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Impact of Critical Success Factors

Expectations for IT Graduates in Software

Highlights

A Review of Information System Theories

Accident Detection in Live Surveillance

Discovering Thoughts, Inventing Future

VOLUME 19 ISSUE 1 VERSION 1.0

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Accident Detection in Live Surveillance

By Shrey Gupta & Vandana Choudhary
Maharaja Agrasen Institute of Technology

Abstract- With the increase in number of vehicles in the country vehicle detection is an important in road traffic management system. Different traffic accident causes such as vehicle overspeeding, wrong way driving, collision and accident can be detected by CCTV installed on roads. The results obtained from traffic parameters can be applied for vehicle tracking, vehicle classification, parking area monitoring, road traffic monitoring and management etc. The main objective of this project is to decrease the deaths caused by accident occurring because over speeding, wrong war driving by ensuring public safety and also a building a better system for managing the traffic on the roads. The aim of this paper is to develop a system that can detect the vehicle accident which are caused by overspeeding, wrong way driving and collision detection on city roads. A prototype system is developed and tested.

Index Terms: *deep learning, heatmap, openCV, ROI, SSD model, tensor flow.*

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Accident Detection in Live Surveillance

Shrey Gupta [α] & Vandana Choudhary [σ]

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Index Terms: deep learning, heatmap, openCV, ROI, SSD model, tensor flow.

I. Introduction

With the increasing number of vehicles on the road there is a need to develop a system which provides information of vehicles to the driving assistant system in intelligent transportation system. It is an essential building block for traffic monitoring and many other applications. Smart traffic monitoring system is incomplete without the existence of system that is capable of detecting any traffic problems automatically, such as traffic rules violation and traffic jam. Thus, the problems solved by this project are:

a) Accident in India

In our country road accidents is a negative externality associated with expansion in road network, motorization and urbanization in the country. A major public health problem is the road traffic injuries, leading to loss of life and forever sufferings to the family of the victim causing disabilities and hospitalization. In case of India, road injuries is the number one causes of death and health loss among persons of age group 15-29 years. During the calendar year 2016, the total number of road accidents is reported at 4,80,652 causing injuries to 4,94,624 persons and claiming 1,50,785 lives in the country. and their number increases around 10% annually. Rail and coastal shipping account for about 32 per cent and 7 per cent, respectively, while the share of inland waterways transportation and air is less than 1 per cent each. Railways are a relatively cheaper mode of transport and are mainly used for transporting bulk materials over long distances.

b) Deaths due to Over Speeding

Over speeding or dangerous driving is the single largest killer on India's roads. According to data compiled by the Ministry of Road Transport and Highways, in 2015, 44.2 per cent (64,633 out of 1,46,133 deaths) of road accident deaths were a direct consequence of over speeding, while of the total accidents 47.9 per cent (2,40,463 out of 5,01,423 accidents) were linked to this.

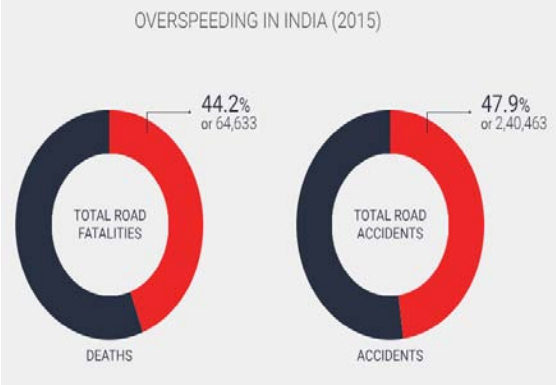

Figure 1

c) Deaths due to Wrong Way Driving

Traffic police study reveals that, almost 30% of road accidents are caused by this dangerous convenience of driving into oncoming traffic. The cops have already booked 1,53,891 drivers till date. According to the Union ministry of road transport and highways, 5,705 people were killed across the country in accidents caused by using the wrong side of the road.

Figure 2

Author α: B. Tech Student, Maharaja Agrasen Institute of Technology, Rohini, New Delhi. e-mail: shreyguptaji@gmail.com
Author σ: Assistant Professor, Maharaja Agrasen Institute of Technology, Rohini, New Delhi.

II. Proposed System

The proposed system will help in developing a smart city transportation system that is capable of sending alert to authorities by detecting the speeds of the car, car moving in wrong direction and collision which can help us in decreasing death caused by road accidents. Traffic jam can also be detected by slow speed and high volume of vehicles, and we can estimate road profile based on it. The road accidents can be reduced by speed detection of a vehicle and wrong direction of moving vehicle thus help to stop the violation of traffic rules to maintain smooth flow to traffic on city roads.

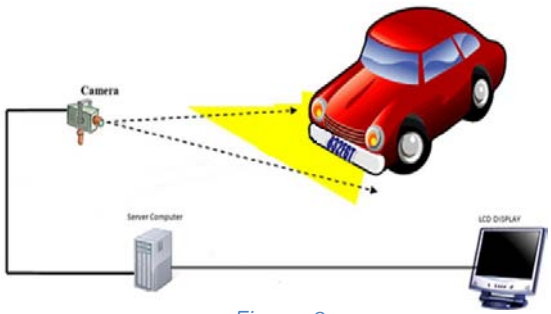

Figure 3

a) Software and Libraries used

The main libraries used in this project to implement different modules together are:

Python 3

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. The other languages use punctuation, but python uses English keywords instead. Python 3.0 is a new version of the language that is incompatible with the 2.x line of releases.

OpenCV

OpenCV (Open Source Computer Vision Library) is a machine learning open source computer vision software library. OpenCV is built to increase the use of machine perception in commercial sector by providing a common infrastructure for new technologies and computer applications. By using this library code can be modified easily and utilized for business.

TensorFlow

TensorFlow™ is a high-performance numerical computation open source software library. The TensorFlow Object Detection API is built on top of TensorFlow open source frame work that makes it object detection models easy to construct, train and deploy on the projects.

III. Working of Proposed System

The proposed system consists of 3 different modules. These are explained below:

Car Speed Module detects the speed of the car ensuring the road safety and reduce in the number of road accidents caused due to overspeeding.

Collision Prevention Module detects distance between car and object and help to pre-charge the brakes in conjunction with an automatic braking or emergency brake assist system.

Wrong Way Detection Module detects car moving in wrong direction by mainly the two causes- overtaking and lazy/reckless driving

Accident Detection Module detects accident caused due to overspeeding, wrong way driving. Also, it sends alert to authorities so that on time help can be provided to the road accident victim.

a) Module 1: Car Speed

In this the vehicle is detected by frames using OpenCV and then with the help of the tensorflow detection api these frames are processed and vehicle is detected. After the Vehicle is detected its image is stored and then check for the direction of the vehicle by using the approach defined in car count module.

The main area of interest for us is when the car crosses the ROI line area. The pixel length is calculated by subtracting the bottom position with the bottom position of the detected car. After that the real scale length is calculated by multiplying pixel length with 44 to convert the pixel length in meter.

Total time passed is also calculated by subtracting the current frame number at which the car is detected from the current frame number detected lists. To know the scale of the total time elapsed for a vehicle to pass through ROI area (24 = fps) the Total time passed is multiplied with 24.

Finally, the speed can be computed by:

- speed = real_length / real_time_passed / constant

To get the vehicle speed in kilometer units, compute the following mathematical calculation:

- speed = speed / 6 * 40

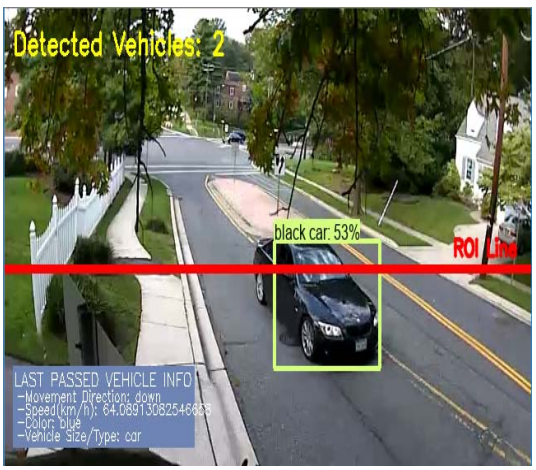

Figure 4

b) Module 2: Collision Prevention

A collision Detection system, also known as a precrash system, forward collision warning system, or collision mitigating system, is an automobile safety system designed to prevent or reduce the severity of a collision.

The camera on the dashboard detect he object by using TensorFlow object detection api and then calculate the distance relative to object from camera. If the distance is less than 0.5 m then the warning is issued on the car dashboard with the alarming sound in the speakers of the car.

Having analyzed the results the loss of speed after impact depends on the initial speed of a car and the angle of collision. The bigger collision angles the higher speed loss is after the hit. From the car movement trajectories after the modeled accident it is observed that the character of the trajectory depends on: the angle of collision, the car speed before the impact. The bigger the angle between the movement direction and the road fencing, the bigger the deflection of the trajectory appears.

Figure 5

c) Module 3: Wrong Way Detection

Wrong way driving crashes occur infrequently, accounting for almost 3 percent of all crashes, but they have a very high likelihood of resulting in fatal or serious-injury crashes. The causes associated with wrong-way crashes tend to make them spatially concentrated to particular stretches of roads, making it important to identify and monitor such high-risk locations. The detail about two popular scenarios of people driving in wrong direction are as follows:

Scenario 1 (Overtaking):

IDEAL: According to the traffic rules of India, there should be no overtaking when there is a single lane for both the directions of traffic as shown in the figure 6.

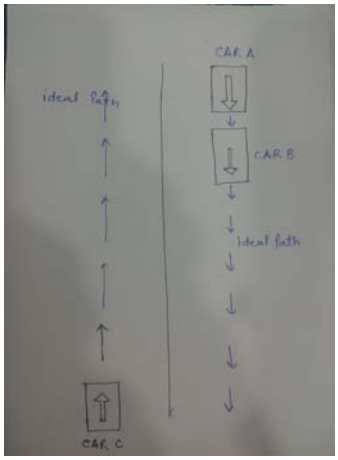

Figure 6: Shows the ideal way of driving without overtaking vehicles

REALITY: Most of them do not adhere to that rule and overtake the vehicles by moving onto other lane (opposite traffic lane) as shown in figure 2. There is a very high probability that the overtaking car (Car A), the car being overtaken (Car B) and the car travelling on the opposite lane (Car C) can meet with an accident.

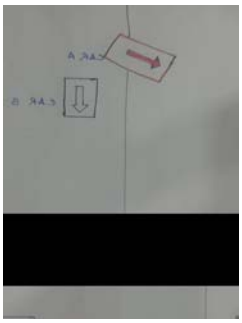

Figure 7(i)

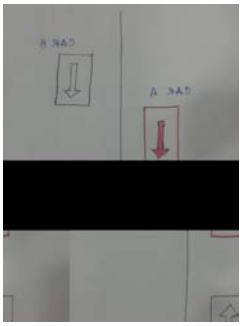

Figure 7(ii)

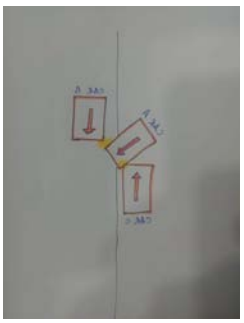

Figure 7(iii)

Figure 7(i),(ii),(iii): Shows overtaking of a vehicle by driving in the wrong direction

Scenario 2 (Lazy/Reckless Driving)

IDEAL: As shown in the figure 8, the Car A should cross over to the right lane and then cross into the desired street.

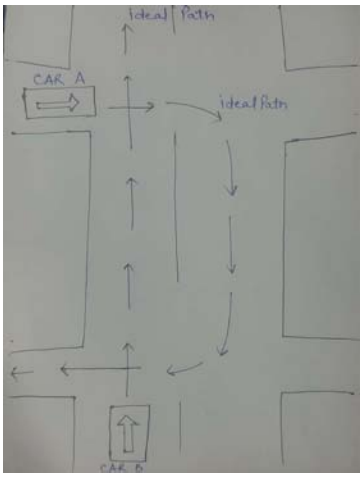

Figure 8: Shows the ideal way of driving of vehicles.

REALITY: Lazy or reckless driving is one of the most common practices by common man used for saving fuel and time. As shown in figure 4, the Car A travels in the left lane (wrong lane) and tries to sneak into the adjacent lane. This can cause an accident if at the same time there is another car like Car B which travels in the right direction but ends up in an accident.

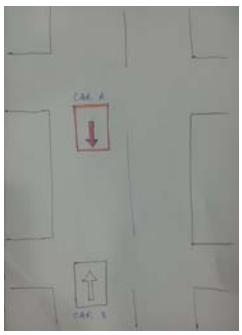

Figure 9 (i)

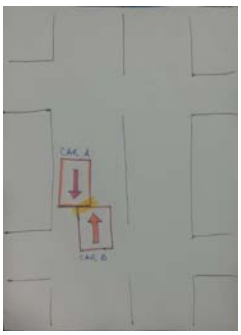

Figure 9(ii)

Figure 9(i) & 9(ii): illustrating the reckless driving by driving in wrong direction to save fuel and time

Design of solution

As a solution for the above stated problem by setting up a device which consist of an SBC (Single-Board Computer) like Raspberry Pi, a siren, a red LED light. The raspberry pi can handle the computer vision processing work and give inputs to siren and LED lights to function appropriately.

