anomaly on the road would be possible to address a real environment. More research in pre-processing, parameter estimation, variances of AIS, and a different simulation of road behavior.

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Determining Aspects on Hotel Reviews based on Two Topic Modeling Techniques and Performing Weighted Average Sentiment Analysis on the Aspects

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Abstract— Finding the best hotel that suits one's expectations without looking at all the reviews one by one gives a fast and easy idea on whether to stay in the hotel or not. Most of the time, star ratings will hasten the process. However, knowing the specific topics that people like and dislike about the hotel is a tedious process. Topics such as, but not limited to, food, staff, service, comfort, and location are vital information to know deeper what people are talking about in the reviews. Mining the aspects equivalent to topics that people are citing on the hotel reviews and the sentiment on every topic will be presented in this study. This study will use two unsupervised modeling techniques to determine the aspects of reviews using Gensim's Latent Dirichlet Allocation (LDA) and MALLET (Machine Learning for LanguageE Toolkit). This study evaluates the results of these techniques and uses the optimal result to determine the sentiment of each aspect. Each review may belong to one or more aspects and will have different probabilistic values. This study uses the weighted average of the probabilistic values of the reviews to summarize the overall sentiment score of each aspect.

Index Terms— aspect-based sentiment analysis, Latent Dirichlet Allocation (LDA), MALLET (Machine Learning for LanguageE Toolkit), topic modeling, fine-grained sentiment analysis

I. INTRODUCTION

Topic modeling has sparked the interest of those who want to do exploratory search on the identity and similarities of the datasets that are yet to be discovered. This unsupervised method can be done using latent semantic analysis (LSA) [1], probabilistic latent semantic analysis (pLSA), and latent Dirichlet allocation (LDA). However, LDA surpasses among other topic modeling techniques [2]. LDA was introduced by Blei, Ng, and Jordan which uses Bayesian model selection to determine the number of topics and the words that contain the topics [3] [4]. The output of LDA is the words that represent a topic and probability of a sentence observed in the topic. Over the time, LDA's different implementation using Gensim's LDA, MALLET, and GuidedLDA or SeededLDA were introduced to the research community. Among these three, Gensim's LDA and MALLET are more advanced and efficient modeling techniques to use. In this study, determining on which model yields better result on the selected dataset will be conducted.

The dataset used in this study came from Kaggle datasets which was crawled by [5] from Tripadvisor. The researchers choose hotel reviews to help the global tourism industry specifically the hotel industry to improve the different aspects they offer to their customers, such as, but not limited to, service, facility, food quality, and price. This study is much more important during this challenging and trying times because of the economic impact brought by COVID-19 pandemic. This study aims to help the hotel owners to attract back their customers by offering what is best and improve the aspect that were unsatisfactory. This

study will uncover the hidden granulized aspects mentioned by the customers in their reviews and combines the result of the topic model and the sentiment analysis to give the overall sentiment of the aspects. In this study, the term "aspect" and "topic" mean the same.

Sentiment analysis is the process of extracting subjective information, opinion or view of a user toward a topic [6]. In this study, fine-grained sentiment analysis will be used. Fine-grained sentiment analysis mines more detailed emotions of users since they will be represented by discrete classes such as strongly negative, weakly negative, neutral, weakly positive, and strongly positive [7] [8]. This classes are represented by 1, 2, 3, 4, and 5 respectively. This method is better than the old way of doing sentiment analysis, which uses the polarity score to identify whether positive, negative, or neutral sentiment. This study will still use polarity score and transform it to fine-grained discrete classes.

Gap of the Related Studies

Opinion mining on a specific hotel using LDA was conducted by [2]. Another study was conducted by [9] which also uses LDA to infer the topics from online accommodation reviews. However, these studies only infer the topics out from the reviews without going farther on performing sentiment analysis on the result. Aside from that, MALLET was not considered in their studies. Similar to our study is conducted by [6]. They created a framework that combines the result of the topic modeling and sentiment analysis. However, they only use one model which is LDA and identify the topic sentiment as positive, negative, and neutral. In this study, fine-grained sentiment

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analysis was conducted to generate the sentiments scores ranging from 1-5 to represent a star like rating in the reviews.

To address these gaps, this study uses two topic models using the Gensim's LDA and MALLET to discover which model generates a more human interpretable aspect. The probabilistic scores of the chosen model will be mapped to the sentiment generated by the fine-grained sent mentioned in the text reviews. Figure 1 is the conceptual framework of this study. The text reviews will undergo lemmatization, removal of stop words, bigram, converting the corpus to dictionary, and transform it to term frequency format. These are the necessary data preparation before building the two models. The two models will be evaluated using their topic coherence and perplexity scores. The probabilistic scores of the chosen model will be mapped to the fine-grained sentiment scores of each aspect. Weighted average formula will be used to get the final fine-grained sentiment score of each aspect.
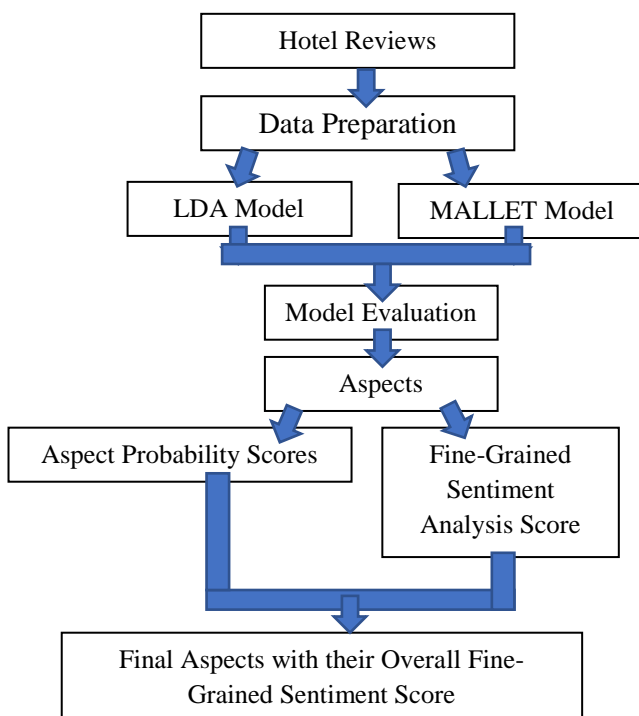

Figure 1: Conceptual Framework

II. METHODOLOGY

In this study, python was used to build LDA and MALLET models that will generate aspects out from the dataset. There were 20,491 text reviews on the hotels which are posted in the Tripadvisor hotels. This dataset is feed to the two models which contains two columns, the text reviews and their corresponding numeric star ratings. Only the text reviews will be utilized to build the two models and the numeric star ratings will be used to cross-match the result of the sentiment analysis.

Data Preparation

The dataset is in csv format and was converted into DataFrame by the python script for efficient data manipulation. The dataset undergoes tokenization to split the text into words using Gensim's simple_preprocess(). The stop words are also removed before creating a bigram model. This study utilizes bigram model to regard the context of the two frequently occurring words from the reviews. This will help later in building a good model to determine not just one word but two words associated to the aspects. Before building the two topic models, we transformed the clean data into dictionary to form a term frequency corpus, which will be needed by both topic models.

Building the Two Topic Models

The Gensim's LDA uses Bayesian technique to determine the probability of each review to the aspect. MALLET is a Java topic modeling toolkit which uses the optimized Gibbs sampling algorithm. MALLET is known to be more efficient than Gensim's LDA [10]. In this study, we want to compare these two models given our dataset. Both of the models are programmed using python. Although MALLET is a Java toolkit, Gensim has a wrapper for this which is gensim.models.wrappers.LdaMallet. MALLET was set up outside anaconda's environment and once it is done, MALLET will just run in the background.

The two topic models were run multiple times to find the best 'k' for the model. Choosing the right 'k' or the number of aspects to build the models is very crucial. This will ascertain that the latent space discovered by these models is generally meaningful and useful. Figure 2 shows the python code that generates the list of models for both LDA and MALLET and their equivalent coherence values. The coherence values will be used later to determine the best 'k' and the right model to use.

Figure 1: Code for Building the Topic Models

Fine-Grained Sentiment Analysis

This study will use the TextBlob library in python to process the clean dataset. TextBlob uses sentiment lexicon to assign scores for each word in the corpus. There are three scores generated by TextBlob, such as, polarity,

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subjectivity, and intensity. In this study, polarity will be used to find the negativity or positivity of the aspect's sentiment. The polarity score obtained by each cleaned review will be transformed into fine-grained sentiment (FGS) score. Since polarity will only yield values ranging from -1 to + 1, to transform this into FGS score, the score is added by 1 and divide it by 2. This will convert the range into 0 – 1. The next step is to convert the result to values ranging from 1 – 5. The study uses np library to digitize the result by to obtain 1-5 range of values. Figure 3 displays the code that transforms the polarity score into fine-grained sentiment score.

```
for score in polarity:
    offset = (score + 1) / 2.
    fgs = np.digitize(5 * offset, np.array([1, 2, 3, 4, 5])) + 1
```

Figure 2: Transforming Polarity Score to Fine-Grained Sentiment Score

The results generated in Figure 3 are mapped to the aspects generated by the MALLET model. Equation (1) is used to compute the weighted average of the sentiment per aspect where *wa* denotes the weighted average score of the aspect, *w* is the probabilistic score of review in every aspect and *x* is the FGS score of the review. *n* represents the 20491 probabilistic scores of reviews in every aspect and FGS scores of reviews. The result of this summarizes the overall sentiment score of the aspects.

$$wa = \frac{\sum_{i=1}^{n} w_i X_i}{\sum_{i=1}^{n} w_i} \tag{1}$$

Figure 4 is a snapshot of the probabilistic values of every aspect obtained from the MALLET model. The snapshot of the FGS score of every review is also shown, as well as the weighted average FGS scores.

| Review Index | Probabilistic Score Per Aspect | | | | | Fine-Grained Sentiment Score on every Review |
	Aspect 1	Aspect 2	Aspect 3	...	Aspect 32 Review	
0	0.1392	0.0822	0.0766	...	0.0131 nice hotel exper	4
1	0.2012	0.0659	0.0551	...	0.0084 ok nothing speci	4
2	0.121	0.1111	0.0817	...	0.0104 nice rooms not 4	4
3	0.1112	0.0573	0.0573	...	0.0131 unique, great sta	4
4	0.1117	0.1026	0.0711	...	0.0092 great stay great s	4
5	0.0869	0.0782	0.0707	...	0.0101 love monaco sta	4
6	0.0943	0.0765	0.0548	...	0.0121 cozy stay rainy ci	4
7	0.1139	0.0619	0.0574	...	0.0135 excellent staff, h	4
8	0.1123	0.0939	0.0723	...	0.0152 hotel stayed hot	4
...	...	...	...	...	...	...
20490	0.0911	0.0656	0.0556	...	0.0128 people talking, c	3
Weighted Average FGS	3.69091	3.694506	3.699528	...	3.75727	