The solution model will consist of two blocks:

- *First Block:* Intelligence to detect whether there is any vehicle driving in wrong direction using Computer Vision.
- *Second Block:* Using the output generated from the first block, the second block can be used to ring the siren and glow the red LED light whenever wrong direction driving vehicle is detected on either/both sides of the road.

By implementing the above solution model, we can alert the vehicles on either side of the road to be extra careful. In this project, we will only deal with the first block (computer vision part) of the above-mentioned model.

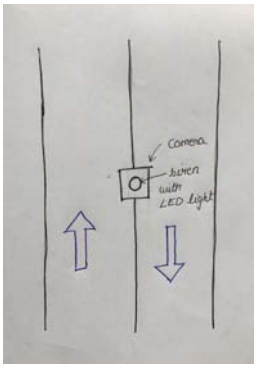

Figure 10(i)

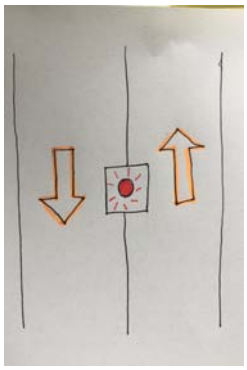

Figure 10 (ii)

Figure 10(i) & 10(ii): Shows that whenever the camera detects vehicle in wrong direction, the siren rings and the red LED light glows

d) Module 4: Accident Detection

In this the vehicle is detected by reading frames at multiple instances from webcam to different variable frames using OpenCV and then with the help of the tensorflow detection api these frames are processed and vehicle is detected. After the Vehicle is detected its image is stored in different frame. And reading of frames at multiple instances from camera and then these frames are stored at different variables.

The difference in frames is calculated. And calling of the difference function occur with the opening of histogram of the two main images store.

When the accident occurs the two-image frame gets overlapped with other rms value of the two images opened before is calculated. If the RMS value of the images is less than 250, then there is a similarity between images. i.e., Scene similar to an accident is found and alert to authorities is send and frame is updated.

Finally, the RMS can be computed by:

RMS= math.sqrt(lambda a,b: (a-b)**2, h1, h2))/len(h1))

h1: Image 1st histogram

h2: Image 2nd histogram

Figure 11

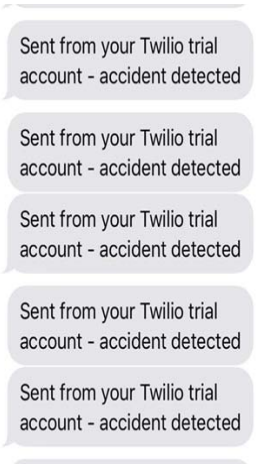

Figure 12

IV. Future Scope

a) Car Speed

Speed estimation process will give an idea to build a smart system for traffic monitoring that is capable of detecting, counting, classifying, and estimating speed of vehicle object from video data.

This will help us to automatically generate over speeding ticket which will reduces the number of traffic police officers needed to deploy in the real field for checking speeding vehicles.

b) Collision Prevention

The collision Detection system can be used pre-charge the brakes in conjunction with an automatic braking or emergency brake assist system.. That can provide the driver with a substantial amount of braking power the moment he depresses the pedal, which may effectively reduce the severity of an accident.

This can helps the driver be more attentive to the road, react sooner to dangerous situations, and have added peace of mind while operating a vehicle, especially at high speeds. Also, it will function reliably in any weather conditions, making driving in fog or rain less risky.

c) Wrong Way Detection

Upon installation, if a wrong-way vehicle entry is detected, the system would immediately alert the wrong-way driver of the error and notify the Authority. Once the wrong-way entry is confirmed, law enforcement would receive immediate notification of the exact entry point. They then could use their protocols and procedures to stop the wrong- way vehicle prior to a crash. While the system aims to notify a driver of their mistake, the focus is to enable law enforcement and Authority to track a wrong-way vehicle on the highway system in real time. The chances of successfully stopping a wrong-way vehicle before a collision become greater when officers know where the vehicle is and where it might be headed.

d) Accident Detection

Accident Detection can enable us to send alert to the authorities on time so that help can be given to the road accident victim and decrease the death caused due to road accidents. Also this system can be interfaced with vehicle airbag system that prevents vehicle occupants from striking interior objects such as the steering wheel or window. This can be also be developed by interconnecting a camera to the photograph of the accident spot makes the tracking easier.

V. Conclusion

This system is capable to detect speed of the car, collision prevention, wrong way direction and accident detection together. The system detects different causes of accidents and send alert to the authorities. It detects the speed of the car by capturing the image detected by the camera. The main aim of this project is to decrease the chances of loss of lives in accident occurring because over speeding, wrong way detection and collision detection and hence improve public safety and also a better system for the managing the traffic on the roads. The system is cost-effective, scalable, fast, at a distance measuring system that can be easily housed in present live surveillance. Apart from this, it also gives an opportunity for transportation engineers and decision makers to plan building of road and can be helpful both in case of personal as well as business purpose, to improves safety and security of the person on road.

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References Références Referencias

1. http://airccse.org/journal/jcsit/6214ijcsit16.pdf
2. https://www.tandfonline.com/doi/pdf/10.1080/16484142.2004.9637965?needAccess=true

3. https://www.researchgate.net/publication/309114385_Fast_obstacle_distance_estimation_using_laser_line_imaging_technique_for_smart_wheelchair
4. https://www.researchgate.net/publication/303766817_Improved_Optical_Flow_Estimation_In_Wrong_Way_Vehicle_Detection
5. https://www.researchgate.net/publication/304808065_Evaluation_of_Roadside_Wrong-Way_Warning_Systems_with_Different_Types_of_Sensors
6. https://www.researchgate.net/publication/322412750_Automatic_road_accident_detection_techniques_A_brief_survey
7. https://ankitshah009.github.io/accident_forecasting_traffic_camera
8. https://www.geographyandyou.com/disaster/disaster-events/track-troubles-road-accidents-in-india/
9. https://www.researchgate.net/publication/271449969_The_investigation_of_car_movement_trajectories_after_contact_in_the_case_of_collisions_with_stationary_safety_barriers
10. https://timesofindia.indiatimes.com/india/90-deaths-on-roads-due-to-rash-driving-ncrb/articleshow/61898677.cms

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Performance Expectations for IT Graduates in Software Development

By Dr. Anuradha Jayakody, A.S.K. Bulathsinghala, L.G.C.S. Lihinigama, K.H.A. Anurad & D.M.K.N. Karunarathna

Sri Lanka Institute of Information Technology,

Abstract- Technology makes the world more connected than it did yesterday, and it integrates worldwide activities in a blink of an eye. In the IT sector, there are several job roles as identified under software development. These job roles have different duties and tasks which requires employees, with a unique set of skills to match the specific requirements in the field. During the past few decades, the employment landscape has changed, and new occupations are rising in the field of software development, yet no satisfactory evidence has been provided by existing literature on the performance expectations in the industry, for IT graduates in software development, in the Sri Lankan context. Therefore, this research objectives to ascertain the expectations of employers on the technical, personal, educational, and general competencies of employees, holding an IT degree and to draw differences among individual and teamwork settings according to the identified competencies.

Index Terms: competencies,IT graduates,IT professionals, software development industry, work expectations.

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Performance Expectations for IT Graduates in Software Development

Dr. Anuradha Jayakody[α], A.S.K. Bulathsinghala[σ], L.G.C.S. Lihinigama[ρ], K.H.A. Anurad[ω] & D.M.K.N. Karunarathna[¥]

Abstract- **Technology makes the world more connected than it did yesterday, and it integrates worldwide activities in a blink of an eye. In the IT sector, there are several job roles as identified under software development. These job roles have different duties and tasks which requires employees, with a unique set of skills to match the specific requirements in the field. During the past few decades, the employment landscape has changed, and new occupations are rising in the field of software development, yet no satisfactory evidence has been provided by existing literature on the performance expectations in the industry, for IT graduates in software development, in the Sri Lankan context. Therefore, this research objectives to ascertain the expectations of employers on the technical, personal, educational, and general competencies of employees, holding an IT degree and to draw differences among individual and teamwork settings according to the identified competencies. A survey method was used to gather data from IT professionals engaged in the software development industry of Sri Lanka, and the analyzed using correlation test. Accordingly, this research will fulfill its objectives and purpose of providing IT employers with a proper guide, explaining which competencies they should look for in the recruitment of IT graduates.**

Keywords: competencies, IT graduates, IT professionals, software development industry, work expectations.

I. Introduction

The software development industry is rapidly increasing along with new technological improvement day by day. Apart from the industry, when it comes to software development, there is a specific process, experts in the software development industry have to practice (Lunn, 2003).In regards to the implementation of software, it is necessary to understand the phases precisely by employees to perform well. That is the reason for employers being a concern to choose recruits for their company.

In the software development industry, there are job roles which are equally critical. With the increase of the technology, every organization using IT which can grab the full advantage. By using information technology, companies eventually end up with developing software. That is the reason for having good market value for the software development industry and IT job role in Sri Lanka as well as in the world.

II. Global Software Development

As a discipline, global software development domain is complemented well by practices that affect research and by the best practices as well. However, for this domain to be a well-established discipline, there is still considerable knowledge of the methods and techniques to be developed, and also more practices to be developed. The main goal of this paper is to study the influence of technical, personal, educational, and general competencies on the expectations of employers in individual and teamwork settings. Although there are obstructions and challenges of managing software development in an international scale, the growth of this area is astounding. The international development software domain seems to be an integral component for companies for several reasons, including economic reasons, such as the overheads and resources, and the need to improve customer service. Since it is fast becoming prevalent in business, valid plans of action are needed, to organize and manage global software development. With the growth of globalization and the further development of distributed software development around the world, the engineering and management practices need to be better clarified, to gain fruitful results in global software development. Also, with time, the methods and systems related to the organization and management of global software development have been improved, and with this development, new and useful practices have proceeded to arise.

III. IT Job Role and Value

Technology makes the world more connected than yesterday, and it integrates the global activities at a blink of an eye. In the IT sector there are several job roles as identify under software development. These job roles have different duties and tasks which needs specific skills of industry expertise. It is considered to be a full technological era where everything anyone ever need is in the distance of a fingertip. New opportunity seekers do not think what kind of things they do; they think how to adapt technologies and produce a

Author α: Senior Lecturer, Faculty of Computing, Sri Lanka Institute of Information Technology, Malabe. e-mail: anuradha.j@sliit.lk
Author σ ρ ω ¥: Faculty of Business, Sri Lanka Institute of Information Technology, Malabe. e-mails: askbulathsinghala@gmail.com, chandulalihinigama777@gmail.com, asitha.anurad@gmail.com, kaushkarunarathna@gmail.com

technological solution for customers. Not only for customers but company also try to familiarize field of technology for their company because company can reduce their wastage and they can improve past production and can produce quality products. Despite of the sector, each company needs the help of IT in which IT employment value always grow up and have high demand always. As well as according to the value chain previous time IT is the supporting activity, but now IT is key activity globally where it demonstrates the need of individuals with IT knowledge to move with this technology trend.

Different kind of IT Jobs can be identified in regarding with software development sector such as software engineers, developers, quality assurance, project managers, and information security managers, etc. It is a well-known fact that if applicants have good knowledge in IT, they have higher demand to be employed because employers needed clever individuals who will run their projects without any difficulties where eventually employment value for IT is very high as well as IT employee have good salaries and have good opportunities to do their own business in this world. If they have good ideas and IT knowledge, they can start their own business. Therefore, if someone knows IT, they have more value in the world, and they can create it themselves. When Considering world best companies it is easy to identify that most of them are IT companies such as Facebook, Amazon, Google.

Apart from that, salary scales for IT employees is high as well as the opportunities they have. Turn an idea into a business is very common in the IT sector like Facebook, Amazon, Google, etc. Countries like Denmark, Switzerland, Canada, Australia has a high demand for software engineer developers and IT employees as well as they can apply for citizenship if they want to. It shows that IT employee has more capital intensive in the world. In the current situation, IT companies and non-IT companies hire more IT audit employees to their company. Since security is given the priority in global companies, try to secure their data and information from the world. As a result, companies hire most of information security managers as employees and increase cyber-security of it. Consequently, IT security managers have more demand in the IT industry. It is very vibrant that the value of IT-related jobs are enhancing day by day along with the technology where it shows how fast this industry has grown. Furthermore, Sri Lanka has a prominent IT market value. Therefore, students select IT degree in their higher education as well as foreign organizations outsource their projects to Sri Lankan companies. This is one of a foremost reason to increase Sri Lankan IT market, and it contains project manager, data analyst, quality assurance, software architect, tech-leads, and developers, etc.

Organizations adapt to new technologies frequently. Few decades back IT considered as a support service, yet it became a main component in every organization by adding more benefits as well as competitive advantages to other organizations. According to the study done by (Acuña, Gómez, Hannay, Juristo, & Pfahl, 2015), individual and teams engaged in the software development process of IT, and ICT companies highly contribute their software development process. Apart from the above, software development process can be identified as a team activity accompanied with the collaboration, coordination and conflicts among the team yet the performance and competencies of the individual are also contribute to the success of the project (Balamohan, Tech, & Dr.S, 2015).

Because of the industry demands, various skills and competencies from the graduates and also the demanding skills and competencies will be differentiating according to the teamwork setting and individual work setting. There were studies conducted in different environments studying about graduate skills and what employer expect (McMurray, Dutton, McQuaid, & Richard, 2016; Md Saad, 2014; Stevens & Norman, 2016) yet the employers' expectations of how these skills affect the performance of the employee when employed individual and in a group has not been observed completely in Sri Lankan context. In that case, this study is focused on examine the influence of technical, personal, educational, and general competencies of new employees holding an IT degree to draw differences between individual and teamwork settings.