Figure 3: Snapshot of the Computed FGS Weighted Average

III. RESULTS AND DISCUSSION

Generated Topic Models

This study uses perplexity and coherence score to determine the right 'k' for the models. Perplexity is widely used for language model evaluation to capture how surprised or how well the model represents the statistics of the new data [11]. Perplexity is measured as the normalized log-likelihood of a held-out test set. However, perplexity and human judgment don't coincide with each other [12]. This study uses a quantitative method which is topic coherence to represent the human judgment. Topic coherence measures the topic based on the degree of semantic similarity of its high scoring words [11]. In this study, we determine first the topic coherence of both models in choosing the right 'k' and compare which model has better topic coherence given the 'k'. Alongside with it, perplexity is also used to support the result.
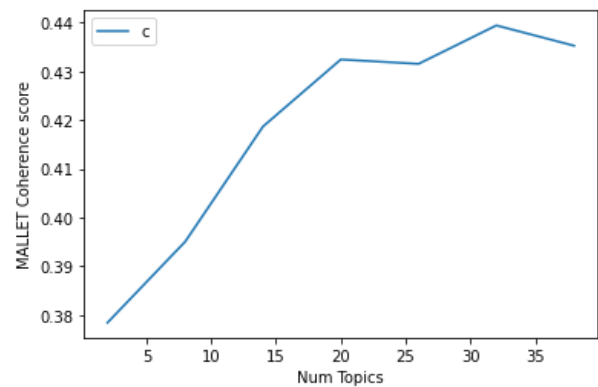
(a)
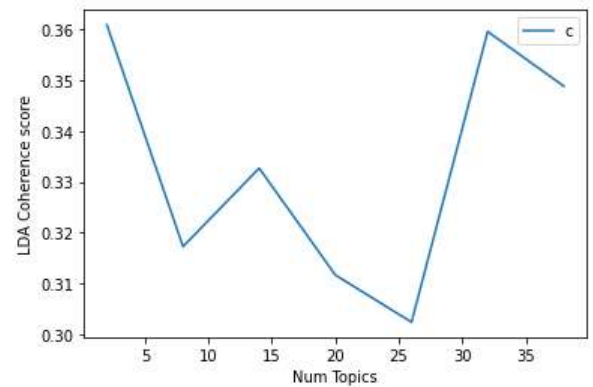
(b)

Figure 5: Graph of the Models' Topic Coherence

Figure 5 shows that the optimal number of aspects in both models is 32. This number gives the highest coherence score before flattening out or a major drop in both graphs. Examining on which model gives a better coherence score, given k=32 is the MALLET model. However, getting the perplexity through the different functions in Gensim's LDA and MALLET libraries, this doesn't give the expected output. The perplexity score of MALLET is -8.26792 while in Gensim's LDA, it's -15.3988. It is supposed to be, the lower the perplexity, the better the model [13]. However, the result is showing that the model generated in Gensim's LDA is better than MALLET. This result supports [12] statement that perplexity and human judgment with the use of topic coherence don't necessary coincide.

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Figure 6 shows the sample visualization of the aspect and its associated keywords of the MALLET model using pyLDAvis library. However, the result displayed in pyLDAvis is not the same with the expected keywords from the model. This incorrect result of pyLDAvis is also counter checked with LDA model. So, both models if we visualize the aspects and the associated keywords, they will not coincide with the projected result of pyLDAvis. This study informs the research community who are using the pyLDAvis to counter check the result generated by their model and the projected result of pyLDAvis. As of now, pyLDAvis is producing an incorrect result and hopefully corrected.
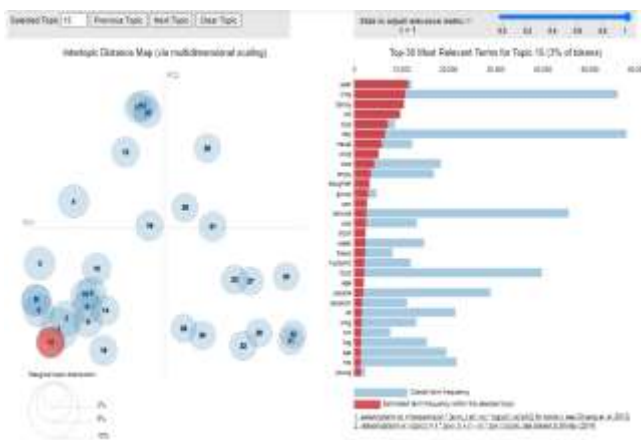

Figure 4: Generated Aspects and Associated Keywords of the MALLET Model

Fine-Grained Sentiment Result

Table 1 displays the summary of the inferred aspects from the reviews and their corresponding top keywords and overall sentiment score. Labeling the aspects based on the keywords entail knowledge expertise on terms related to the hotel. The labels may vary from one expert to another and so, these labels can still be modified depending on the agreed labels. The raw weighted average of FGS are also shown which can be used to represent fractional star rating, in which a star can be partially colored. These raw scores will also specify the detailed sentiment of the customers. This study also discovers that the aspect generated by the model are sorted based on its latent semantic of the reviews. As shown in Table 1, the weighted average of FGS are also sorted. The bath experience of the customers yields the lowest score, while giving a tip is recommendable or customers are giving tips because they are satisfied with the workers of the hotel. Rounding up the weighted average FGS yields the score of 4, for all aspects. This means that the hotels in Tripadvisor can be categorized as weakly positive, based on the discrete classes of fine-grained sentiment analysis. With this result, the hotel management can look into which aspects they want to improve to attract back their customers, especially during the economic crisis that is experienced worldwide.

Table 1: MALLET Aspects and Fine-Grained Sentiment Result

Aspect No.	Aspect Label	Associated Keywords	Weighted Average FGS	Rounded off Weighted Average FGS
1	Bath Experience	day, water, towel, leave, hot, open, time, bring, work	3.69091	4
2	Staff's Attitude	excellent, staff, good, helpful, friendly, location, hotel, breakfast, stay, clean	3.694506	4
3	Overall Experience	love, time, wonderful, beautiful, husband, amazing, trip, place, perfect, absolutely	3.699528	4
4	People in the Hotel	guest, staff, experience, wife, fact, issue, point, management, make, offer	3.703722	4
5	Staff	great, staff, stay, friendly, place, clean, location, helpful, recommend, fantastic	3.708466	4
6	Child Friendly	family, kid, pool, day, time, club, child, year, area, restaurant	3.712767	4
7	Services	service, room, property, quality, good, concierge, time, expect, experience, high	3.715736	4
8	Room Amenities	room, bathroom, shower, wall, light, door, floor, tv, bath, small	3.719459	4
9	Hotel Location	hotel, walk, location, minute, stay, central, room, amsterdam, min, breakfast	3.722833	4
10	Outside the Hotel	street, location, block, walk, great, comfortable, quiet, restaurant, square, corner	3.725262	4
11	Parking Lot	hotel, free, business, car, parking, stay, park, nice, lobby, internet	3.727635	4

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12	City Location	hotel, city, modern, barcelona, area, location, euro, metro, bar, reception	3.7296	4
13	Departure	staff, return, experience, visit, feel, wonderful, stay, make, trip, home	3.731343	4
14	Reservation	room, desk, call, reservation, check, charge, book, day, manager, give	3.732971	4
15	Hotel's Bar	day, good, time, fantastic, bar, lovely, holiday, great, bit, week	3.734316	4
16	Hotel's View	stay, room, night, hotel, view, clean, staff, friendly, extremely, balcony	3.73571	4
17	Beach Resort	resort, beach, food, vacation, pool, beautiful, buffet, people, week, ground	3.737148	4
18	Swimming Pool	beach, pool, drink, water, fun, bar, lot, resort, activity, swim	3.738	4
19	Hotel Ambiance	hotel, location, paris, breakfast, florence, helpful, lovely, quiet, walk, perfect	3.739205	4
20	Hotel's Cleanliness	nice, good, place, clean, pretty, big, bit, lot, night, great	3.74051	4
21	People/Places Near the Hotel	bad, place, thing, pay, money, day, dirty, people, smell, rude	3.741524	4
22	Arrival Time	check, arrive, room, early, hour, day, wait, pm, morning, time	3.742672	4
23	Hotel Amenities	pool, restaurant, area, spa, garden, large, place, feel, bali, villa	3.743856	4
24	Bedroom	room, bed, small, bathroom, night, large, size, comfortable, double, sleep	3.7449	4
25	Room Type	view, room, hotel, stay, suite, floor, upgrade, standard, sydney, good	3.745842	4
26	Food	restaurant, food, eat, good, bar, dinner, buffet, drink, lunch, meal	3.746847	4
27	Hotel is Recommendable	hotel, stay, night, location, choose, recommend, weekend, cruise, decor, boutique	3.748072	4
28	Noise in the Hotel	room, night, floor, noise, door, hear, window, open, elevator, noisy	3.74961	4
29	Hotel's Distance from Airport	walk, airport, bus, minute, stop, station, taxi, tour, train, easy	3.751098	4
30	Free Breakfast	breakfast, coffee, include, room, free, small, large, hot, morning, provide	3.752737	4
31	Hotel's Price	price, review, book, pay, star, room, expect, rate, read, night	3.754746	4
32	Giving a Tip	people, time, thing, make, good, tip, work, lot, speak, review	3.75727	4

IV. CONCLUSION

The model generated by MALLET yields better results in determining the aspects in the hotel reviews supported by its topic coherence, but not with its perplexity score. The best 'k' for the model is 32 which gives more meaningful and useful interpretation to human. The inferred aspects are really itemized based on the top keywords generated by the model. These aspects were given their fine-grained sentiment score by computing the weighted average of the probability scores generated by the topic model and the fine-grained sentiment score of the review. Among these aspects, giving a tip gains the highest overall sentiment score which is 3.75727 and the bath experience of the customers need to be given more improvement by the hotel management which scores 3.69091. This study successfully found the best model to discover the aspects in the hotel reviews with the use of topic coherence. Moreover, the research gap of combining the result of the model and sentiment analysis is addressed. Based on the glitch and challenges found in this study, looking at pyLDAvis visualization graph should be corrected and creating a framework to find the unique probable label of the aspect can be explored.

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Philippine Travel Mate: A Travel Tour Guide Mobile Application

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Abstract— The developed research project was the Philippine Travel Mate: A Travel Tour Guide Mobile Application. The mobile application was able to act as a virtual travel tour guide that provides the location and description of a certain tourist spot in the Philippines. Additional features of the software are the capabilities to search for flights including the promo flights of different airlines, look for nearby hotels for possible reservations, and give direction on how to get in a tourist spot from a specific location with the aid of Google map. The software has been found to be functional, usable, reliable, efficient, portable, and maintainable. The software testing was conducted and respondents easily learned and get adapted with the system. It was created using Basic4Android as programming language, Java for Android device connection, Android SDK as development tool for Android platform, PHP for web tool; and MySQL as database. It was tested in terms of functionality and portability. The mobile application was evaluated by 5 information technology professionals and 25 travelers using the ISO 9126 evaluation instrument. The mobile application proves that it can be adopted as a travel tour guide of an individual who wish to travel and discover the Philippines.

Index Terms— android application, GPS mapping, mobile application, virtual travel guide

I. INTRODUCTION

Travel is the movement of people between relatively distant geographical locations, and can involve travel by foot, bicycle, automobile, train, boat, airplane, or other means. People travel for pleasure, relaxation, discovery and exploration, and to be able to know other cultures [1]. Travel may be local, regional, national (domestic) or international. A trip may also be part of a round-trip, which is a particular type of travel whereby a person moves from one location to another and returns. Travelers engage for tourist guides especially if they have limited time yet want to see the tourist attractions of their current location. These tourist guides provide assistance, information, cultural, historical and contemporary heritage interpretation to people on organized tours and individual clients at educational establishments, religious and historical sites, museums, and at venues of other significant interest. Tourist guides are normally residents of the region in which they give tours.

Tourism is travel for recreation, leisure, religious, family or business purposes, usually for a limited duration. Tourism is commonly associated with international travel, but may also refer to travel to another place within the same country [2]. The World Tourism Organization defines tourists as people "traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes." [3] Today, tourism is a major source of income for many countries like Philippines, and affects the economy of both the source and host countries, in some cases being of vital importance.

Tourism is an important sector for the Philippine economy, contributing 7.8% to the Philippine gross domestic product (GDP) in 2014 [4]. Philippines is an archipelagic country composed of 7,107 islands with 82 provinces divided in 16 regions. The Philippines has a great majority of touristic offerings, whether one is looking for natural wonders, historical landmarks, culture and tradition, arts and crafts, shopping, recreation and entertainment, among many others. Korea is the main visitor market of the Philippines which supplies the biggest arrivals to the country from January to February 2016 with a total of 284,763 arrivals. This market accounted for 26.08% which is more than one-fourth of the total arrivals. It was followed by United States of America, China, Japan, Australia, Canada, Taiwan, Singapore, United Kingdom, and Malaysia.

Communication and getting around the Philippines is easy as most Filipinos understand and speak English language. Mobile phones are used throughout the archipelago as a form of communication. Mobile phones or commonly known nowadays as smart phones are also commonly used to collect location data. The geographical location of a mobile phone can determine its real physical location as the Geographical Information System (GIS) makes it possible. GIS is a computer system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data [5].

Travel or leisure can be pricy at times [6]. It will depend on the travelers target destination. Engaging to tourist guide is not the option of the travelers with tight budget. They will explore the place all by themselves but the sad part is they might not be able to reach a good tourist destination because of being unfamiliar to a certain place or being lost in it. The project is to develop a travel tour guide mobile application in the Philippines. Mobile phone application will serve as the tourist guide. It will present the tourist attractions according to its type and geographical location.

II. OBJECTIVES OF THE STUDY

To develop Philippine Travel Mate: a travel tour guide mobile application for the traveler who wants to discover the beauty of the Philippines.

Specifically, the study aims to:

1. Design a mobile application with the following features:

    a. Viewing of Philippines tourist attraction according to its region;

    b. Locating of nearby tourist attractions;

    c. Find the tourist attraction location with the aid of Google maps and Global Positioning System (GPS) mapping;

    d. Provide history, pictures, and trivia of the chosen tourist attractions;

2. Construct a mobile application using the following software:

    a. Basic4Android as programming language;

    b. Java for the Android device connection;

    c. Android SDK as development tool for Android platform;

    d. PHP for web tool; and

    e. MySQL as database

3. Test and improve the application in terms of functionality and portability; and

4. Evaluate the performance of the developed application using the ISO 9126 software quality criteria.

III. CONCEPTUAL FRAMEWORK

This section presents the review of related literature and studies underlying the framework of the study.

Leisure and vacation is one of the most awaited moments of every individual. This is the time to relax and be recharged from an exhausting work or study. Travelling to different places will be a good choice. Checking tourist attractions within the area or nearby places will be a good start.

According to Lovino [7], visiting the Philippines is a big fun. There are perfect beaches, friendly locals, and beautiful nature. Plus, it is a cheap country to travel and there is a great value for money.

Since mobile technology is widely used by almost everyone, traveling with aid of mobile phone as tour guide will be possible. It will give an ease to a user if travelling alone will be his choice.

Philippines' Tourism

Philippines is an archipelagic location that consist of 7,107 islands that are categorized broadly under three geographical divisions: Luzon, Visayas and Mindanao.

Philippines has numerous beaches, caves and other rock formations. Tourist attractions in the country includes the white sand beaches of Boracay, named as the best island in the world by Travel + Leisure in 2012 [8].

Source: http://www.tourism.gov.ph/PublishingImages/9.JPG
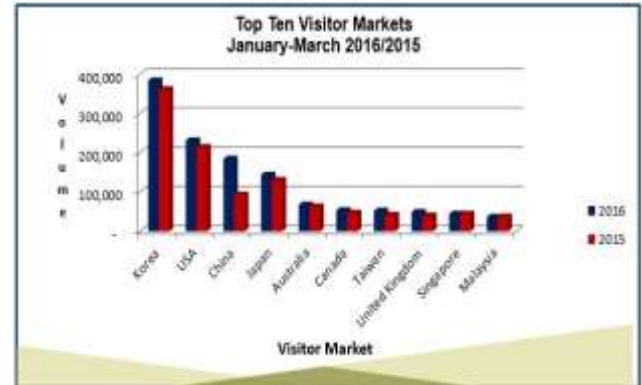
Fig 1. Top Ten Visitor Markets of the Philippines first quarter 2016

Tourism is an important sector for the Philippine economy, due to the large intake of money for businesses with their goods and services. It contributed 7.8% to the Philippine gross domestic product (GDP) in 2014. Fig. 1 shows that Korea is the main visitor market of the Philippines which supplies the biggest arrivals to the country from January to March 2016 with a total of 383,544 arrivals. This market accounted for 23.94% of the total arrivals. The United States of America ranked as the 2nd visitor-generating market with 231,233 visitors, constituting 14.43% of the total, an 8.02% increase from its arrivals of 214,057 in the same period [9].

China which provided 184,512 visitors secured the 3rd spot, with an 11.52% share to the total. Japan followed by contributing 143,624 visitors, comprising 8.96% of the total inbound traffic. The 5th major market was Australia with 67,265 arrivals, comprising 4.20% of the total. It was followed by Canada, Taiwan, Singapore, United Kingdom, and Malaysia [10].

Mobile Technology

Mobile technology [11] is exactly what the name indicates – technology that is portable; it refers to any device that you can carry with you to perform a wide variety of "tasks". It is technology that allows those tasks to be performed via cellular phone, PDA, vehicles, laptops, etc. A standard mobile device has gone from being no more than a simple two-way pager to being a cellular phone, a GPS navigation system, a web browser, and instant messenger system, a video gaming system, and much more. It includes the use of a variety of transmission media such as: radio wave, microwave, infra-red, GPS and Bluetooth to allow for the transfer of data via voice, text, video, 2-dimensional barcodes and more.

Mobile Application

As described by webopedia.com, mobile application which is also called as mobile apps is a term used to describe Internet applications that run on smartphones and other mobile devices. Mobile applications usually help users by connecting them to Internet services more commonly accessed on desktop or notebook computers, or help them by making it easier to use the Internet on their portable devices. A mobile app may be a mobile Web site bookmarking utility, a mobile-based instant messaging client, Gmail for mobile, and many other applications.

IV. MATERIALS AND METHOD

This section discusses the conceptual model, project design, project development and methodology of the study. Testing and evaluation procedure were also included.

Conceptual Model of the Study

On the basis of the foregoing concepts, theories, and findings of related literature, studies presented, and insights taken from them, a conceptual model is developed as shown below:

Fig 2. Conceptual Model of Philippine Travel Mate: A Travel Tour Guide Mobile Application

Fig. 2 shows the conceptual model of Philippine Travel Mate: A Travel Tour Guide Mobile Application that followed the IPO model in its development. Fig. 2 consists of input, process, and output. After applying the IPO model, evaluation of the system follows.

Project Design

Philippine Travel Mate: A Travel Tour Guide Mobile Application integrates a mobile application system in providing guidance to travelers and tourists who wants to explore the Philippine tourist attractions and destinations.

Fig. 3. Framework of Philippine Travel Mate: A Travel Tour Guide Mobile Application

Fig. 3 shows the graphical view of Philippine Travel Mate: A Travel Tour Guide Mobile Application. The mobile application provides the user the categories of tourist attractions, then by choosing the desired location the mobile application will give the user the history, pictures, and description of the chosen tourist destination. Nearby attractions will also be present on the mobile application.

Use case diagram and flow chart were made to analyze the components and their relationship to other components in the system in a graphical way at a conceptual level.

Fig. 4. Use Case Diagram of Philippine Travel Mate: A Travel Tour Guide Mobile Application

Fig. 4 shows the use case diagram of the Philippine Travel Mate: A Travel Tour Guide Mobile Application. The user can search information regarding the Philippine tourist attractions. The mobile application will display information about a certain tourist attraction from its database. The user has the choice to search a specific tourist attraction or can choose from regions or provinces. Beaches, mountains, rainforests, historical places, religious places, museums, and other significant tourist destination in the Philippines are presented in the mobile application. Since Philippines is subdivided into regions, searching of tourist attractions per region is possible.

Project Development

In project development, system analysis should take place. Features, software, and hardware requirements are some of the important things to be considered and should be identified in the system.
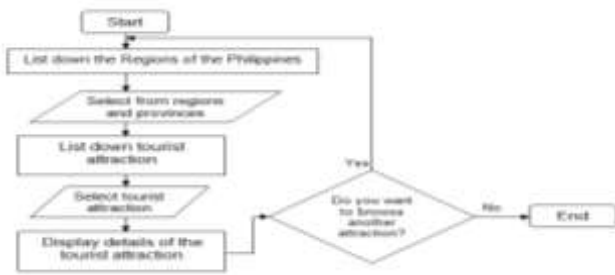
Fig. 5. Flowchart of the system

Fig. 5 shows the flowchart of the system. The system shows the user the Regions of the Philippines and the user should select one. The system reads the users choice and displays the list of tourist attractions from the category that the user has chosen. The user is prompted to choose a specific tourist attraction. The system will then show the details of the chosen tourist attraction. If the user wants to search for a new tourist attraction the system will show the categories again. If the user is already satisfied with his search he can terminate the system.