IV. Literature Review

The world is always changing with technology and innovations. Because "of this rapidly changing technology, globalized markets and new modes of work organizations, there is high demand for IT staff with multiple and hybrid skills profile" (Paguio, 2016). It is not a undisclosed matter any longer that there is a shortage of professional IT skilled people out there all over the world. With the increase of new technology advances, the competitiveness is also increasing. Henceforth employers prefer to hire people who are IT, experts. There are different techniques, that can measure the skills of candidates, and numerous researches have been done throughout the time concerning employers' expectations of the capabilities of employees/ graduates/ undergraduates in the IT industry. Initially, prior to looking at the employer's expectations of graduates, specifically in the industry of IT software development, the role of higher education in this regard has to be understood. Institutes engaged in tertiary education often seek to apply practical aspects of a subject to the theoretical work, included in a curriculum, to best prepare the students enrolled in higher education for their eventual release into the real world experience as employees. The rate of employability of

graduates from a university, as reflected from employer's feedback, is a factor that induces a higher education institutes' reputation (Shah, Grebennikov, & Nair, 2015) and therefore, conversing with the industry professionals and incorporating information from the industry to the subject work is an essential aspect in higher education (Osmani et al., 2015). Although this is the case, oftentimes, more focus is given by students towards grades and academic performance, mainly focusing on the improvements to their grade point averages (GPA). Good academic work will best prepare students in regards to placement tests (Andrews & Higson, 2008) and are sought after by employers in selecting graduates as suitable employees (Belwal, Priyadarshi, & Al Fazari, 2017; Chhinzer, 2018). Although educational success is an extremely important element in graduates, some of the other essential factors that have been perceived by employers as the most suitable attributes are factors that are more practical, as opposed to theoretical information, for a workplace. Some of them are interpersonal and communication skills, social skills, leadership, being team players and, in the case of IT related jobs, the technical skills (Aasheim, Williams, & Butler, 2009; Hernández-March, Martín del Peso, & Leguey, 2009; Jackson, 2014; Mardis et al., 2018). Therefore, higher education institutes and mediums must ensure to recognize these components and practice embedding them to the students' academic activities for better preparation (Jackson, 2012). Because of the expansion of higher education that has occurred with enrolment of a large number of students, and since there are many avenues and options to evaluate and choose in the case of higher education, it is important to look at the gaps that exist between the industry specialists' expectations and graduates that leave the institutes in order to stay competitive and provide the best education compared to other avenues (Nicolescu, Păun, & Management, 2009; Shah et al., 2015).

Prior to looking at the specific domain of this study, that is the software development industry, the findings from researches looking into other specialization or general areas will be looked at, to broadly identify the gaps between the employers' perceived competencies that a graduate should have versus what skills and knowledge graduates actually have.

There are many existing studies that have looked at graduates' competencies and employability in other countries, especially within Australia, which was confirmed by Osmani, et al.(2015) after the review of 39 papers in the areas of management, accounting and computer science. However, there are multiple articles that have focused on graduates' attributes and employability from a range of different countries within different time periods. In the meantime in Spain, Hernández-March, et al.(2009) carried out a research to firstly identify the required competencies from university graduates as demanded by the labor market, and secondly to find out the mismatches that may exist between the current higher educational students receive and company demands; third, to look into minimizing the gap that exists between the current level of education of the graduates and the business need, as recognized by employer, so that higher education institutes can seek to reduce this lacuna through improvements to the curriculum. The objectives of the aforementioned study was done through mixed methods, using 4 in-depth interviews and questionnaires targeting 872 companies surveyed from a database of the 5000 main Spanish companies and respectively they have divided the competencies under vocational competencies and generic competencies (knowledge related skills, methodological skills, and interpersonal skills) and subsequently the results of the study showed that employers value the most in graduates are technical field specific knowledge as well as interpersonal skills. Furthermore Jusoh (2011) investigated in expectation gaps, job satisfaction, and organizational commitment of fresh graduates to reveal the difference between what fresh graduates expect and their experiences pertaining to the working environment, by using self-administered questionnaires. This study was in the view of graduates after employment. The data was collected from 128 graduates, and they were asked to indicate their preferences on organizational culture, leadership, communication, decision making, team working, motivation and development, the results indicate that significant expectation gap exists in all the areas surveyed. Focusing on both the graduates and employers' perspectives of the necessary level of skill that the graduates as employees must have, it was revealed that there is a disparity that explained the role that higher education plays in teaching the software needed in the financial services sector (Tickle, Kyng, & Wood, 2014). This study, through an in-depth online survey, was carried out in Australia, but the applicability was common globally since the practices of the financial services sector are often common around the world. This study of Tickle, et al. (2014) found that the disparity could be due to the less formal training in the workplace or also due to proper and effective learning opportunities were unavailable during higher education. This is serious accusation to higher education from a workplace that heavily utilizes the software for productive work. For the purpose of examining the difference between fresh graduates' expectations and actual experiences regarding work environment Islam (2015) conducted a research which evaluated using a questionnaire where 170 Malaysian graduates were questioned, and results indicate that there are gaps concerning what fresh graduates expect and their actual experience regarding work environment and apart from that leadership communication and decision making

was found to be significantly related with job satisfaction whereas leadership was found to be related with organizational commitment. Another study within the Malaysian context of graduate employability by Cheong, Hill, Fernandez-Chung, & Leong (2016) stressed that there are discrepancies with the expectations and realities with Malaysian graduates and that while they are "far from ideal", there are certain strengths that come from these graduates such as "familiarity with local conditions", being willing to work effortlessly, and agreeing to work for inferior hiring costs in comparison to graduates from other countries. McMurray, et al.(2016) examined on what employers demand for business and management skills in the Scottish workforce by using 71 employers as a sample where they have found that the factors that are important in recruiting graduates according to employers were; personal attitude, employability skills, relevant work experience, degree result and the most important transferable skills to employers when recruiting graduates were; trustworthiness, ability to be relied on, motivation, ability to communicate well and being willing to learn. In order to explore the most common graduate attributes as they apply to graduates' employability in Oman , Past three cohorts of graduates from a prominent university in Oman were interviewed by using both focus group and survey approach and Belwal, et al.(2017) conclude that the domain of educational institutions in Oman were mainly restricted to the basic generic skills in developing the graduates' attributes, as well as students' perspectives on employers selection criteria revealed that computing skills, the ability to work in teams, proficiency in English language, prior training and the personality of the graduates are the five most significant employability skills in Oman. Chhinzer (2018) came to the field in order to explore employer perceptions of graduate student employability and using a two-phased approach, the authors analyzed 122 employers' assessments of graduate students at a Canadian university who completed a work term with the employer in either 2014 or 2015 and authors collected individual data from student files at the university which lead to demonstrate qualities such as "professional maturity, soft skills, problem solving, continuous learning and academic achievement" had a positive relationship with employer perception of graduate employability. It also indicates that employers consider generic skills, general – mental ability, subject specific knowledge, willingness to work, attitudes and behaviors, responsiveness to feedback when assessing the employability of graduate students.

Looking at employers' perceptions of graduates, finding from beyond the skill levels of graduates have been researched, focusing on post-graduates. These studies have revealed almost similar results in what the employers expect from graduates and will be important since graduates at their current level itself can progress better by grasping the attributes expected at the post-graduate level. In 2001, a research was conducted in Malaysia to evaluate employers' general perception on the recruitment and work attributes of executives with MBA Degrees. In a survey of 500 employers throughout Malaysia, Tay (2001) have found that managers do recognize the contribution of MBAs based on their positive work attributes by investigated on communication skills, analytical skills, Creative and innovative skills in this study and subsequently the results indicated that MBAs with good work ethics, sound management and leadership skills, critical thinking and analytical abilities have more chances to be hired. According to Martensen (2009), they have focused on measuring competencies of higher education graduates and employers' needs, and they have studied the Danish employers' perceptions of MSc graduates from Copenhagen Business School by interviewing 250 employers regarding professional competencies, personal and social competencies, and also they have concluded that the business industry advertises for improved professional competencies of a more general commercial character; below areas should be improved;

- Ability to create results,
- Business knowledge,
- Communication skills (ability to communicate with other people), and
- Application of theoretical knowledge.

This review broadly looked at the overall scope of graduate attributes in different areas. However, the requirements of specific industries can differ from one another. Therefore, as per the research objectives, the employers' perceptions of IT graduates attributes must be considered. Firstly, it must be identified that the software development industry drives on the development and importance of ICT that has grown over the years. Gerhan & Mutula (2007) focused on a model that shows how ICT is used, and it proposed that ICT is a "commodity, supporting development activity, driver of the economy" and can be "directed at specific development projects". Applying this model to a university showcased the importance of ICT to create knowledge workers.

Furthermore, literature shows a significant research that was conducted in Turkey to investigate employers' performance expectations for new IT graduates in individual and teamwork settings for software development by using a survey approach of 110 employers and study revealed that significant diversity exists in individual and teamwork setting regarding employers' expectations for new graduates' competencies in terms of adapting to new software development methods and approaches, using time effectively and experiences gained in undergraduate projects (Akman & Turhan, 2018).

The findings and results from the reviewed literature revealed the identification of the gaps between the employers' expectations and the competencies that graduates must possess is vital in order to bridge them to create the most workable environment for new IT graduates. This means that the graduates can work on getting rid of the aspects of a job that can create an initial reality shock from the formal setting, which should be facilitated by their higher education as well (Vilapakkam Nagarajan, 2014). Considering the research area, there is a clear lacuna of studies that have considered the employer's expectation of IT graduates in the software development industry in the Sri Lankan context. Therefore, this research will consider some of the most sought after competencies that were identified by IT specialists. They can be categorized as the technical, personal, general competencies and looking at these competencies according to two main settings, that is the individual setting and in teamwork settings. Accordingly, these factors will drive the research in creating the theoretical framework and methodologies which will reveal the employer's perceptions of the competencies of new IT graduates in the Sri Lankan software development industry, which will provide the findings to answer the research questions, according to the hypothesized factors and achieve the objectives of this research.

V. Hypothesis of the Research

As the study based on the industry software development, It is a well-known factor that most of the time there are works to do as a team and the success of the project depends on the teamwork and competencies that employees own individually. Furthermore Akman & Turhan (2018) stated that there is a significant difference in the expectations of employees when it comes to the technical, personal, and educational, competencies of their employees who newly graduated from IT stream in individual and teamwork settings. In accordance with current literature, competencies put into four categories.

a) Technical competencies

To perform effectively in a specific job in an organization employees need to have exact knowledge and skills, those skills can identified as technical skills. And there are several researches have been conducted to examine the gap between employer perception and graduates technical competencies. Developing technical competencies during undergraduate education considered to be a significant element for employability in the industry (Nair, Patil, & Mertova, 2009). And Akman & Turhan (2018) indicate that technical skills are more essential than organizational and managerial skills. As mentioned before competencies were grouped under four categories, under technical category authors will be considering SD processes, SD methods, SD solutions, Adaptability, and Situation Monitoring (refer figure). All these findings show that between technical competencies and employers' expectations for different work sittings can be further investigated. Therefore following hypotheses are going to be tested.

H1tx - Observed technical competency of the new graduate that holds an IT degree has a significant impact on expectations of an employer in individual work settings.

H1ty - Observed technical competency of the new graduate that holds an IT degree has a significant impact on expectations of an employer in teamwork settings.

b) Personal competencies

There are many personal attributes that decide employee performance and directly impact to the organization. Mukhtar, et al. (2009) researched to measure the relationship between personal competencies and employability and results indicate that there is a lack of competencies among university graduates in communication, leadership and time management. As well as research emphasize that importance of working in different work settings too. To conduct this study, we are going to investigate skills in communication, leadership, time, creative thinking, and mutual Support under personal competencies category. In that case, it is important to properly investigate employers' perception about personal competencies in individual and teamwork settings (refer figure 1). Therefore, the following hypotheses are proposed.

H2px - Observed personal competency of the new graduate that holds an IT degree has a significant impact on expectations of an employer in individual work settings.

H2py - Observed personal competency of the new IT graduate that holds an IT degree has a significant impact on expectations of an employer in teamwork settings.

c) Educational competencies

In a study conducted by Akman & Turhan (2018) contrasted that there is an influence on involving different work settings can be different according to the course-based and senior year graduation projects. And also they have found that literacy in the English language has as the highest demand by employers. In this study on the education competencies, authors are going to investigate on language skills, projects, accreditation, knowledge of business fundamentals, and work ethics (refer figure 1). Even if these competencies were tested before, there is a need for more surveys to increase the validity of the items used in measuring employability in terms of different works settings so that authors of formulating the following hypotheses.

H3ex - Observed educational competency of new graduate that holds an IT degree has a significant impact on expectations of an employer in individual work setting.

H3ey - Observed educational competency of new graduate that holds an IT degree has a significant impact on expectations of an employer in teamwork setting.

d) General Competencies

Apart from the above competencies, employers are looking for competencies despite the degree such as problem solving, self-management, accountability, interpersonal skills, and knowledge of business trends. Mardis, et al. (2018) researched technology educational opportunities, professional requirements, and industry demands, and tested on general competencies of employees and discovered that the internship postings importantly emphasized technical competencies over general competencies (refer figure 1).

Even if these competencies were tested before, there is a requirement for additional reviews to increase the validity of the items used in determining employability in terms of different works settings so that authors of formulating the following hypothesis.