Methodology

Software Development Lifecycle is crucial in Desktop or web application development. Mobile applications are being developed for deployment in smart phones. Looking at the rising need of mobile applications and the associated development complexity, it is imperative to have a dedicated framework lifecycle for mobile application — Mobile Application Development Lifecycle (MADLC). The lifecycle includes the following phases: Identification phase, Design phase, Development phase, Prototyping phase, Testing phase, Deployment phase and Maintenance phase.

In the first phase which is the identification phase, ideas are collected and categorized to come out with improvement of an existing application or having new idea.
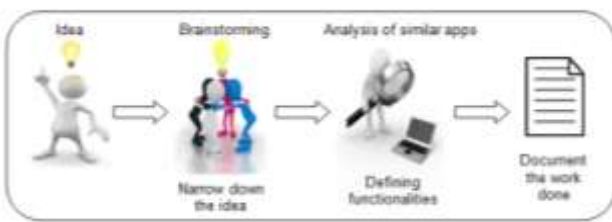
Fig. 6. Identification Phase

Fig. 6 shows the identification phase of the methodology to be used on the study. Gathering or collecting of ideas is the initial step, then the brainstorming to narrow down the gathered ideas. It was followed by the analysis of similar application to check the functionality of the similar application. This step is also to identify the functionality of the mobile application to be developed. If no similar mobile application exists on any mobile platform, then the idea with its core functionality should be documented.

Next phase is the design phase. In this phase, the idea from identification phase will be developed into an initial design of the mobile application.
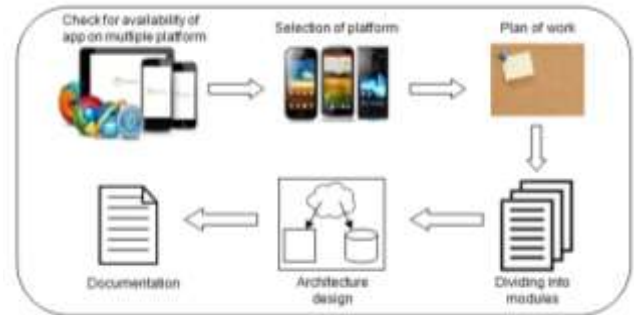

Fig.7. Design Phase

Fig. 7 shows the design phase. The possibility of developing the application on all mobile platforms is determined but the specific target mobile platform should be identified. A decision should be made on what operating system will be adopted in the creation of application and if the version of the developed application will be free, trial, limited, or premium version. The application functionality is broken down into modules and prototypes. The software architecture of the application is created. A very important part of the design phase is to create the storyboard for the user interface interaction: this storyboard describes the flow of the application. All steps should be documented.

Another phase is the development phase. In this phase, the application is coded. Coding for different modules of the same prototype can proceed in parallel. The development process can be in two stages: Coding for Functional Requirement and Coding for User Interface requirements.
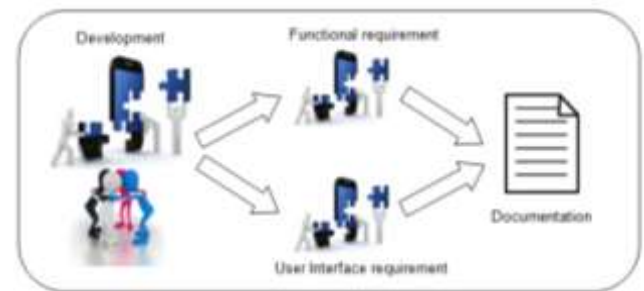

Fig. 8. Development Phase

Fig. 8 shows the development phase. Parallel development can be done for modules of the same prototype that are independent of each other. Subsequently, these modules can be integrated. In the second stage, user interface is designed; it is not a good practice to have a different look and feel for the same application on different platforms. The minimum set of interface components present in all mobile platforms should be used in the design. Finally, the documentation of the development phase should be made.

The next phase of mobile application development lifecycle is the prototyping phase. In fig. 9, the functional

requirements of each prototype are analyzed and the prototypes are tested sent to IT experts for feedback. After receiving the feedback, the required changes are implemented through the development stage. When the second prototype is ready, it is integrated with the first prototype, tested and sent back to the IT expert. The development, prototyping, and testing phases are repeated until the final prototype is ready. The work done is documented.

Fig. 9. Prototyping Phase

After the prototyping phase it was immediately followed by testing phase. Testing is the most important part of any development lifecycle model for it will determine the functionality and usage of a system or application. Testing of the prototype is performed on an emulator or simulator followed by testing on the real device. The testing on the real device, for example in the case of Android operating system development, should be performed on multiple operating system versions, multiple models of handsets with variable screen size. This phase was illustrated in fig. 10.

Fig. 10. Testing Phase

Another phase and the last phase in the development process is the deployment phase. After the testing is done and the final feedback is obtained, it is now ready for deployment.
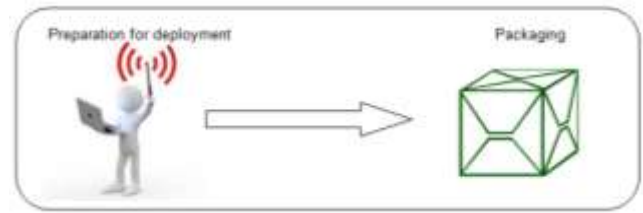

Fig. 11. Deployment Phase

Fig. 11 show that the deployment phase is being prepared. The installer should also be prepared as this is a part of the packaging of the application. Create an icon for your application. Lastly, you need prepare the file format required by your target operating system platform.

The final phase of this model is the maintenance phase and this is a continuous process. Feedback is collected from users and required changes are made in the form of bug fixes or improvements.
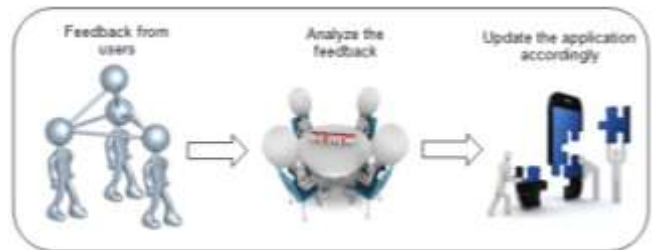

Fig. 12. Maintenance Phase

Fig. 12 shows the process done under maintenance phase. Every feedback received from the users is being analyzed. Appropriate security patches, performances improvements, and additional functionality should be provided at regular intervals in the form of updates to the application.

Operation and Testing Procedure

The main purpose of this stage is to test the functionality and portability of the mobile application. It was tested by five information technology professionals.

The following tables show the steps undertaken during the conduct of the tests.

Table 1. Testing Procedure on Functionality

Components	Test Conducted
Main Page Screen	• Selected a button to open a specific region. Description of the region was shown together with the list of provinces under selected region. • Entered a tourist spot name on the search tab. It was transferred to the specific tourist spot searched. • Selected the promo flights button. Opened the wego website and shown the cheap domestic flights in the Philippines list. • Selected the Cebu Pac PAL Air Asia promos button. Shown the promo flights of Cebu Pacific, Philippine Airlines, and Air Asia.
Region Page Screen	• Selected a specific province. Description of the province was shown together with the list of tourist spots under the selected province.
Province Page Screen	• Selected a tourist spot. Description of the selected tourist spot was shown together with the Google map button and hotel button.

Tourist Spot Page Screen	• Selected the Google map button. Shown the location of the selected tourist spot. Searched direction on how to go to the chosen tourist spot. • Selected the hotel button. Shown the nearby hotels for reservations. • Selected the home button. Shown the main page screen.

Table 2. Testing Procedure for Portability

Mobile Specifications	Test Conducted
Samsung Galaxy J7 Android 4.4 KitKat Resolution 1280x720 Size Samsung Galaxy V Android 4.4 KitKat Resolution 480x800 Size 4.0 inches Samsung Galaxy Y Android 2.3 Gingerbread Resolution 240x320 Size 3.0 inches Huawei Ascend Y100 Android 2.3 Gingerbread Resolution 240x320 Size 2.8 inches Lenovo Yoga Tablet 8 Android 4.2 Jelly Bean Resolution 1280x800 Size8.0 inches	• Copied the APK installer. • Located the path and ran the APK to install the mobile application. • Tested the installation process to other mobile devices. • Ran the application on the device. • Ran the application even other applications were running. • Uninstalled and the re-installed the mobile application

Evaluation Procedure

To determine the performance of the mobile application, the ISO 9126 evaluation instrument with the criteria of functionality, usability, reliability, efficiency, portability, and maintainability were used.

Various activities were undertaken during the evaluation. Thirty (30) respondents was requested to evaluate the system. These respondents were composed of five (5) information technology professionals, and twenty five (25) people who are travelers. The functions and whole process was discussed thoroughly to ensure the understanding of the evaluators for the system to be evaluated properly.

A five-point scale was used to evaluate the system. Each criterion was rated in the scale of 1-5, where 5 is Excellent, and 1 is Poor.

Table 3. Likert Scale

Scale	Verbal Interpretation	Mean Score	Rating
5	Excellent	4.51 – 5.00	
4	Very Good	3.51 – 4.50	
3	Good	2.51 – 3.50	
2	Fair	1.51 – 2.50	
1	Poor	1.00 – 1.50	

Table 3 shows the descriptive rating scale for the evaluation of the research project. The rating is 1-5, where 5 is Excellent, 4 is Very Good, 3 is Good, 2 is Fair, and 1 is Poor.

V. RESULTS AND DISCUSSION

This section includes the project description, structure, capabilities and limitations, and results of the conducted evaluations.

A. Project Description

The software aims to promote the beauty of the Philippines with the aid of Philippine travel mate: a travel tour guide mobile application. The developed mobile application is capable of searching tourist spots in the Philippines. It was divided by regions and provinces for better searching.

Fig. 13. Main Page of Philippine Travel Mate: A Travel Tour Guide Mobile Application

Fig. 13 shows the main page of the mobile application composed of region buttons and search tab for quick searching of a desired tourist spot. Located at the upper right part of the screen are the buttons for promo flight for easy access.

Beside in searching a tourist spot, the user can be able to book a hotel reservation near the location. An added Google map will help the user to find the location if he/she wants to travel using a private vehicle. Promo flights are

also included since Philippines is an archipelagic country and travelling by land is not always possible.

The software was created using Java, PHP, Basic4Android and MySQL.