H4ex – Observed general competency of new graduate that holds an IT degree has a significant impact on expectations of an employer in individual work setting.

H4ey – Observed general competency of new graduate that holds an IT degree has a significant impact on expectations of an employer in teamwork setting.

V. Research Design and Methodology

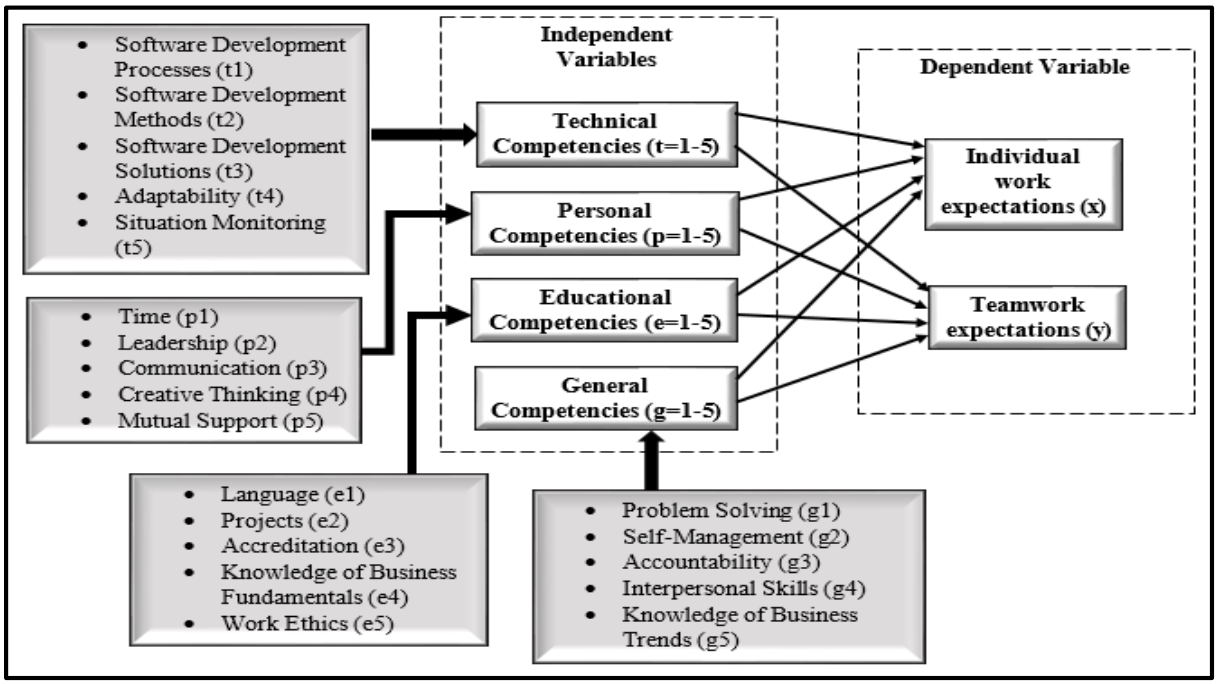
Authors are doing explanatory research, which is an effort to link concepts to understand cause and effect. To bond the gap among performance expectations of an industry for new IT graduates in software development in Sri Lankan context, a conceptual framework was designed using past literature in which it describes independent and dependent variables indistinctly. The questionnaire of this study supported by mentioned variables where it distributed among IT professionals to gather relevant data. With the intention of identifying the expectations of employers on the technical, personal, educational, and general competencies of an employees, holding an IT degree and to draw differences between individual and teamwork settings, the research design of this study is carried out.

In this investigation, authors have used judgmental sampling technique where it identified as non-probability sampling technique, which depends based on the judgment of research team. The previous studies which similar to this study are frequently led by researchers had conveniently selected judgmental sampling technique (Akman & Turhan, 2018). Consequently, this technique of sampling was taken.

An entire sample of 120 employers from software development industry was surveyed to identify the expectations of employers on the technical, personal, educational, and general competencies of employees, holding an IT degree and to draw differences between individual and teamwork settings in software development industry through judgmental sampling though total of 112 survey questionnaires were used after removing outliers, demonstrating 93.3% of response rate. Priority was given to the participants who are working software development industry as professionals when choosing respondents.

This section specifies how the proposed methodology is used to analyze the expectations of employers on the technical, personal, educational and general competencies of employees that holding an IT degree to draw differences between individual and teamwork settings. The complete study was aligned on a conceptual framework, which has six (6) variables which will be discussed further.

The Conceptual framework is the investigator's understanding of how specific variables in the study link with each other. As a result, it recognizes the variables vital in the research investigation. According to the conceptual framework of this study, authors have identified six (6) variables as technical competencies, personal competencies, educational competencies, general competencies, individual work expectations, and teamwork expectations. When reviewing the past literature, Akman and Turhan (2018) had used technical, personal and educational competencies in their study and authors of the current study expand the conceptual framework by reviewing other past literature such as (Paguio, 2016; Tay, 2001). To achieve the objective of the study, to ascertain the expectations of employers on the technical, personal, educational, and general competencies of employees, holding an IT degree and to draw differences among individual and teamwork settings according to the identified competencies. Here technical, personal, educational and general competencies act as independent variables and individual and teamwork settings act as dependent variables.



Source: Based on (Akman & Turhan, 2018)

Figure 1: Conceptual Framework

VII. Descriptive Results

From the table 1, a comprehensive analysis of the set of respondents with concerning their current position in the industry can be contrasted. From a total of 112 respondents, a majority (30.36%) is tech Leads (34). Count of IT unit/project managers and senior software developers is 25 each. That is 22.32% of the total number of respondents. There are 17 Senior IT professionals leaving only 11 information security managers. That can be justified by the fact that Sri Lanka does not employee enough Information security managers in the IT industry. The distribution of these respondents in the sectors of public, private and semi-Government a clear majority is in the private sector. That is 105 out of 112 (93.75%) leaving only 5 (4.46%), and 2 (1.79%) from the sectors of public and semi-government. This might not reflect the distribution of management level employees in the IT industry of Sri Lanka, but gives a hint about the general distribution in the three sectors. Since public and semi-government sectors' respondent count is very little, the private sector's respondent distribution by designation is roughly equal to the total distribution that discussed earlier. And also, field of study through higher education of the respondents, obviously the majority (90) has studied in the field of IT. That is an 80.36% of the total. Other 22 (19.64%) is from non IT- related fields of study. Most of the respondents from non-IT related fields of study are in the positions of tech Lead (10) and IT unit/project manager (8). The X2 test shows that the dependence on the field of study through higher education and their current position is statistically meaningful ($X2 = 11.269$; $df = 4$; p-value = 0.024). The total distribution by gender is 62.5% Male to 37.5 Female roughly 2:1 ratios. When it comes to experience, there are not many experienced employees in the management level of the IT industry. Most of the employees have experience of less than six (6) years. Employee count reduces drastically with the years of experience.

Table 1: Chi-square test for demographic variables

Variable		Respondent's current position							
	Total	IT Unit/Project manager	Senior IT professional	Senior Software Developer	Information Security Manager	Tech Lead	**Chi-square X^2**	**df**	**p**
Respondent's Sector	**112**						7.853[a]	8	.448
Public	**5**	1	1	1	0	2			
Private	**105**	22	16	24	11	32			
Semi-Government	**2**	2	0	0	0	0			
Respondent's field of study through Higher Education	**112**						11.269[a]	4	.024
IT related	**90**	17	15	25	9	24			
Other	**22**	8	2	0	2	10			
Gender of the Respondent	**112**						1.450[a]	4	.835
Male	**70**	17	12	14	7	20			
Female	**42**	8	5	11	4	14			
Years of management experience of the Respondent	**112**						14.293[a]	12	.282
Less than 6	**57**	12	7	14	5	19			
6-10	**34**	10	3	9	5	7			
11-15	**14**	2	5	2	1	4			
More than 15	**7**	1	2	0	0	4			

Source: Based on authors' calculations

Table 2: Chi-square test for demographic variables

Variable	Respondent's field of study through Higher Education					
	Total	**IT related**	**Others**	**Chi-square X^2**	**df**	**p**
Organization's satisfaction from new graduates	**112**			9.242[a]	4	.055
Highly Satisfied	**13**	9	4			
Satisfied	**31**	27	4			
Average	**36**	33	3			
Dissatisfied	**12**	8	4			
Highly Dissatisfied	**20**	13	7			

Source: Based on authors' calculations

In this study, (from table 2) that most of the respondents' field of study through Higher Education was IT- related. Out of the 112 respondents 90 were related to IT while only 22 was in other fields of study. Out of all 112 respondents, a majority of 36 thinks that the organization's satisfaction from newly graduated employees is average while another 31 thinks the organization is satisfied. A relatively lower number of respondents, 13 and 12 respectively think the organization is highly satisfied and dissatisfied from the new graduates. The responses have a near symmetric distribution within these four responses, but a relatively higher number (20) of responses have been recorded as highly dissatisfied. Hence the symmetric distribution has got biased towards dissatisfaction. If it separate the responses by the respondents 'field of study, almost 1/3rd of respondents with a non-IT related higher education has responded as highly dissatisfied. The X2 test that the different between the distribution of the organization's satisfaction expectation and the respondent's field of gradation cannot find significance (X2 = 7.583; df = 8; p-value = 0.448).

VIII. Quantitative Analysis

For examining the influences of technical, personal, educational and general competencies on the expectations of employers in individual work settings and teamwork settings 23 Likert scale questions were used in which it had 5-point Likert item with 1= "Strongly agree" and 5= "Strongly disagree."

According to the Spearman correlation tests for the hypotheses, results are representing in table 3.

For the technical competencies, significance value and correlation coefficient values disclose followings:

Individual work settings: There are satisfactory proofs to accept H1t1x and H1t2x at the 0.01 level. And also, H1t3x at the 0.05 significance level in the individual work settings. It demonstrates that "SD-processes," "SD-methods" and "SD-solutions" have a statistically significant relationship with individual work settings, which means, employers are definite of the new IT graduates should be competent in the software development processes and should be adoptable to new software development methods and approaches. As well as new IT graduates should be capable of devising solutions to problems. Those are important for individual work settings. Variables "adaptability" and "situation monitoring" were not identified to have a statistically significant relationship with the variable "individual work" settings. Therefore, H1t4x and H1t5x were rejected. This finalized that employers are not considering about adopt to changes through work environment and demonstrate initiative to identify and rectify incorrect practices from new IT graduates in individual work settings.

Table 3: Correlation analysis for variables

Empirical Factor	Test Variables	Individual Work (IW) Hyp.	Coeff.	ρ-val.	Team Work (TW) Hyp.	Coeff.	ρ-val.
Technical Competencies							
	SD-processes	H_1t1x	0.327**	0.000	H_1t1y	0.449**	0.000
	SD-methods	H_1t2x	0.336**	0.000	H_1t2y	0.294**	0.002
	SD-solutions	H_1t3x	0.203*	0.032	H_1t3y	0.262**	0.005
	Adaptability	H_1t4x	0.150	0.115	H_1t4y	0.197*	0.038
	Situation monitoring	H_1t5x	0.160	0.093	H_1t5y	0.129	0.176
Personal Competencies							
	Time	H_2p1x	-0.042	0.663	H_2p1y	-0.042	0.662
	Leadership	H_2p2x	0.219*	0.020	H_2p2y	0.158	0.096
	Communication	H_2p3x	0.036	0.706	H_2p3y	0.092	0.332
	Creative thinking	H_2p4x	0.044	0.647	H_2p4y	0.117	0.218
	Mutual Support	H_2p5x	0.111	0.244	H_2p5y	-0.023	0.809
Educational Competencies							
	Language	H_3e1x	0.204*	0.031	H_3e1y	0.144	0.129
	Project	H_3e2x	0.194*	0.040	H_3e2y	0.162	0.088
	Accreditation	H_3e3x	0.101	0.291	H_3e3y	-0.006	0.949
	Know. of Busi. Fund.	H_3e4x	0.171	0.071	H_3e4y	0.159	0.095
	Work Ethics	H_3e5x	0.077	0.419	H_3e5y	0.165	0.082
General Competencies							
	Problem Solving	H_4g1x	-0.107	0.262	H_4g1y	0.120	0.209
	Self-Management	H_4g2x	-0.004	0.964	H_4g2y	0.157	0.098
	Accountability	H_4g3x	-0.018	0.851	H_4g3y	0.097	0.307
	Interpersonal Skills	H_4g4x	0.056	0.557	H_4g4y	0.271	0.004
	Know. of Busi. Trends	H_4g5x	0.041	0.671	H_4g5y	0.081	0.393

***Correlation is significant at the 0.01 level (2-tailed)*
**Correlation is significant at the 0.05 level (2-tailed)*
Source: Based on authors' calculations

Teamwork settings: In this category, "SD-processes," "SD-methods," SD-solutions" are having a statistically significant relationship with teamwork settings at the 0.01 level. And also, variable "adaptability" is having a statistically significant relationship with teamwork settings at 0.05 level. Therefore, H1t1y, H1t2y, and H1t3y were accepted at 0.01 significant level. H1t4y was accepted at 0.05 significant level. This states that new IT graduates should be competent in the software development processes, adoptable to new software development methods and approaches, capable in devising solutions to problems, adapt to changes through work environment in teamwork settings. This category found only on a variable that there is no statistically significant relationship with a teamwork setting. The variable is "situation monitoring," and this demonstrates that employers are not expecting new IT graduates to indicate initiative to identify and rectify incorrect practices. Therefore, H1t5y was rejected.