B. Project Structure

The mobile application is capable of searching tourist spots in the Philippines. Detailed structures of the mobile application are shown in the succeeding figures.
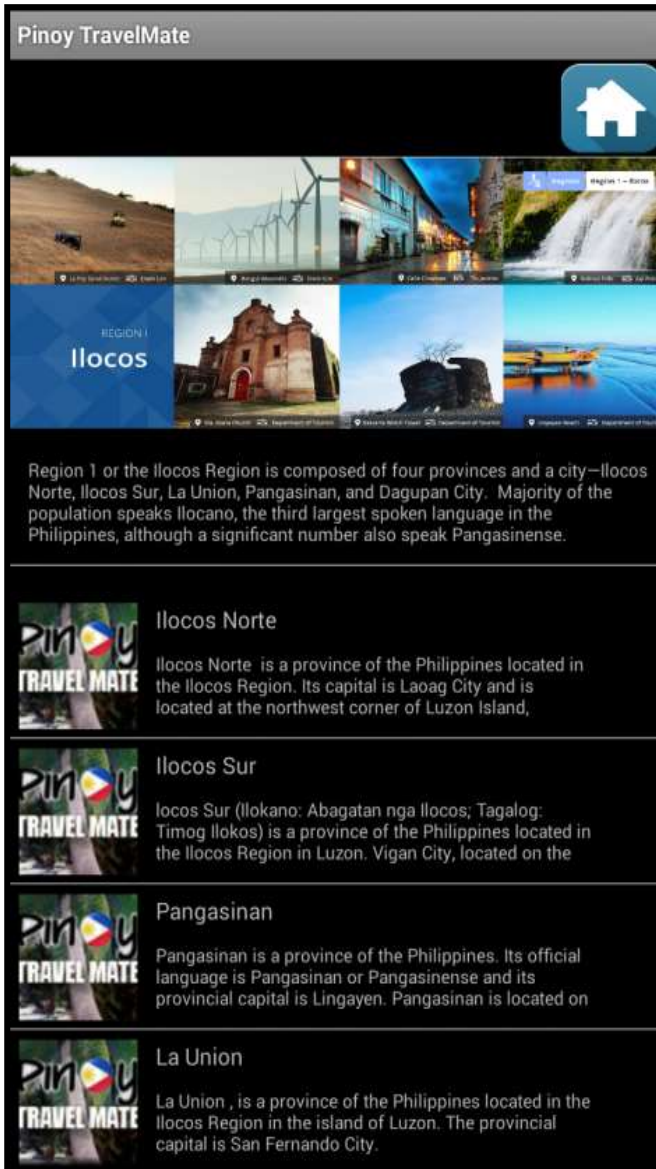

Fig. 14. Ilocos Region Page

Fig. 14 shows the Ilocos region page after choosing Ilocos region button on the main page. It shows the description of the region. The provinces under the region were listed.

Fig. 15. Ilocos Norte Province Page

The Ilocos Norte province page was shown in fig. 15 after choosing Ilocos Norte province from the region page. The description of the province was shown together with the list of tourist spots under the chosen province.

Fig. 16. Tourist Spot Page

Fig. 16 shows the tourist spot page specifically the Laoag Sinking Bell Tower page. Different buttons are present such as Google maps, hotel reservation, back to the previous page button, and home button. If the traveler finds the area attractive and wants to visit the place, Google map is the guide. Hotel reservations are linked. Nearby hotels will be shown under the hotel reservation button.
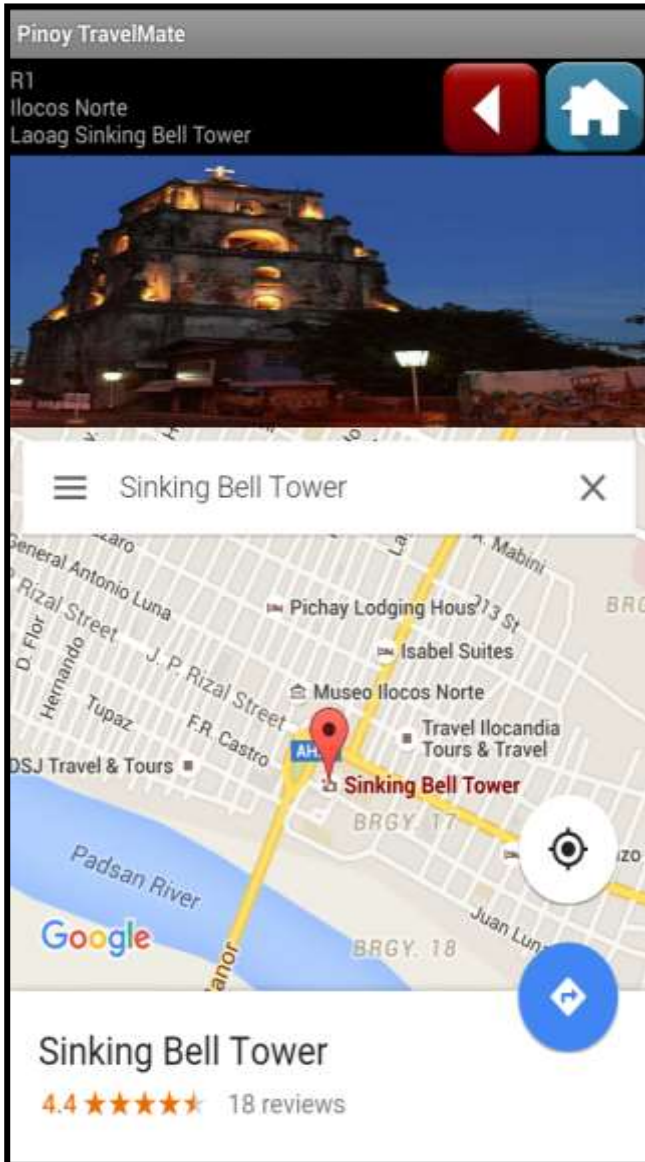

Fig. 17. Google Map Page

Google map page is for the guidance of a traveler incase he/she is not familiar with the place as shown in Fig. 17. Direction on how to get there was provided by the Google map.
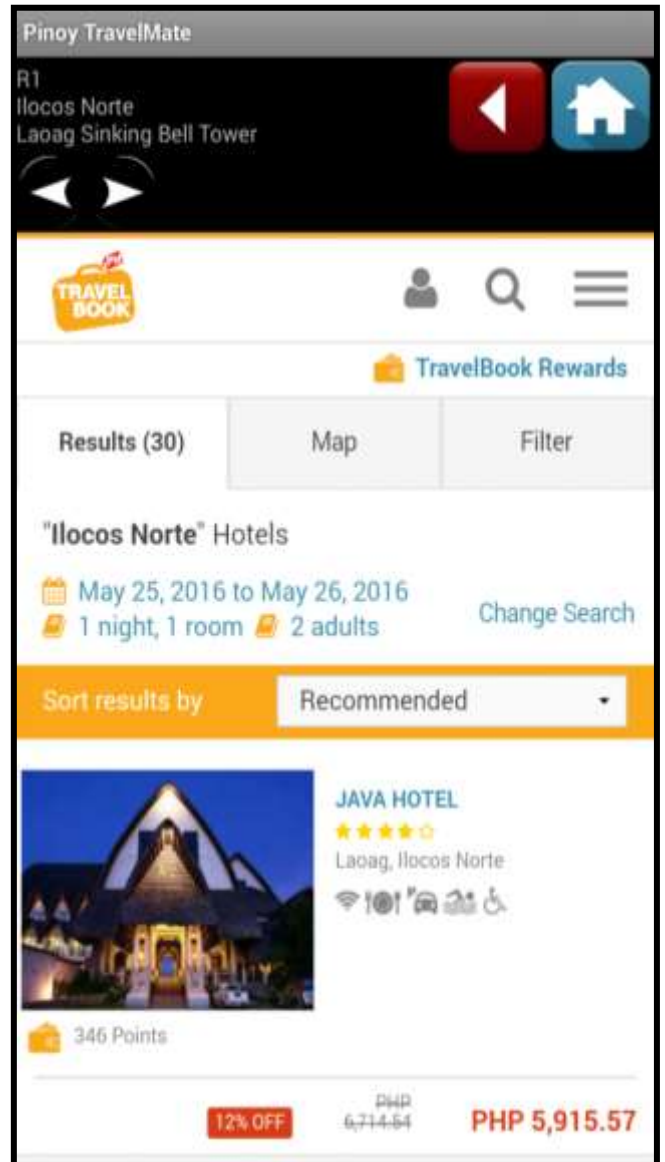

Fig. 18. Hotel Reservation Page

Fig. 18 shows the hotel reservation page. After clicking the hotel reservation page button from tourist spot page, it will be linked to the travelbook.ph website. The location of the nearby hotels was automatically identified according to the chosen tourist spot.
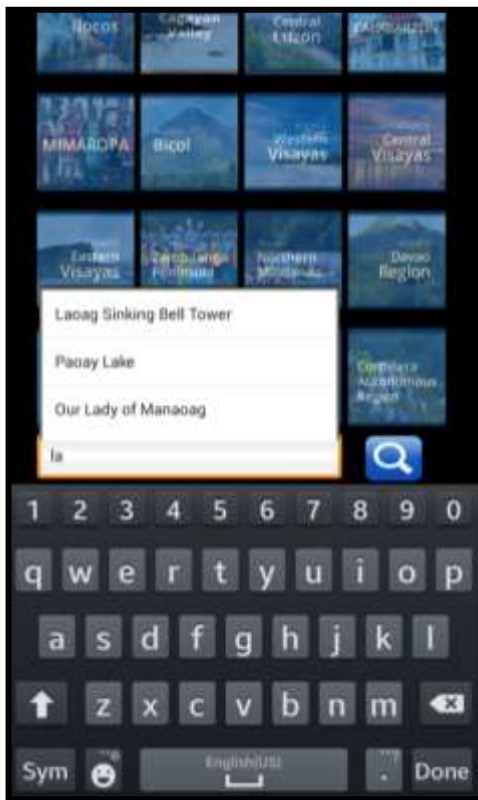
Fig. 19. Tourist Spot Search Tab

Fig. 19 shows the tourist spot search tab. As the user starts to type a letter, suggested tourist spots were shown. The search tab can be use to directly go to the tourist spot page of a selected item of destination.

Fig. 20. Promo Flight Page

After choosing the promo flight button from the home page of the mobile application, it will be linked to the promo flight page as shown in fig. 20. This page provides a link of cheap domestic flights in the Philippines according to the site of wego.com.
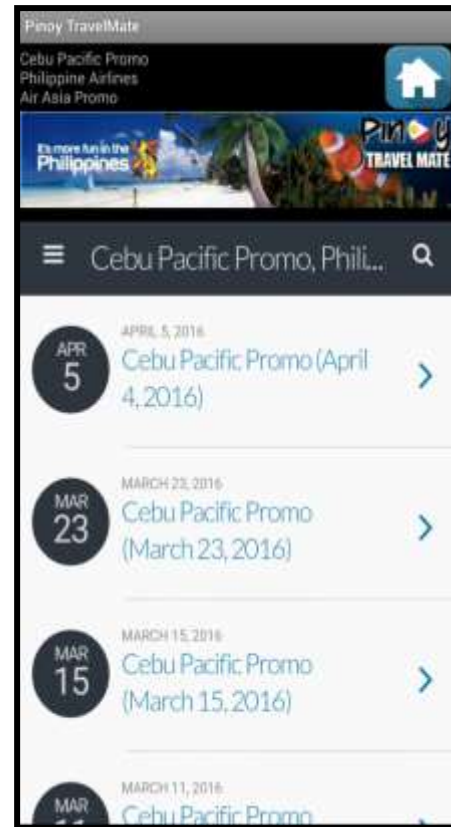

Fig. 21. Cebu Pacific Promo Flight Page

Fig. 21 shows the Cebu Pacific promo flight page. The page enables the user to check out the promo flights of Cebu Pacific, Philippine Airlines and Air Asia.
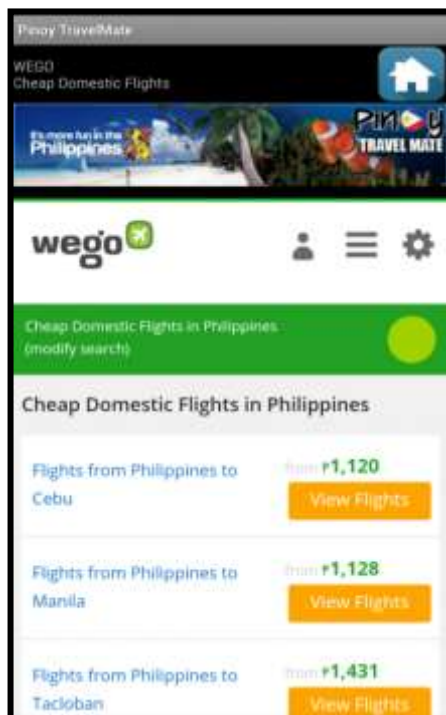
C. Project Capabilities and Limitations

The following are the capabilities of the project:

1. The mobile application can act as a travel tour guide that will provide the location of a tourist spot in the Philippines.

2. The mobile application is capable of searching for promo flights from a certain airlines.

3. The mobile application is capable of searching nearby hotels from a certain tourist spot location.

4. The mobile application can help the user give direction on how to get in a tourist spot from a specific location with the aid of Google map.

The following are the limitations of the project.

1. The mobile application will only run on devices with Android operating system.

2. The mobile application is not capable of providing details of a tourist spot that is not included on the database.

3. The mobile application can only be use with the devices with internet connection.

D. Project Evaluation

Evaluation Result

The mobile application was evaluated according functionality, usability, reliability, efficiency, portability, and maintainability. It was evaluated by 30 respondents with 5 information technology professionals and 25 travelers.

Table 4. Summary of Evaluation Results

Criteria	Mean	Qualitative Interpretation
Functionality	4.60	Excellent
Usability	4.66	Excellent
Reliability	4.43	Very Good
Efficiency	4.35	Very Good
Portability	4.44	Very Good
Maintainability	4.40	Very Good
Overall Mean	**4.48**	**Very Good**

An excellent rating of 4.60 of the mobile application was obtained in terms of functionality. It implies that it performs the task required and the results are as expected.

With excellent mean rating of 4.66 on the usability, it means that the software is easy to use, easy to learn, and user-friendly in terms of Graphical User Interface (GUI).

On reliability, the mobile application got a very good with a mean rating of4.43. This means that the software can handle errors, can resume working, and can restore lost data.

Efficiency on the other hand was rated very good with 4.35 mean rating. This indicates that the software responded quickly and utilized resources efficiently.

Portability got a mean rating of 4.44 which is very good that the mobile application can be easily installed and moved to other platforms.

With a mean rating of 4.40, maintainability was rated very good. This shows that the mobile application is easily modified, faults are easily diagnosed, and that it can be tested easily.

The mobile application which got an overall mean rating of 4.48, a very good description, proves that it can be adopted as a travel tour guide of an individual who wish to travel and discover the Philippines.

VI. CONCLUSIONS

In considerations of the objectives of the study and the results of testing and evaluation carried out, the following conclusions were derived.

1. The Philippine Travel Mate: A Travel Tour Guide Mobile Application was designed such that:

   a. It can act as a travel tour guide that will provide the location of a tourist spot in the Philippines;

   b. It can search for promo flights from a certain airlines;

   c. It can explore nearby hotels from a certain tourist spot location; and

   d. It can help the user give direction on how to get in a tourist spot from a specific location with the aid of Google map.

2. The mobile application was successfully created using Basic4Android as programming language, Java for the Android device connection, Android SDK as development tool for Android platform, PHP for web tool, and MySQL as database.

3. Test results validated the functionality and portability of the developed mobile application.

4. The mobile application was rated "Very Good" with mean rating of "4.48" by the respondents using ISO 9126 evaluation instrument, which proves that it can be adopted as a travel tour guide of an individual who wish to travel and discover the Philippines.

VII. RECOMMENDATIONS

The mobile application will act as a travel tour guide that will provide the location of a tourist spot in the Philippines.

However, some recommendations for further enhancement of the project are hereby advised:

1. The mobile application is highly recommended for implementation.

2. Categorize the tourist spots according to their attraction details for better searching.

3. Create a mobile application that can run on different operating system.

4. The mobile application should be uploaded to Google Play app store.

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Alteration of Gut Microflora by Anti-Cancer Drugs

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I. INTRODUCTION

Hepatocellular carcinoma (HCC) is the third most common cause of cancer death, the most recurrent primary liver cancer and fifth most common malignant worldwide with over 7-8 lakhs new cases each year[1]. HCC can develop at any stage of liver cirrhosis[2,3].

Gut microbes in the human body plays an essential role in the immunity, health and disease. They have been found to be the most diverse and constitute the densest cell number in the human microbiota and studies continue to support the premise that commensal bacteria, largely anaerobes, serve to maintain microbial stability and colonization resistance by preventing overgrowth or domination with more pathogenic bacteria, through interactions within the microbial community and with the host. Results have indicated that the imbalances in gut microbiota are related to numerous disorders, such as inflammatory bowel disease, colorectal cancer (CRC), diabetes, atopy and liver dysfunction[4].

The liver is susceptible to exposure of bacterial products which gets translocated from intestine lumen thru portal vein, is accountable for liver inflammation. Bacterial product translocation is caused by altered permeability due to bacterial over hauling and alteration in intestinal microfloral composition. These translocated micro organisms and/or bacterial products i.e. LPS and Peptidoglycan induce liver inflammation thru activation of Toll like receptors (TLR) and NOD-like receptors (NLR)[5,6]. Obesity and type 2 diabetes (T2D) are also associated with inflammation and activation of immune system mechinary thru intestine metabolites like free fatty acids (FFA), lipids and infiltration of bacterial products like LPS, leading to development of diseases or disorders[7].

There have been many scientific evidences suggesting the important role of gut microbiota in the pathogenesis or progression of many liver diseases, such as alcoholic liver disease (ALD), Nonalcoholic Fatty Liver Disease (NAFLD) and Nonalcoholic Steatohepatitis (NASH), total parenteral nutrition (TPN)/intestinal failure-related liver disease (IFALD), and primary sclerosing cholangitis (PSC)[8]. These disease has been reported to be resultant of bacterial pathogenesis or their products activating the inflammatory pathways and mediators. There is fine balance between various microbial species resides in gut. In HFD fed obese mice population of Firmicutes increase over Bacteroidetes[9]. Proteobacteria, phyla containing Gram Negative bacteria (e.g. E.coli.) are having role in progression of NAFLD as they are major source of LPS and endotoxemia[10].

Gut microbiome may play a crucial link in the promotion, progression and even in the treatment of cancer. The tomour responses to chemotherapy vary and mechanism pertaining to the ascertaining the reasons for the therapeutic failure needs to be understood. The present study was undertaken to understand the potential role of gut microbiota on the efficacy of some the standard chemotherapeutic drugs.

II. MATERIALS & METHODS:

Diethylnitrosamine (DEN) and 2-acetylaminofluorene (AAF) were used for liver cancer induction in male Wistar rats[11]. 5-Fluorouracil (20mg/kg bw) and Doxorubicin (1 mg/kg bw) were two chemotherapeutic agents selected in the study and were administered intraperitoneally[12].

Upon completion of the the induction and treatment, the tissues i.e., liver, small intestine and large intestine were used for expression studies as well as for the histophological analysis. The fresh fecal sample were collected just before the autopsy and used for the stool DNA isolation to study different phyla and bacterial sps.

III. RESULTS

Induction of apoptosis is one of the most important characteristics which differentiates a cancerous cell from a normal cells. The liver showed an increased proliferation of hepatocytes following DEN-AAF induced hepatocellular carcinoma as compared to the control group. Following the treatment with 5-F and Dox the proliferative characteristics reduced significantly and more profound results were obtained in 5-F treated group.

The expression studies carried for the analysis of NF-kB, TLR-2, TLR-4, MMP2 and MMP9 revealed that MMP2 and MMP9 expression in the liver which was up-regulated in cancer induced groups was down regulated in both the reversal groups. In contrast, there was no change in the NF-kB expression but the TLR-2 and 4 expressions increased significantly in both 5-F and Dox treated groups. The NF-kB, TLR-2 and TLR-4 expressions in the liver were at par to that found in small and large intestine with large intestine majorly affected.

There was a significant increase in the gram negative sps as compared to the gram positive in liver cancer induced groups. This gap between the gram negative and positive was further increased in the reversal groups. The circulating lipopolysaccharide showed almost three fold in the reversal groups.

The results of cancer induced and reversal groups showed an increase in the Bacteroides and Proteobacteria population with a reduction in the Firmicutes at the phyla levels. In addition, it had also decreased the Bifidobacteria and Clostridia numbers, while increased Escherichia population at genus level compared to the control group. An increased Gram negative Proteobacteria and Bacteroidetes phyla along with an Escherichia genus following an HSD feeding had found to be positively correlated with an increased serum LPS levels. An increased serum LPS following an HSD administration had created the metabolic endotoxemia in the gut. LPS is an important ligand for the PRRs, such as TLR4 and NLR1.

The animals did not show any signs of reversal even after 30 days of withdrawal of the chemotherapeutic drugs.

IV. DISCUSSION

Bacterial and metabolic compositions is highly crucial for the infant development and immunity. Urbaniak et al [13] reported a significant change in the microbiome of the lactating mothers exposed to chemotherapeutic agents. In the present study, the microbiome alteration was more profound following chemotherapeutic agents administration. The fluctuations were concurrent to those obtained in diabetic induced groups[14].