Comparison: As stated by the results, "SD-processes," "SD-methods," "SD-solutions" are significant for both individual and teamwork settings. The variable "adaptability" is insignificant for the individual work settings and significant for the teamwork settings. But the variable "situation monitoring" is insignificant for both individual and teamwork settings in technical competencies.

For the personal competencies, significance value and correlation coefficient values disclose followings:

Individual work settings: The only variable that found to have a significant relationship with individual work settings in personal competencies is "leadership" at the 0.05 significant levels. Therefore, H2p2x was accepted.

This states that the new IT graduates must possess leadership skills. All other variables "time," "communication," "creative thinking," and "mutual support" have found to be an insignificant relationship with individual work settings in personal competencies. Consequently, H2p1x, H2p3x, H2p4x, H2p5x were rejected. This indicates that employers do not expect new IT graduates to manage time effectively, to be excellent communicators, ability to come up with new ideas and how the system operates and work accordingly.

Teamwork settings: There are satisfactory proofs to reject all the hypotheses in teamwork settings for personal competencies. These contrasts that employers believe new IT graduates manage time effectively, leadership skills, excellent communications, ability to come up with new ideas and how system operates and work accordingly are not required in the teamwork settings for personal competencies. Hence, H2p1y, H2p2y, H2p3y, H2p4y, and H2p5y hypothesis are rejected.

Comparison: Considering the above results, "leadership" is the only variable that having a significant relationship with the individual work settings for personal competencies but insignificant with teamwork settings. All other variables are insignificant in both individual and teamwork settings.

For the educational competencies, significance value and correlation coefficient values disclose followings:

Individual work settings: Variables "language" and "projects" are having a statistically significant relationship with individual work settings at the 0.05 significant level. Therefore, H3e1x and H3e2x hypothesis accepted. This yields that employers consider the new IT employees graduated from a university adopting English as the medium, and new IT graduated employees worked in a project during their university education. But other variables "accreditation," "knowledge of business fundamentals," and "work ethics" are insignificant with the individual work settings. That means, university accredited by the UGC (University Grant Commission), know underlying business concepts like debt, cash flow, supply, and demand for company products that effect business operations, to have good work ethics are do not consider as important in the individual work settings. Therefore, H3e3x, H3e4x and H3e5x hypotheses are rejected.

Teamwork settings: According to the above results, all hypotheses H3e1y, H3e2y, H3e3y, H3e4y, and H3e5y are rejected in the teamwork settings. Variables "language," "project," "accreditation," "knowledge of business fundamentals," and "work ethics" are insignificant with teamwork settings. This states that employers do not consider importantly English as the medium, projects during university education, accredited by the UGC, knowledge of business fundamentals, to have good work ethics in teamwork settings.

Comparison: "Language" and "projects" are two variables that have a significant relationship with the individual work settings but insignificant with the teamwork settings. All other variables are insignificant with both individual and teamwork settings.

For the general competencies, significance value and correlation coefficient values disclose followings:

Individual work settings: There is satisfactory evidence to reject hypotheses H4g1x, H4g2x, H4g3x, H4g4x, and H4g5x. Because variables "problem solving," "self-management," "accountability," "interpersonal skills," and "knowledge of business trends" are insignificant with the individual work settings. This indicates that, employers do not consider being work through details of a problem to reach a comprehensive solution, self-management skills that help an employee to feel and be more productive in the workplace, complete the tasks they are assigned, self-esteem, interpersonal skills, to have sound knowledge on current business trends as vital in the individual work settings.

Teamwork settings: There are satisfactory evidence to reject hypotheses H4g1y, H4g2y, H4g3y, H4g4y, and H4g5y. Because variables "problem solving," "self-management," "accountability," "interpersonal skills," and "knowledge of business trends" are insignificant with teamwork settings. This indicates that, employers do not consider being work through details of a problem to reach a comprehensive solution, self-management skills that help an employee to feel and be more productive in the workplace, complete the tasks they are assigned, self-esteem, interpersonal skills, to have sound knowledge on current business trends as essential in the teamwork settings.

Comparison: This yields that general competencies do not have a significant relationship with the individual work settings and teamwork settings.

IX. Discussion

Before looking at the specific domain of this study, that is the software development industry, the findings from researches looking into other specialization or general areas will be looked at, to broadly identify the gaps between the employers' perceived competencies that a graduate should have versus what skills and knowledge graduates have. Looking at employers' perceptions of graduates, finding from beyond the skill levels of graduates have been researched, focusing on post-graduates. These studies have revealed almost similar results in what the employers expect from graduates and will be vital since graduates at their current level itself can progress better

by grasping the attributes expected at the post-graduate level.

However, looking into the transition from a graduate to an IT person was looked at by Clark, Zukas, and Lent (2011) through a three-year longitudinal study, interviewing respondents through in-depth interviews. It revealed that the transition from undergraduate engaged in studying IT into a graduate working in the IT profession, based upon graduate credentials and employability skills is not a straightforward way to look at the transition, but that individual initiative taken for the work is also an important component. It saw that each individual had their own experience into the change, which is an indication of the personal competencies and attributes playing a part in graduates' work life.

In 2001, research was conducted in Malaysia to evaluate employers' general perception on the recruitment and work attributes of executives with MBA Degrees. In a survey of 500 employers throughout Malaysia, Tay (2001) have found that managers do recognize the contribution of MBAs based on their positive work attributes by investigated on communication skills, analytical skills, creative and innovative skills in this study. Subsequently the results indicated that MBAs with good work ethics, sound management, and leadership skills, critical thinking and analytical abilities have more chances to be hired.

The findings of the study show that employers' point of view, technical competencies for example competent in the software development processes and adaptable to new software development methods and approaches are an influence on both individual and teamwork settings. Comparable to this result, another study was conducted in turkey by Akman and Turhan (2018) found that new IT graduated employees should be competent in software development processes and software development methods that significantly related to individual and teamwork settings. But from this study, another result was found that software development solution is significant related with both settings which are individual and teamwork settings. This finding is struggled with previous research which was done by Akman and Turhan (2018) because they found that new IT graduates should not be capable of devising solutions to problems in both individual and teamwork settings. And also, research done by Nair et al. (2009) was found that being flexible and adoptable as the graduate capability. According to this study, results yield that new IT graduates should be able to adapt to changes through the work environment only in teamwork settings. This states that new employees should be flexible and adoptable when working as a team. In proportion to this result, situation monitoring is having an insignificant relationship with individual work settings as well as teamwork settings. This result is a conflict with previous findings because they found that situation monitoring as a teamwork competency which means, when working as a team, new IT graduates should demonstrate initiative to identify and rectify incorrect practices (Paguio, 2016).

For the personal competencies, the finding of this study states that "leadership" is the only variable which is having a significant relationship with individual work settings. But that is insignificant with teamwork settings. This demonstrates that employers are expecting new IT graduates to possess leadership skills only in individual work settings but not in teamwork settings. Akman and Turhan (2018) found that "leadership" as an insignificant variable with both work settings which are individual and teamwork settings. Therefore, this finding is a conflict with previous research. Apart from that they found that, the variable "time" as significant with teamwork settings. That means employers are considering the time management in teamwork settings rather than with individual work settings. But in this study, the variable "time" is not significant with the individual and teamwork settings. According to the research done by Akman and Turhan (2018) found that the variable "communication" as the significant with individual and teamwork settings. Compared to this study, it was found that "communication" is not affecting the individual and teamwork settings. And also, the study yields that "creative thinking" and "mutual support" are insignificant with the individual and teamwork settings. The research conducted by Tay (2001) found that "creative thinking" is essential when working as a team. And another study was conducted by Paguio (2016) has found that "mutual support" as a teamwork competency.

For educational competencies, the study found that "language" and "project" are significant with individual work settings but not with the teamwork settings. It yields that employers are expected IT graduated employees should adopt English as the medium during their university education, as well as employees should work in a project during their university education.

Also, there is a study that found "language" as a teamwork competency in Akman and Turhan (2018) study. But "project" as teamwork competency only. Apart from that, for the "accreditation" variable, findings were the same as the prior research done by Akman and Turhan (2018). Variables "knowledge of business fundamentals" and "work ethics" are not affecting for any of these two work settings which are individual and teamwork settings. This means employers are not expecting graduated employees to know underlying business concepts like business debt, cash flow, supply, and demand for company products that effects business operations and do not consider about good work ethics. In the study done by Mardis et al. (2018) had found that "knowledge of business fundamentals" is not much affecting. Research done by Tay (2001) had originated that "work ethics" as an important variable for

MBA graduates. Findings of this study yield that general competencies are not affecting the individual and teamwork settings.

This section provided a detailed comparison with existing literature and findings of the current study to get an idea for the graduates themselves in self-improving their skill set as they look forward to a successful career in renowned companies. They will have a better idea about which areas of competencies they should be improving and which competencies will not affect their career success.

X. Conclusion

Information Industry is a fast-growing industry in the current economy due to the emerging demand from almost all the other industries. It requires employees with a unique set of skills to match the specific requirements in the field. Once you hired an employee and after he/she starts working on a project, it will be really tough to replace that individual until the project ends. This timeline might span from few months to a few years depending on the nature of the project and the specific job role of the individual. The objective of this study was to identify the expectations of employers on the technical, personal, educational and general competencies of employees that holding an IT degree to draw differences between individual and teamwork settings according to the identified competencies.

This research is an explanatory research in which 23 variables were selected to analyze, and they were categorized into 7 categories as technical competencies, personal competencies, educational competencies, general competencies, individual work setting, teamwork setting and general performance expectations. One hundred and twenty (120) responses were collected through Survey using judgmental sampling method, and eight (8) of them were removed after identifying as outliers. Total of one hundred and twelve (112) responses were analyzed using correlation test to see the relationship between independent and dependent variables and compare them among individual and teamwork settings.

Among technical competencies, software development process, software development methods, software development solutions have a significant relationship with individual work while adaptability was also significant in teamwork setting along with software development processes, software development methods, and software development processes. Only leadership skills were significant in individual setting when considering Personal competencies, and there were no correlation with any skills in teamwork setting at all. Language and project have a significant relationship with Individual work setting, and there are no skills were significant with teamwork setting in educational competencies. According to the results of general competencies, test results contrasted that there are no skills which have significant relationship with either individual work setting or teamwork setting.

Limitations to this study can be identified, such as respondents have a lack of time with their busy work schedules and chances of meeting IT professionals were decreased due to security reasons implied in Sri Lanka lately. Future researchers can increase the sample size as well as go with an In-depth analysis, and using non-linear regression is also possible with this study.

Furthermore, authors believe that, the study will help employers as well as new IT graduated employees to find out which skills need to be tested more as well as which skills need to be improved. It will be an essential guide for the graduates themselves in self-improving their skill set as they look forward to a successful career in a renowned IT company. They will have a better idea about which areas of competencies they should be improving and which competencies will not affect their career success.

References Références Referencias

1. Aasheim, C. L., Williams, S., & Butler, E. S. (2009). Knowledge and Skill Requirements for it Graduates. Journal of Computer Information Systems, 49(3), 48-53. doi:10.1080/08874417.2009.11645323
2. Acuña, S. T., Gómez, M. N., Hannay, J. E., Juristo, N., & Pfahl, D. (2015). Are team personality and climate related to satisfaction and software quality? Aggregating results from a twice replicated experiment. Information and Software Technology, 57, 141-156. doi:https://doi.org/10.1016/j.infsof.2014.09.002
3. Akman, I., & Turhan, C. (2018). Investigation of employers' performance expectations for new IT graduates in individual and team work settings for software development. 31(1), 199-214. doi: doi:10.1108/ITP-01-2017-0020
4. Andrews, J., & Higson, H. (2008). Graduate Employability, 'Soft Skills' Versus 'Hard' Business Knowledge: A European Study (Vol. 33).
5. Balamohan, P., Tech, M., & Dr.S, G. (2015). Emotional Intelligence – Its Importance and Relationship with Individual Peformance, Team-Effectiveness, Leadership and Marketing Effectiveness (Vol. 6).
6. Belwal, R., Priyadarshi, P., & Al Fazari, M. H. (2017). Graduate attributes and employability skills: Graduates' perspectives on employers' expectations in Oman. 31(6), 814-827. doi: doi:10.1108/IJEM-05-2016-0122
7. Cheong, K.-C., Hill, C., Fernandez-Chung, R., & Leong, Y.-C. (2016). Employing the 'unemployable': employer perceptions of Malaysian graduates.

Studies in Higher Education, 41(12), 2253-2270. doi:10.1080/03075079.2015.1034260
8. Chhinzer, N. (2018). An exploration of employer perceptions of graduate student employability. Education + Training, 60(1), 104-120. doi: 10.1108/ET-06-2016-0111
9. Clark, M., Zukas, M., & Lent, N. (2011). Becoming an IT Person: Field, Habitus and Capital in the Transition from University to Work (Vol. 4).
10. Gerhan, D. R., & Mutula, S. M. (2007). Testing a recent model of ICT in development: Botswana and its university. Information Technology for Development, 13(2), 177-197. doi:10.1002/itdj.20060
11. Hernández-March, J., Martín del Peso, M., & Leguey, S. (2009). Graduates' Skills and Higher Education: The employers' perspective. Tertiary Education and Management, 15(1), 1-16. doi:10.1080/13583880802699978
12. Islam, T. (2015). Graduates' expectation gap: the role of employers and Higher Learning Institutes. Journal of Applied Research in Higher Education, 7(2), 372-384. doi:10.1108/JARHE-05-2014-0056
13. Jackson, D. (2012). Non-technical skill gaps in Australian business graduates. Education + Training, 54(2/3), 95-113. doi:10.1108/00400911211210224
14. Jackson, D. (2014). Undergraduate perceptions of the development of team-working skills. Education + Training, 56(1), 7-20. doi:10.1108/ET-01-2013-0002
15. Jusoh, M. (2011). Expectation gaps, job satisfaction, and organizational commitment of fresh graduates. Education + Training, 53(6), 515-530. doi:10.1108/00400911111159476
16. Lunn, K. (2003). Software Development Life Cycle. In K. Lunn (Ed.), Software Development with UML (pp. 53-68). London: Macmillan Education UK.
17. Mardis, M. A., Ma, J., Jones, F. R., Ambavarapu, C. R., Kelleher, H. M., Spears, L. I., & McClure, C. R. (2018). Assessing alignment between information technology educational opportunities, professional requirements, and industry demands. Education and Information Technologies, 23(4), 1547-1584. doi:10.1007/s10639-017-9678-y
18. Martensen, A. (2009). Quality in higher education: linking graduates' competencies and employers' needs. International Journal of Quality and Service Sciences, 1(1), 67-77. doi:10.1108/17566690910945877
19. McMurray, S., Dutton, M., McQuaid, R., & Richard, A. (2016). Employer demands from business graduates (Vol. 58).
20. Md Saad, M. S. (2014). Employers' perceptions of important employability skills required from Malaysian engineering and information and communication technology (ICT) graduates (Vol. 16).
21. Mukhtar, M., Yahya, Y., Abdullah, S., Hamdan, A., Jailani, N., & Abdullah, Z. (2009). Employability and service science: Facing the challenges via curriculum design and restructuring.
22. Nair, C. S., Patil, A., & Mertova, P. (2009). Re-engineering graduate skills – a case study. European Journal of Engineering Education, 34(2), 131-139. doi:10.1080/03043790902829281
23. Nicolescu, L., Păun, C. J. T. E., & Management. (2009). Relating Higher Education with the Labour Market: Graduates' expectations and employers' requirements. 15(1), 17-33. doi:10.1080/13583880802700024
24. Osmani, M., Weerakkody, V., Hindi, N. M., Al-Esmail, R., Eldabi, T., Kapoor, K., & Irani, Z. (2015). Identifying the trends and impact of graduate attributes on employability: a literature review. Tertiary Education and Management, 21(4), 367-379. doi:10.1080/13583883.2015.1114139
25. Paguio, R. (2016). Teamwork from accounting graduates: what do employers really expect? Accounting Research Journal, 29(3), 348-366. doi:10.1108/ARJ-05-2014-0049
26. Shah, M., Grebennikov, L., & Nair, S. (2015). A decade of study on employer feedback on the quality of university graduates (Vol. 23).
27. Stevens, M., & Norman, R. (2016). Industry expectations of soft skills in IT graduates: A regional survey.
28. Tay, A. (2001). Management's perception of MBA graduates in Malaysia (Vol. 20).
29. Tickle, L., Kyng, T., & Wood, L. N. (2014). The role of universities in preparing graduates to use software in the financial services workplace. International Journal of Mathematical Education in Science and Technology, 45(2), 200-213. doi:10.1080/0020739X.2013.790518
30. Vilapakkam Nagarajan, S. (2014). The Relevance of University Studies to Professional Skills Requirements of IT Workplaces: Australian IT Graduates' Work Experiences (Vol. 2).

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The Human Side of Information Security when Technical Controls Fail

By Whyte Stella Tonye
Walden University

Abstract- The misuse of information has significantly impacted negatively on both individuals and organizations security. The technical side of security controls is critical in an organization's security system. This paper provides insight into some information security using the human side and other measures to protect the system. The paper also describes the technical control measures that are intended to meet the protection requirements of a system. Technical controls are security controls executed in the computer system. The controls provide automated protection from unauthorized access or misuse, facilitate detection of security violations, and support security requirements for applications and data. Since Implementation of technical controls, however, requires significant operational considerations it should, therefore, be consistent with the management of security.

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The Human Side of Information Security when Technical Controls Fail

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Abstract- The misuse of information has significantly impacted negatively on both individuals and organizations security. The technical side of security controls is critical in an organization's security system. This paper provides insight into some information security using the human side and other measures to protect the system. The paper also describes the technical control measures that are intended to meet the protection requirements of a system. Technical controls are security controls executed in the computer system. The controls provide automated protection from unauthorized access or misuse, facilitate detection of security violations, and support security requirements for applications and data. Since Implementation of technical controls, however, requires significant operational considerations it should, therefore, be consistent with the management of security.

I. Introduction

Cybercrime is a serious business

According to Furman, Theofanos, Choong, and Stanton (2012) each year more than 9 million U.S. residents are victims of identity theft, of which cyber attacks cost about $8 billion per year causing economic damage to the nation. Not all cybercrimes are committed by strangers as is often with phishing scams (Kirlappos & Sasse, 2012; Sheng, Holbrook, Kumaraguru, Cranor & Downs, 2010). Sometimes cybercrimes are carried out by insiders with intimate knowledge of the systems and co-workers from whom they steal. Themay not be detected by computer-automated technical controls like the fire and forget scripts alone may not detect these crimes. The human side information security is critical, apart from the applied focus on technology, achieving IT security is more than just a technical problem. There is a need to increasingly involve the active participation of human to securely design, deploy, configure, and maintain the system (Funel & Clark, 2012).

Nigeria now embraces technology to solve its information security challenges although faced with the upsurge in cyber terrorism and corruption. The country's stage of corruption hindered national development which has become a critical challenge factor to be considered when selecting and recruiting reliable personnel as technical controls. It is important to understand that human elements and other factors could impact global threats or undermine information and national security as well as international security in the country. The awareness of these challenges and introducing appropriate policy and training will provide critical guidance to Nigeria information security and other developing countries in a way that could lead to significant long-term improvements in information security management, procedures, the overall security of facilities, organizations infrastructure, and prevent risks that may be posed by these challenges. Organizations should implement SETA programs to detect and reduce technical control failures using the human side to effect safe, secure, and unhindered application of information security (Dahunsi, Ariyo, Stainback, and Hall, 2017). The paper suggests a strategy for conducting SETA programs for National information security assessment and evaluation as steps preceding the development of a SETA program considering the rate of technical control failures across the country.

Whenever both internal and external controls are implemented lackadaisically, there is always a huge financial loss in an organization. Risks occur when management does not understand the technical controls they have put in place or adequate staff maintenance of these controls.

Cases of internal fraud occurs when poor trading mistakes are made by investors who could not admit their mistakes on bad business decisions. Over 90 Nigerian banks with state government's participation and privately owned banks failed in the 1990s as a result of excessive operating expenses, inadequate credit administration, interest rate speculation, asset mismatching, weak controls, fraud and forgeries an overtly aggressive growth policy abandonment of prudent banking, persisted in those banks (Ugoani, Amu, & Emenike, 2014). According to Dhillon & Moores, (2001), Toshihide Iguchi, a bond trader of Japan's Daiwa Bank for the New York office made trading mistakes that lead to over $1.1 billion in accumulated losses from 1984 through 1995, which he felt he could not admit. As the losses mounted, so did his cover-ups and exploitation of Daiwa's poor information security and accounting controls. Eventually, the Federal Reserve and U.S. Attorney's Office got involved once the scandal broke in the news, and Daiwa Bank lost its charter to do business in the U.S.

Author: *Walden University. e-mail: stellawhyte@outlook.com*

Examples of some Banking Institutions and their control problems

Institution	Problem	Remedy
Nigeria Government-owned banks	Fraudulent practices, Undue reliance on FX, no internal controls Blinded by fake "profits."	Only competent and qualified personnel to handle Bank management. Enforce timely bank record examinations. Perform internal and external financial audits.
Barings Bank	Not conservative	Don't hire financially risky people -- do background checks, and audit performance.
	Lack of segregation of internal controls	Do not place all reporting in the hands of a single role.
Daiwa Bank	Too much employee trust	Don't trust your employees to always make the best choices.
	Corporate culture	Change cultural practices so that it is not as embarrassing for employees who make mistakes.
All Banks	Lack of Information Security and accounting audits	Hire and train better information security auditors and accounting auditors.

II. Summary

In summary, the lessons derived from the lapses from the above-mentioned banks is that technical controls need to be manned and reviewed by humans, automation alone cannot be relied on. Furthermore, since money is involved, formal accounting controls systems should be instituted and followed. Informal controls which are the third sets of controls are less expensive than both technical and formal controls. These controls center around increasing employee awareness, ongoing education, training, and management development programs that grow a sub-culture. Informal controls foster awareness of what is going on, but not be so punishing as to cause employees to refrain from admitting when they make mistakes.

Businesses can do a few other things to reduce insider threats, this can be done by (i) hardening the financial systems; (ii) increase logging and reduce anonymity; (iii) reduce stress and frustrations (iv) assist and implement compliance; and (v) dismantle peer-pressure to prevent cover-ups in the workplace. (Willison, 2006). Ironically, while some humans make mistakes, others can also catch some of these mistakes better than some forms of automation. Nevertheless, the insider threat is always present and likely will be with us for quite some time. However, when designing and deploying security solutions for organizations, it is important to take the user into consideration. To protect company assets, it is important to secure hiring practices, roles, policies, standards, guidelines, procedures, risk management, awareness training, and management planning must all contribute to protecting assets. The use of these security structures provides some protection from the threat humans present against your security solutions.

Iterating from Furman, Theofanos, Choong, and Stanton's (2012) article, participants were already acquainted with the security symbols and trust marks although Kirlappos and Sasse (2012) expressed that security training on phishing offers little assurance to clients who survey a possibly pernicious site in this attitude. Security instruction needs to consider the drivers of customer conduct, in this circumstance the prompts consumers search for and how they decipher them. Successful security awareness, education, and preparing must accomplish more than caution clients of perils they should focus on the confusions that underlie consumer activities. Even though we concentrate on phishing, a leap of change could help security scientists and specialists grow more robust security training, instruction, and preparation in different ranges of computer security. Instructive campaigns should first comprehend clients' impression of computer and online security for it to be compelling (Furman et al., 2012). Current instruction and preparation endeavors do not make impacts because they expect that clients are quick to stay away from risk and hence prone to embrace practices that may secure them. Cybercriminals just post their website with malevolent substance on the web, and then utilize site design improvement procedures to have it ascend to the top when you look at the invented organization. More robust training must be carried out to supplement any specific anti-phishing measures to enhance clients' capacity to recognize phishing locales. Compelling security training needs to test clients' presumptions about trust signals and their choice procedures and supplant them with trust signs and systems for surveying risk in an online situation (Kirlappos et al., 2012).

The initial move toward viable client instruction is to perceive that awareness, training, and preparation is the three particular strides procedure to enhance client ability. Clients should be pulled to considerations and to help them understand that there are issues that may influence them. Training is an important step to make clients responsive to instruction and preparation measures. The use of solid visual components or silliness should be utilized to catch clients attention to enable security awareness (Kirlappos et al., 2012). Having a workforce taught and more attentive of security regions resemble growing the Information Security division into the entire organization. It gives the Security

Director or Chief Information Security Officer (CISO) a more extensive base of mental aptitude in which they can tap if necessary. Completing a security education training and awareness (SETA) programme can be seen as a piece of risk administration. By incorporating security and risk management into the organization and its continuous procedures, these vital capacities will turn into a method for working together. By having uneducated workers, an organization is going out on a limb inputting the security of the whole association under the control of not very many security experts that can't ultimately secure the data with just the assistance of innovation. This risk can significantly minimize through the execution of an effective SETA program (Hight, 2005).

Users should receive training when they first enter an organization, and they should receive periodic refresher training, even if it's just an email from the administrator reminding them of the threats. The human side of information security is significant, though in spite of the implied focus upon technology, achieving IT security is more than just a technical problem, there is a need to increasingly involve the active participation of human to design, deploy, configure and maintain systems securely. (Furnell & Clarke, 2012).Fundamental controls are significant to our networks, but they are not complete without the human side of information security. Since the devices and infrastructure, we use to share and retrieve information has changed the way we protect this information and the users who depend on them should also change (Thompson, 2013). Fundamental controls like antivirus, firewalls, and online security are not enough and as important and sufficient as human controls. Both hackers and other information security criminals have exploited the human side of information security and so should be protected or guarded. The people who use, administer, and operate accounts in computer systems are the weakest link in the security chain.

Several organizations data have been compromised as a result of mere users bad choice of decision making as they click the email which may have links that send the user to a dangerous site in the internet or page. Sometimes using an infected USB stick, using a personal device to connect to public sites that may be difficult for organization's security detection and receiving physical mail may also be very dangerous to the organizations' data. There is always a warning on not clicking on links in emails, links are dangerous. It has been observed that humans are more at the edge while intruder and attackers are the closest to you and know you more than you think. Attackers have begun to personalizing their attacks, so we should also personalize our defense. The human element of information security should be embraced and not ignored (Thompson 2013).Furman, Theofanos, Choong, & Stanton (2012), stated that more than 9 Million US residents become victims of identity theft costing the US economy an estimate of $8 Billion a year. Humans are often unaware of the risks and therefore not equipped to use available tools to manage them. The use of protection updates, security sets, and installation of firewalls, spyware, and antivirus must be well understood and managed properly by uses of networks should be used to mitigate risks. Users need to be educated to be aware and to employ sound practices routinely. To do this and change user's perception of security, Furman et al., (2012) suggested three ways to change user's behavior.