V. CONCLUSION

Although the currently used chemotherapeutic agents show most efficient anti-cancer efficacy but they are also a potent agent to cause severe gut microfloral dysbiosis. In the present scenario, the liver cancer characteristics are reversed but there is a permanent irreplaceable damage caused on the microbiome which by itself may lead to other complications. The need of the hour would be targeting the microbiome for the treatment of cancer

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Diagnosing Organizational Culture in Engineering Firms Toward Enhanced Policy Formulation

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I. INTRODUCTION

One of the main factors for having an outstanding organization and an exceptional workplace is "organizational culture". According to Torben Rick (2015), the most important thing about culture is the feasible point of difference for any organization. It is something that cannot be copied or duplicated. One of the most noticeable thing in any company is their culture – the way they talk to one another, greet customers and how they dress.

But more than these impressions, organizational culture includes an organization's expectations, experiences, philosophy, values and future expectations. It may also develop naturally and may be passed on from the CEO's personality and manner to the employees. Culture therefore is established on shared attitudes, beliefs, customs, and written and unwritten rules that have been developed overtime and are considered valid (The Business Dictionary, 2018).

Engineering firms comes in all sizes, ranging from one-person consultancies operating out of their home to multinational companies that deal not only in engineering but also the construction, operation, and maintenance of facilities (Gibson, 2018). In the Philippines there are different engineering firms which are owned by foreign nationals.re With this, we can see that different organizational culture will arise and therefore greatly influence the work attitude of every employee.

Assessing organizational culture is one of the best way to identify the dominant culture of different engineering firms. This may also identify which organization is most flexible in their structure that will eventually lead to an effective organization. An effective organization continuously achieve the outcomes that they intend to produce. The best and most effective organization can handle competition well and is there on the top of the industry.

II. STATEMENT OF THE PROBLEM

The study aimed to determine the dominant culture type of different engineering firms in the National Capital Region.

Specifically, this study intended to answer the following:

1. What are the socio-demographic profile of the respondents according to gender, age, civil status, job title, highest educational attainment and length of service to the company?

2. What is the level of the organizational culture of engineering firms as perceived by the respondents in terms of the Dominant Characteristics, Organizational Leadership, Management of Employees, Organizational Glue, Strategic emphases, and Criteria of success?

3. What are the dominant culture types of engineering firms in terms of clan culture, adhocracy culture, market culture, hierarchy culture;

4. How significant is the relationship of dominant culture across the profiles of the respondents?

5. How significant is the relationship between organizational culture to types of dominant culture?

6. What policy can be formulated to improve the organizational culture of the engineering firms?

III. HYPOTHESES

H_0 : There is no significant relationship on the dominant culture across the profiles of the respondents.

H_0 : There is no significant relationship between organizational culture and the different domains.

IV. RESULTS AND DISCUSSION

Significant Relationship of Dominant Culture Across Profiles of the Respondents

Relationship of Dominant Culture Across the Gender of the Respondents

It is revealed in the study that there is no significant relationship between the dominant culture and the gender of the respondents having a 0.002 as the coefficient 0.9799 as the P-value. It was also revealed that the most dominant culture perceived by the respondents at the current state of their organization is the Clan culture. Regardless of age, the respondents perceived the organization as a very personal place. It can be an extended family. More so, the organization defines success on the basis of the development of human resources, teamwork, employee commitment and concern for people.

Relationship of Dominant Culture Across the Age of the Respondents

The result of the study showed that at the current state, there is a significant relationship on the dominant culture when the respondents were grouped according to age. The computed value for Chi-square is 7.035 and a P-value of

0.0080. This means that the age of the participants has an effect on their perceived organizational culture. Majority of the respondents ages from 25-30 years' old which is also considered as the prime working age. This age range is where employees are still looking for the right organizational culture for them in which they would settle. Most workers at this age range are usually job hopping and continuously looking for a greener field in the industry.

Relationship of Dominant Culture Across the Civil Status of the Respondents

Under the current state, the study showed that considering the civil status of the respondents with a coefficient of 10.991 and a P-value of 0.009, it has a significant relationship with the dominant culture. It means that the civil status of the respondents has a great effect on the dominant culture of an organization. Many researches have shown that employees who are married show much more commitment to their organizations compared to single employees. It could mean that those who are married have less concerns on the type of organizational culture. They may be more focused on the security of their job. On the other hand, single employees who are also at their prime age of working have high considerations on the type of culture the organization has. It may be because at these point in their lives they have less responsibilities and therefore can concentrate on looking for an organization that they prefer and where they can settle.

Relationship of Dominant Culture Across the Highest Educational Attainment of the Respondents

The computed Chi-square test gives a coefficient of 0.187 and a P-value of 0.6653. This means that there no significant relationship on the dominant culture across the respondents' demographic profile when grouped according to their educational attainment. This means that the highest educational attainment of the participants has no effect on their organizational culture.

Relationship of Dominant Culture Across the Job Title of the Respondents

The computed Chi-square test gives a coefficient of 0.151 and a P-value of 0.6979. This means that there no significant relationship on the dominant culture across the respondents' demographic profile when grouped according to their job title. This also means that the dominant culture as perceived by the respondents is not affected by the job title of the employees.

Relationship of Dominant Culture Across the Length of Service of the Respondents

Under the current state, the study showed that considering the civil status of the respondents with a coefficient of 10.637 and a P-value of 0.0013, it has a significant relationship with the dominant culture. This means that the length of service of the respondents has an effect on the type of organizational culture. In terms of service, majority of the respondents are working from 3 years and below.

This means that during the early stage of working for the company, which is also considered as an adjustment period, the type of culture greatly influences the employees to stay or the leave the company.

Relationship of Dominant Culture Across the Employment Status of the Respondents

The result of the study showed that at the current state, there is a significant relationship on the dominant culture when the respondents were grouped according to employment status. The computed value for Chi-square test is 5.650 and a P-value of 0.0175. Majority of the respondents were regular employees. This means that the status of employment greatly affects the dominant culture of the company. This could be because those employees who are permanent are the ones who are committed to the organization and therefore have a big influence on the culture that the firm has.

Significant Relationship Between Organizational Culture and Dominant Culture

Relationship of Organizational Culture to Clan Culture

The value of Pearson r is 0.4664. Although technically a positive correlation, the relationship between variables I weak (the nearer the value is to zero, the weaker the relationship). The value of R^2, the coefficient of determination, is 0.2175.

Relationship of Organizational Culture to Adhocracy Culture

The value of Pearson r is -0.6931. this is a moderate negative correlation, which means there is a tendency for high X variable scores to go with low Y variable scores (vice versa). The value of R^2, the coefficient of determination, is 0.4804.

Relationship of Organizational Culture to Market Culture

The value of Pearson r is 0.1167. Although technically a positive correlation, the relationship between variables is weak (the nearer the value is to zero, the weaker the relationship. The value of R^2. The coefficient of determination, is 0.136.

Relationship of Organizational Culture to Hierarchy Culture

The value of Pearson r is 0.6917. This is a moderate positive correlation, which means there is a tendency for high X variable scores go with high Y variable scores (and vice versa). The value of R^2, the coefficient of determination is 0.4784.

Proposed Policy Formulation

AREAS	CURRENT POLICY	ENHANCED POLICY
1.Company Hours	1. Official Time is 8:00 am to 5:00 pm a. Employees are required to be at their workstation at least five minutes before 8:00am. b. There is a grace period of five minutes. At 8:06, employees are considered late. All employees are required to strictly observe their prescribed work hours and break period as determined by the Company. During working hours, all employees shall focus on their duties.	*Implementation of flexible working hours:* *Example:* *1. An employee who clocks in at 0930 will be required to clock out at 1830* *2. An employee who clocks in at 0630 will be required to clock out at 1600* *3. An employee who clocks in at 1030 will be required to file half day leave for AM shift and clock out at 1700* *The following will be allowed provided that it will not cause any harm or inconvenience to others* *a. Eating at the desk* *b. Accessing website to the work such as YouTube, Twitter, etc., provided that you are using your own internet data.* *Using cellphone, whichever the personal or the Company's,*
2. Overtime Work	1.Night Differential: Work rendered between 10:00 PM to 6:00 AM will have an additional ND premium of 10% 2. Overtime pay calculations are based on the number of hours worked.	Night Differential: Work rendered between 10:00 PM to 6:00 AM will have an additional ND premium of 10% *and a meal allowance of P80.00* *2. Employees may, by mutual agreement with their manager, be granted the equivalent time off in lieu of paid overtime. (i.e. 4 hours worked = 6 hours off) Time off in lieu must be taken within two weeks of working such time or it will be forfeited.*
3. Job Rotation	Every employee may be transferred by the Company from one post to another within the same department or to another department.	*An employee who has been transferred by the Company may be required to undergo a training period of three (3) months.*
5.Promotional Aspects	The Company shall utilize channels of promotion to advance employees to more responsible areas of work in various departments, based on their skill, competence and general ability.	*Full utilization of training programs and encouragement in the taking of technical examinations shall be extended to employees. Any employee who works hard, shows initiative, responsibility, faithfulness and leadership in the job shall be given an opportunity to advance under the Company's "promotion from within" policy.*
6. Personal appearance	All employees must follow our dress code and personal appearance guidelines.	*Clothing allowance amounting to ____ will be given to all regular/permanent employees,*
7. Marriage Leave	**Regular employee shall be entitled once during the course of his/her employment to three (3) consecutive working days' paid marriage leave for his/her first marriage only. Submission of a copy of the marriage certificate is required.**	**Regular employee shall be entitled once during the course of his/her employment to *five (5) consecutive working days'* paid marriage leave for his/her first marriage only. Submission of a copy of the marriage certificate is required.**
8. Sick leave	**10 days Sick Leave will be granted every year for regular employee. The unused Sick Leave is convertible into cash every January.**	***10 days Sick Leave* will be granted every year for regular employee who has been working with the company for less than 1 years** ***12 days Sick Leave* will be granted every year for regular employee who has been working with the company for more than 1 year up to 2 years** ***15 days Sick Leave* will be granted every year**

		for regular employee who has been working with the company for more than 2 years. The unused Sick Leave is convertible into cash every January.
9. Medical and dental benefits	**When a regular employee falls sick during office hours, the Company shall reimburse the cost of the fare supported by receipts if applicable, from office to home/hospital/clinic.**	**When a regular employee falls sick during office hours, the Company shall reimburse the cost of the fare and medicine supported by receipts if applicable, from office to home/hospital/clinic. All expenses must not exceed P5000.00 with in the year.**
10.Renewal of PRC License	**Renewal fee for employees are reimbursable provided that it is supported by receipts if applicable,**	**Renewal fee *and membership fee to professional organization* for employees are reimbursable provided that it is supported by receipts if applicable,**
11.Loan facility	**Personal loan**	**Personal loan** *Car / Housing loan*

Eleven different areas were considered in formulating the proposed policy. First is the company hours. Due to worsening traffic especially in the metro, a flexible working hours is then proposed. Next is the overtime work. Aside from a night differential of 10 percent of the daily salary, an additional Php 80.00 for meal allowance is then suggested. Next is the job rotation. To avoid stagnancy and boredom, the employees should be transferred from one post to another. Next is promotion. Any employee who works hard, shows initiative, responsibility, faithfulness and leadership in the job shall be given an opportunity to advance under the Company's "promotion from within" policy. Next is personal appearance. The company should a lot clothing allowance for their employees. Next is marriage leave. Instead of 3 consecutive working days' paid leave, it will now become 5 days. For sick leave, a 10, 12, and 15 days will be granted depending on the length of stay of an employee. Medical and dental benefits are also proposed to assist employees during their sickness. Since the respondents were engineers, it is also proposed that the company shoulder the fee for license renewal. Lastly, a loan facility may be created such as personal loan, car loan or housing loan.