1) Awareness – Capture users attention and interest.
2) Education - Understand users correct knowledge base.
3) Training – Provide adequate skill set.

Human behavior needs training and reconstruction of a new mental model. Despite technical control measures, people with authentic access may behave in ways that put an organization data, system, and business at risks with unrepairable destructions. A human inside attacker may be someone who is entrusted with authorized access that manipulates system access to exploit it or removes organizations' data in any way. Security is heightened by organizations setting security policies and accurately implementing it (Pfleeger et al., 2010). According to Sheng, Holbrook, Kumaraguru, & Downs(2010), when their users have prior exposure to phishing education, they will be less susceptibility to phishing, this means that there will be less clicking on legitimate websites and reduce giving out information that may be used by attackers. Sheng et al. iterated that gender and age are the two key demographics that predict phishing susceptibility, especially women clicking on links in phishing emails more easily than men. Women have less technical training and less technical knowledge than men; also, users at the age between 18 and 25 are much more likely to fall for phishing than the others. As participants in this age group have lower education level, and younger on the Internet so have less exposure to training materials and more susceptible to risks as stated by other researchers in Sheng et al.,'s (2010) study. The introduction of the SETA programs to provide anti-phishing education and training to high school and college students can mitigate risk.

According to the Flynn (n.d), organizations may not be able to protect the integrity availability and confidentiality of information in this present day highly networked systems environment without ensuring that its employees are involved in understanding their roles and responsibilities and are adequately trained to perform these responsibilities. Stallings and Brown (2012, 2nd Ed.) stated that there should be an emphasis on the importance of security awareness policy document provided to all employee. This policy should

be established to employees that participate in the awareness program is compulsory, and that sufficient fine will be given to all employee who does not participate in the awareness activities. The SETA program is for all users in an organization with a specific program for their jobs and level of technical expertise while the responsibility to organize this program is on the Chief Information Officer (CIO) (Flynn n.d). Failures in information security technical controls can be avoided or mitigated with strong Security Education, Training and Awareness (SETA) programs. The UK Office of Fair Trading launches a campaign aiming at increased consumer consciousness to make shopping websites by launching successful security awareness in websites and newsletters. The security education, training, and awareness program will do more than just warning users of dangers. These awareness programs also target the misconceptions that underline the user's action. (Kirlappos and Sasse, 2012). Organizations should also keep in mind, not to overload users with too many details and information but to help users understand their role in information securely and how they can mitigate risks, providing information early and making the programs formal. (Flynn, n.d).Researchers and practitioners recognize the need for business leaders to establish adequate internal control frameworks. Small and Medium Enterprises (SME) leaders lack strategies for improving internal control systems. The purpose of this case study was to explore the strategy leaders of SMEs in Nigeria use effective controls to improve internal control practices. Building on the internal control theory and transactional leadership theory, semi-structured face-to-face, and phone interviews were conducted with eight purposively-selected leaders of SMEs in Nigeria who successfully implemented internal control practices. Themes that emerged from the thematic analysis of the interview data include segregation of duty; processes adherences, policies, and procedures; staffing, training, and experience; information technology; and staff empowerment and management commitment. (Aladejebi, 2017) The result of this study shows that leaders of companies in Nigeria use similar strategies for the improvement of their internal control practices. The participants used segregation of duty and adherence to processes, policies, and procedures as strategies for improving internal control practices. Findings of this study could contribute to positive social change by providing organizations with knowledge on strategies to improve internal control practices which will minimize loss of assets and boost profitability and business sustainability. Increase in business profitability, stakeholders will increase the firms' corporate social responsibility (CSR) through payment of more taxes, and provision of employment opportunities and social amenities to the local community (Aladejebi, 2017).

a) Purpose of the SETA Program

1) Improve organization security
2) Holds employees for their actions by communicating the policy to their users.
3) Encourage security feedback
4) To change employee security culture
5) Help in developing security skills and knowledge so that users can perform their jobs using IT system security
6) More awareness of the need to protect system resources.
7) To enable the employee to focus on security.

b) Benefits of SETA programs

1) Improve Employee behavior.
2) Increase ability to hold employees accountable for their actions.
3) Mitigate companies responsible for an employee's behavior.
4) Complying with regulations and infrastructural objectives (Stallings and Brown 2012)

c) 4 Ways by which Organizations can implement SETA programs

1. One to one interactions on security awareness
2. Use of Webinars
3. Group training
4. Computer-based training

III. Future Consideration

Future examination ought to recognize the attituded that will help clients in building the proper cybersecurity mental models. A complete mental model would empower users to comprehend with the viability of the ways of dealing with stress and precisely assess analogies that they convey from the physical world to the virtual world (Furman et al., 2012)

IV. Conclusion

In conclusion, the paper discusses the technical side of Information Technology and the worry researchers, administrators, and managers have concerning insider attackers where people with legitimate access behave badly and put organization's data at risk with unwelcome consequences. A lesson was learned from the example of the Hard Disk: Naive User and Absent Policy shows that sometimes security can be threatened by well-intended insiders indicating that security education, training, and awareness program is meant for all users in an organization with a specific program for their jobs and level of technical expertise. Technical controls are only part of a total security awareness program. When information security professionals only focus on technology, the human side can often be overlooked, with potentially devastating consequences. Hackers and other information security

criminals have exploited this human side at least as often as they have breached technical controls. The cost of this exploitation to organizations and individuals has been staggering. One reformed hacker, Kevin Mitnick said that companies spend millions of dollars on firewalls, encryption, and secure access devices and it's money wasted because none of these measures address the weakest link in the security chain: the people who use, administer, operate and account for computer systems (Cyber Attack, 2000).

References Références Referencias

1. Aladejebi, A.O. (2017). Strategies for Improving Internal Controls in Small and Medium Enterprises in Nigeria.Walden Dissertations and Doctoral Studies. Retrieved from Http//scholarworks.walden.edu/dissertations/4708
2. Dahunsi, Stephen OlumuyiwaAriyo; Auxier, John D. II; Stainback, Joseph Ruric IV; and Hall, Howard Lewis (2017) "Aligning Technology, Policy and Culture to Enhance Nuclear Security: A Comparative Analysis of Nigeria and the U.S.," International Journal of Nuclear Security: Vol. 3: No. 1, Article 7. Retrieved from http://trace.tennessee.edu/ijns/vol3/iss1/7.
3. Dhillon, G. (2001). Violation of safeguards by trusted personnel and understanding related information security concerns. Computers & Security, 20(2), 165-172.
4. Dhillon, G., &Moores, S. (2001). Computer crimes: theorizing about the enemy within. Computers & Security, 20(8), 715-723. Doi:10.1016/S0167-4048(01)00813-6
5. Flynn, J. (n.d). Implementing Security Education, Training, and Awareness Programs. Retrieved fromhttp://slideplayer.com/slide/10501090/
6. Furnell, S., & Clarke, N. (2012).Power to the people? The evolving recognition of human aspects of security. Computers & Security, 31(8), 983–988. Retrieved from the Walden Library databases.
7. Furman, S. M., Theofanos, M. F., Choong, Y.-Y., & Stanton, B. (2012).Basing cyber security training on user perceptions. IEEE Security & Privacy, 10(2), 40–49. Retrieved from Walden Library Database.
8. Hight, S. (2005). The importance of security, education, training, and awareness program (November 2005). *City of Raleigh*, 1-5. Retrieved from http://www.infosecwriters.com/text_resources/pdf/SETA_SHight.pdf
9. Kirlappos, I., &Sasse, M. A. (2012). Security education against phishing: A modest proposal for a major rethink. *IEEE Security & Privacy, 10*(2), 24–32. Retrieved from the Walden Library databases.
10. Olufemi, A.A (2017). Strategies for Improving Internal Control in Small and Medium Enterprises in Nigeria. Walden University Dissertation and Doctoral study.
11. Sheng, S., Holbrook, M., Kumaraguru, P., Cranor, L. F., & Downs, J. (2010). Who falls for phish? A demographic analysis of phishing susceptibility and the effectiveness of interventions.CHI '10 - Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 373–382.
12. Sheng, S., Holbrook, M., Kumaraguru, P., Cranor, L. F., & Downs, J. (2010). Who falls for phish? A demographic analysis of phishing susceptibility and the effectiveness of interventions.CHI '10 - Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 373–382.Retrieved from the Walden Library databases.
13. Stallings W. & Brown, L. (2012). Computer security: Principles and practice. 2nd Ed. Pearson.
14. Thompson, H. (2013). The human element of information security. *IEEE Security & Privacy, 11*(1), 32–35. Retrieved from the Walden Library databases.
15. Ugoani, J. N. N. (2014). Poor Management and Failed Banks: A Study of Banks with State Governments Participation in Nigeria. International Journal of Economics, Commerce and Management United Kingdom. 2(2),
16. Willison, R. (2006). Understanding the perpetration of employee computer crime in the organizational context. Information and organization, 16(4), 304-324. doi:10.1016/j.infoandorg.2006.08.001.

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Impact of Critical Success Factors on ERP Implementation: Typical Organizations in Sri Lankan Context

By Anuradha Jayakody, E.M.M.N. Samaranayake, Punchihewa N.N.W.G, B.V.R. Jeewantha & H.N.I. Wijesiri
Sri Lanka Institute of Information Technology

Abstract- Enterprise Resource Planning system is a software that suitable for the user to earn more ROI by involving business activities. By the way, most organizations are still afraid to adopt this to their organizations. The reason is the high-cost wastage, and also bankruptcy. But it is not true at all the time. ERP can implement to small and medium-sized organizations too.

To clarify these points, the paper focuses on the critical factors that affect the success of an ERP implementation process. It will do by a conceptual framework. It review and assertion of 15 hypotheses will carry out using "structural equation modeling technique". The definition of multi-variable technology used since the ability to check multiple linear connections at once simultaneously depends on one or more variables dependently and independently

Index Terms: *enterprise resource planning, critical success factors, stakeholders*.

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Impact of Critical Success Factors on ERP Implementation: Typical Organizations in Sri Lankan Context

Dr. Anuradha Jayakody [α], E.M.M.N. Samaranayake [σ], Punchihewa N.N.W.G [ρ], B.V.R. Jeewantha [ω] & H.N.I. Wijesiri [¥]

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I. Introduction

With the advancement of information technology, the way enterprises do business has become automated. It has been going non-stop for nearly a decade. Simply the manual operations became an e-operations. There are many interpretations of ERP. Websites, magazines, and even manual analysts interpret this to their liking. These changes, in turn, show a different connotation of the benefits it can achieve. There are those who take advantage of it as well as the disadvantages. Some are bankrupting their businesses. Despite these results, this system still holds a huge place in the business world

For years, scholars have identified the ERP solution as the best solution for businesses. It identifies business needs and provides the right solutions that can increase business productivity. These software packages are known for their ability to integrate all of a company's information needs within a single computer system (Shivam Gupta, 2017). As a return, this gives management a better overview of all of the company's operating and managing activities(David L. Olson a, 2018).

The process of handling the ERP system is a well-studied task. That's because it's so hard. There are several factors that affect any function of proper management(Kevin J. Trainor a, 2010). This study seeks to identify the success factors that can affect small and medium enterprises in Sri Lanka. Considering this, we will try to look at some factors to study how ERP can be successfully built and utilized. We also look at the effectiveness of these factors in the eyes of stakeholders. We are trying to identify the positive factors that affect to any enterprise in Sri Lanka. Research questions of the study will overcome the objectives of the research by testing a conceptual framework.

a) ERP System

ERP is a business management software that can use to a unified application to conduct the business and automate many back-office functions related to human resources, technology, and assistance (Ehie and Madsen, 2005). Typically, ERP software integrates with all interfaces to an application, including product planning, improvements, products, sales & marketing, and the user interface.

"ERP systems are software packages that integrate business processes across an organization"(Abu-Shanab et al.). It integrates information from each unit of the company into a single database and provides access to interfaces for effective communication(Abu-Shanab et al.).

According to IT, ERP is one of the most innovative development and is considered the best IT solution that an organization can adopt in the last few decades(Shatat, 2015). With the most appropriate IT solution, the ERP system becomes one of the core needs of the e-business era, and thus, the ERP is the backbone of the e-business era(Shatat, 2015).

Many small and medium-sized companies fear to adopt ERP solutions because of the high cost. According to the benchmark survey, 42% of companies establish an ERP process without analyzing their financial position, and the ROI of the new device cannot

Author α: Senior Lecturer Faculty of computing| Information systems engineering, Sri Lanka Institute of Information Technology.
e-mail: anuradha.j@sliit.lk
Author σ ρ ω ¥: SLIIT Business School Undergraduate, Sri Lanka Institute of Information Technology.
e-mails: mnayani.samaranayake@gmail.com, navun100@gmail.com, Rashmika.rj7@gmail.com, nadeeka.w77@gmail.com

be calculated (Jacobson, 2015). To prepare for such a move, organizations need to understand the implementation and involvement of the ERP.

b) ERP Implementation Cost

The concept of adoption applies not only to custom software but also to the packages available in the market. Most studies on application package implementation highlight the criticality of the adoption process (Hong et al., 2002). Organizations needed extensive knowledge and outside support when they started using ERP software. Therefore, they have to bear not only the purchase cost but also the cost of support.