The study was conducted to diagnose the dominant culture in an organization of different engineering firms. Specifically, it aimed to determine the demographic profile of the respondents; the level of organizational culture as perceived by the respondents in the current and preferred state in terms of the six dimensions such as dominant characteristics, organizational leadership, management of employees, organizational glue, strategic emphasis and criteria of success; the dominant culture type of the organization both in current and preferred state; and to be able to formulate policies to improve organizational culture of the engineering firms.

A total of one hundred (100) respondents from different engineering firms in National Capital Region were asked to be part of the study. All respondents should have a bachelor's degree in engineering. The study aimed to be able to diagnose the dominant organizational culture in engineering firms towards enhanced policy formulation.

To be able to gather the needed data, a survey questionnaire which is the modified Organizational Culture Assessment Instrument (OCAI) by Quinn and Cameron (2000) were distributed to the respondents. There were eight (8) engineering firms include in the study. Results showed that most of the respondents were male within the age bracket of 25 – 30. Majority of them are single and had been working in the company for three years and below in a regular status.

From the data gathered, it was revealed that the respondents perceived that the current organizational culture prevailing in their company is the Clan culture. This means that they believe that their organization is a very personal place where people can freely express themselves with the assurance that they will be heard. Their leadership is an organization is generally considered to represent mentoring, facilitating or nurturing. The management approach in the organization is characterized by teamwork, harmony, and involvement. The glue that embraces the organization together is faithfulness and common trust. The organization also emphasizes human development. It also means that the organization describes triumph on the basis of the growth of human resources, collaboration, employee commitment, and concern for individuals.

Least perceived among the dominant culture is Hierarchy. It means that the respondents perceived their organization gave less importance on control, security of employment, stability in relationships, rules, policies and efficiency.

Analyzing the result of the study, it was revealed that the respondents preferred to maintain the dominant culture which is the Clan on their organization. It even increases its weighted mean from 27.90 on the current state to 31.04. The Adhocracy clan placed second as the preferred culture for the engineering firms. Market was the third preference and lastly, the Hierarchy culture.

V. CONCLUSION

The OCAI is based on the Competing Values Framework (CVF), which is recognized as one of the forty most important models in the history of business (Cameron & Quinn, 2011). It originally emerged from empirical research on what factors make organizations effective. The framework has since been applied to a variety of topics related to individual and organizational behavior. It has been the focus of empirical studies for more than 25 years, and it has been employed to help thousands of organizations and tens of thousands of managers improve their performance (Fox, 2013).

Leaders or the top management of engineering firms must understand that organizational culture is important because it is the single largest factor that inhibits organizational improvement and change. The leader should know that healthy cultures enhance success whereas unhealthy cultures inhibit success, but in order to take advantage of the power of organizational culture, it must be adequately measured.

This study determined the current state of organizational culture of engineering firms. After intensive research, the proponent of this study was able to come up with the following conclusion.

Base on the findings, of the complete sample of 100 respondents, first it can be concluded that the most dominant culture type on an engineering firm is the Clan culture.

When grouped according to the demographic characteristics, the age, civil status, length of service, employment status had a significant relationship with the organizational culture.

In the general assessment, Clan culture ranks highest among the types of dominant culture an engineering firm has both in current and preferred state. It can be concluded that respondents prefer to have an organization that is more like a home where they can feel that it is like an extended family. They prefer leaders who exemplify mentoring, facilitating and nurturing. Organizational culture should be built on trust and commitment and should define success on the basis of the development of human resources, teamwork, employee commitment and concern for people.

Through this assessment leaders of engineering firms will have a great deal about their organization's social interaction, basic assumptions of organizational life, perceptions about leadership styles and management of day-to-day activity. This study will help them identify the right culture to achieve strategic goals, beliefs and behaviors.

VI. RECOMMENDATION

To help diagnose and initiate change in an organizational culture, it is therefore recommended to use the Organizational Culture Assessment Instrument (OCAI).

This will help the leaders or the management to stimulate their thinking about activities or behaviors that can move the organization toward the desired future culture.

Table 4.76 is composed of the proposed policy to be formulated to amend the existing policy of the organization. It is also recommended that in designing and implementing an organizational culture change, there is a need to foster involvement. There is also a need to minimize resistance to the culture change by those affected, clarify for all concerned what the new cultural emphases will be, identify what is to remain unaltered in the organization in the midst of change, generate specific action steps that can be initiated to create momentum toward culture change, identify measures and metrics to ensure accountability, and develop the leadership competencies to ensure organizational effectiveness after the change. It is also important to take into consideration the following: reach consensus regarding the current organizational culture; reach consensus on the preferred future organizational culture; determine what the changes will and will not mean; identify stories illustrating the desired future culture; identify a strategic action agenda, identify immediate small wins, identify leadership implications, identify metrics, measures, and milestones to maintain accountability; and identify a communication strategy.

Effects of Extracts of Bioactive Glasses on the Viability, Migration, and ALP Activity of Osteoblast-Like Cells

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Abstract— Bone defects caused by infection, tumor, trauma, surgery, and congenital malformation are common, but the repair of large bone defects is still a challenge in orthopedic and craniomaxillofacial surgery. The current gold standard for bone repair, autologous bone grafting, is limited by limited bone supply, pain at the donor site, higher risk of infection, and longer operation time. Thus, various bone graft substitutes were developed in the past decades. Among them, bioactive glasses have drawn much attention because of their good biocompatibility, high osteoconductivity, and excellent osseointegration ability. To elucidate the mechanism of their beneficial effects on bone regeneration, we tested the extracts of bioactive glasses on the viability, migration, and ALP activity in hFOB 1.19 cells. In general, extracts of bioactive glasses at 0.05 g/ml had no effects on the viability, migration, and ALP activity; Extracts of bioactive glasses at 0.1 g/ml slightly inhibited the cell proliferation but increased the ALP activity; Extracts of bioactive glasses at 0.2 g/ml decreased the viability, migration, and ALP activity of cells. Our results indicated that the dissolution products of bioactive glasses contained both beneficial and harmful components for the osteogenic differentiation of hFOB 1.19 cells, and the dose of bioactive glasses must be carefully considered when they are used in the clinic.
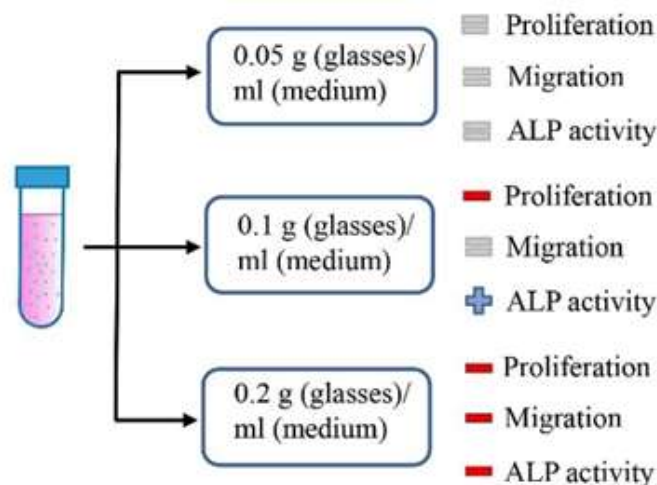
Figure 1.Effects of extracts of bioactive glasses at different concentrations on hFOB 1.19 cells.

Antifertility Study of *Dactylorhiza hatagirea* using Cyclophosphamide induced Method in Male Albino Rats

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Abstract— The Cyclophosphamide is used in cancer treatment. The present study was carried out to investigate the possible protective effect of *Dactylorhiza hatagirea on* reproductive toxicity induced by Cyclophosphamide (CP) in male albino rats. The aim of this study was evaluating the effect of different doses of this drug on male rat reproductive parameters. Animals were divided into six groups. G1 was considered as control received normal diet and water. G2 was given CP at a dose level of 6.5 mg/kg body weight/day, for 4 weeks. G3 was orally given CP at a dose level of 6.5 mg/ kg body weight/day for 4 weeks followed by vehicle administration for 8 weeks. G4 was orally administered ethanolic extract of root of *Dactylorhiza hatagirea* 100mg/kg and CP daily for 4 weeks. G5 was orally administered ethanolic extract of root of *Dactylorhiza hatagirea* 200mg/kg and CP daily for 4 weeks. G6 was orally administered ethanolic extract of root of *Dactylorhiza hatagirea* 200mg/kg and CP daily for 8 weeks. The extract will be administered after 2 hours before CP administration. Animals from Groups 1, 2, 4 and 5 was sacrificed after 4 weeks (day 29) of the experiment; while animals of Group 3 and 6 was sacrificed after 8 weeks (day 57) of the experiment. The body weights of the animals was recorded before and at weekly intervals during the course of experiment and the relative organ weights was recorded at the time of sacrifice. Blood was collected by cardiac puncture immediately after euthanasia. Prostate & Seminal vesicles were removed and weighed. Sections were studied microscopically for changes in histoarchitecture or morphology. Testes were removed and stained with H&E for histological examinations.

Testosterone and LH were measured in the sera. MDA, CAT and SOD were measured in the testicular tissue. The results showed that treating animals with CP caused degeneration of seminiferous tubules and loss of the spermatogenic cells. Biochemical results showed a decrease in levels of testosterone, LH, SOD and CAT activities and an increase in MDA. Treating rat with CP and ethanolic extract caused an improvement in the pathological alterations and increased the number of sperms. Moreover Testosterone, LH, SOD and CAT increased, while MDA decreased. The results of this study indicated that ethanolic extract protected rat against CP induced reproductive toxicity.

Keywords— Cyclophosphamide, Dactylorhiza hatagirea, Testosterone

UPCOMING CONFERENCES

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2nd International Conference on
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