ERP implementing value is high. There should be a better understanding of the high costs involved in implementing ERP. It is also necessary to assess whether it is appropriate to take such a step(Kumar, 2011). As with continuous employee training, it is very important to keep in touch with the vendor, until the application is familiar with the business. ERP implementation prices costs embody coaching of employees the customization of the system to suit with existing firm interfaces (Ahmad, 2013).

In small to mid-sized firms, ERP implementation budget around ranges from $m2 to $M4, for large organizations, it will exceed $M100. Furthermore, and when the implementation of ERP systems, wherever some organizations gain several edges and reach some competitive advantage, others encounter costly failures(Emad Abu-Shanab, 2015).

Many ERPs fail because the ERP software package is not working properly, resulting in financial losses, and bankruptcy(Emad Abu-Shanab, 2015). For example, Dell suffered a financial loss of about $ M200 when the ERP system was built for two years(Wu, 2008).

c) Critical Success Factors (CSFs)

CSFs are the trail creator to implement ERP with success by resolution the cost failures. CSFs embody prime management support, vendor's support, consultant's competence, user's support, IT capabilities, and project management leadership(Emad Abu-Shanab, 2015).

On the other hand, the system's initial implementation is initially. The second criterion is to include institutional and technical aspects into a system, and ultimately, the factors that affect successful implementation.CSF could be an essential issue or activity for a business or organization's success.

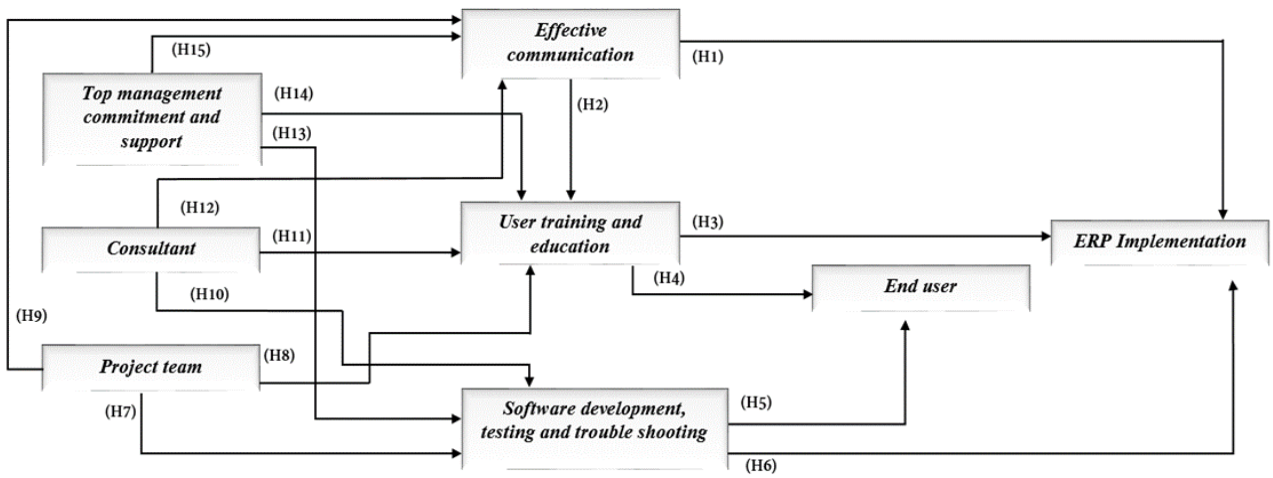
User training and external consultancy as vital factors for successful ERP implementation(Koh, 2009). CSF assists managers directly affect a particular outcome, by proactively taking necessary actions inbound areas (Prodromos Chatzoglou, 2016).

d) Difficulties Facing of ERP Adoption

Before beginning an ERP implementation process, organizations ought to prepare a practicableness study of ERP adoption (Emad Abu-Shanab, 2015). The matter of describing the requirements: the developers' tries to develop the system in line with users' would like, wherever users fail to establish what users want (Shatat). A group of researchers classified ERP outcomes into monetary edges (reduction in operating, administrative and inventory costs), and non-financial edges (reduction of knowledge errors, facilitating info sharing, client satisfaction, and rising efficiency)(Chand, 2005).

(Sammon, 2010) identified a set of ERP implementation problems areas: Failure to acknowledge change is one of the most likely issues to be found throughout the so-called ERP implementation section. Eligibility is another potential shortcoming across the implementation sector that indicates failure of process clear project objectives. Such issues can reduce the level of performance. Fails to educate all workers about the ERP project or provide adequate rights and adequate resources for such needs. And finally, Failure to set the right plan for action and determine the ERP budget.

II. Conceptual Framework



III. Hypothesis of the Study

H1: The positive relationship between Effective Communication and ERP Implementation

H2: The positive relationship between Effective Communication and User Training and Education

H3: The positive relationship between User Training and Education and ERP Implementation

H4: The positive relationship between User Training and Education and End User

H5: The positive relationship between Software development, testing, and troubleshooting and End User

H6: The positive relationship between Software development, testing, and troubleshooting and ERP Implementation

H7: The positive relationship between Project Team and Software development, testing, and troubleshooting

H8: The positive relationship between Project Team and User Training and Education

H9: The positive relationship between Project Team and Effective Communication

H10: The positive relationship between Consultant and Software development, testing, and troubleshooting

H11: The positive relationship between Consultant and User Training and Education

H12: The positive relationship between Consultant and Effective Communication

H13: The positive relationship between Top Management Commitment and Support and Software development, testing, and troubleshooting

H14: The positive relationship between Top Management Commitment and Support and User Training and Education

H15: The positive relationship between Top Management Commitment and Support and Effective Communication

IV. Significance of the Study

When considering business behavior, ERP is a new management technology that demands an integrated approach. According to improvements in performance, companies are always looking to use this technology, but the company needs to understand what it is for (Chang et al., 2008).

Although if it is not voluntary the use of ERP system, the understanding about the ERP system helps organizations to prepare, their employees to face a new challenge and learn to use new technologies.

We have proposed a conceptual framework to analyze the factors influencing the use of the ERP system. The usage of that framework based on past research showing the importance of critical factors in the use of technology.

Enterprise Resource Planning (ERP) systems have built up a promise for integrating business processes and have proven their value in different organizations.

Therefore, according to the increase of productivity and cost-saving, they have achieved in the face of usability problems (Topi et al., 2005). Most of the time, we can hear anecdotes about the difficulties while using ERP systems, but there is little documentation about problems typically faced by users.

The purpose of this research is to identify what are the factors that influence the proposed framework. Also, this study considers the promise of using collaboration theory to evaluate the usability characteristics of existing systems and to new system designs.

According to the impressive results already achieved by some organizations with these systems, if understanding how to use them, imagining how much more would be possible wasn't such an overwhelming task (Topi et al., 2005).

Furthermore, this research examines what are the factors facilitate or not facilitate the success of ERP projects and what can bring problems to ERP projects.

Business processes change theory is based on a case study methodology to compare successful implementation or failure implementation (Motwani et al., 2002).

V. Summary

ERP is a useful tool if the company uses it with an idea. Some organizations still have no idea about the ERP, and some are afraid to admit it to their organizations. Surrounding the community, they think the ERP will cost more and will incur losses. It is a study of how well it works if factors are used accurately.

References Références Referencias

1. Ahmad, M. &. (2013). Critical Success factors for ERP implementation in SME. *Robotics & computer-intergrated Mnufacturing, 29(3)*, 104-111.
2. Chand, H. H. (2005). A Balanced Scorecard Based Framework for Assessing the Strategic Impacts of ERP systems.
3. David L. Olson a, ∗. ,. (2018). Robotics and Computer–Integrated Manufacturing. 30-36.
4. Emad Abu-Shanab, R. A.-S. (2015, January). Critical Success Factors for ERP Implementation: The Case of Jordan. *International Arab Journal of e-technology, 4*. Retrieved September 5, 2013
5. Kevin J. Trainor a, A. R. (2010). Industrial Marketing Management.
6. Koh, S. G. (2009). The demand for training and consultancy investment in SME-Specific ERP systems implementation and Operation. *International journal of production Economics*, 241-254.

7. Kumar, A. &. (2011, july). Critical Success Factors in ERP Implementation in India. *International transactions in applied sciences., 4(2)*, 271-280.
8. Kyung-Kwon Hong, Y. G. (2002). The critical success factors for ERP implementation : An organizational Pespective. 25-40.
9. Prodromos Chatzoglou, D. C. (2016). Critical Success factors for ERP implementation in SMEs. *Proceeding of the Federated Conference on Computer Science and Information Systems, 8*(2300-5963), 1243-1252. doi:10.15439/2016F37
10. Sammon, A. F. (2010). Project Praparedness and the Emergency of Implementation Problems in ERP Projects. 1-8.
11. Shatat, A. S. (n.d.). Critical Success Factors in Enterprise Resource Planning (ERP) System Implementation:.
12. Shivam Gupta, S. K. (2017). Role of cloud ERP on the performance of an organizationContingent resource-based view perspective. *The International Journal of Logistics Management, 29*, 659-675. doi:10.1108/IJLM-07-2017-0192
13. Wu, L. O. (2008). Active ERP Implementation Management: A real option perspective. *The journal of systems and Software*, 1039-1050.

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Academicians' Acceptance of Online Learning Environments: A Review of Information System Theories and Models

By Asanka Gunasinghe, Junainah Abd Hamid, Ali Khatibi & SM Ferdous Azam

Management & Science University

Abstract- Aim of this paper is to review technology (IS) acceptance theories and models, recognizing empirical evidence available to support the suitability of each theoretical model in explaining academicians' acceptance of online learning technology. Understanding the factors influencing system usage is crucial for decision-makers to recognize potential user needs and concerns, which could be addressed during the development phase of a system. Thus, for decades, researchers have been trying to understand why people accept new technologies. As a result, a wide variety of theories and models explaining the concept of technology acceptance. Some prominent theoretical models explaining technology acceptance are, "Theory of Reasoned Action", "Diffusion of Innovation theory", "Theory of Planned Behavior", "Social Cognitive Theory", "Technology Acceptance Model", "Model of PC Utilization", "Motivational Model", "Unified Theory of Acceptance and Use of Technology", "UTAUT 2", "UTAUT 3". The concept of academic's acceptance of online learning technology can be explained through several determinants that are operationalized through above information systems models.

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I. Introduction

Academic acceptance of online learning environment is a topical research trend in the information system (IS) acceptance domain(Mirzajani, Mahmud, Fauzi Mohd Ayub, & Wong, 2016). In IS literature, the online learning environment is also referred to asa virtual learning environment, eLearning technology, Learning management system, or Content management system(Phungsuk, Viriyavejakul, & Ratanaolarn, 2017). The online learning environment is a web-based system using multimedia enabling anytime, anywhere access to educators and learners (Ma, Han, Yang, & Cheng, 2015). Online learning assists academicians in efficacious conduct of courses while providing students with enhanced learning experience(Poon, 2013). The popularity of online learning has resulted in an upsurge in studies that scrutinize its role within higher educational settings(Annetta, Folta, & Klesath, 2010). Some of these studies were keen on analyzing the acceptance of online educational technologies within the higher educational (HE) institutions. Other studies either focused on the use of eLearning for teaching and learning purposes and its effect on the educational outcomes of teachers and students or concentrated on examining the factors affecting teachers or students in accepting online learning technology in the higher educational (HE) institutes.

a) Technology Acceptance

In general, "acceptance" refers to the consenting action of an individual to receive what is being offered (Taherdoost, 2018). The term "technology acceptance" denotes the initial optimistic decision of an individual to use a technological innovation (Dillon, 2001). User acceptance is crucial for the growth and proliferation of any new technology (Bano & Zowghi, 2015). Besides, the term "acceptance" is an indication of user involvement in systems development (Bano & Zowghi, 2015). If policy makers understand the factors influencing system usage, user concerns can be addressed during the development phase of a system (Taherdoost, 2018). Similarly, practitioners in IS field have been looking to answer this question to better the designs of systems they develop, in response to the demands of new users. For decades scholars have been attempting to understand why people accept new technologies resulting in a wide variety of theories and models explaining the concept of technology acceptance (Lai, 2017).

b) Overview of Technology (IS) Acceptance theories

Technology acceptance models and theories have been useful in understanding user acceptance of various technologies in a wide variety of system domain. Acceptance studies are common in the fields of health, education, mobile technology, and consumer purchase behavior. Several technology acceptance models have been developed by various scholars, and each of these models explains acceptances of new technologies through numerous factors identified and validated with empirical evidence. Some prominent theories explaining technology acceptance are, Theory of Reasoned Action (Fishbein & Ajzen, 1975), Diffusion of Innovation theory (Rogers, 1983),Theory of Planned Behavior (Ajzen, 1985),

Author α σ ρ ω: Management & Science University, Malaysia.
e-mail: asankhaa.gunasinghe@gmail.com

Social Cognitive Theory (Bandura, 1986), Technology Acceptance Model(Davis, 1986, 1989; Davis, Bagozzi, & Warshaw, 1989), Model of PC Utilization (Thompson, Higgins, & Howell, 1991), Motivational Model (Davis, Bagozzi, & Warshaw, 1992), Unified Theory of Acceptance and Use of Technology-1(Venkatesh, Morris, Davis, & Davis, 2003), UTAUT-2 (Venkatesh, Thong, & Xu, 2012), UTAUT-3 (Farooq et al., 2017). These theories/models are mostly refined or extended or combined and applied to study user acceptance of technology in different domains.

c) Academicians acceptance of technology

The user adoption precedes the effective implementation of that (Al-Emran, Mezhuyev, & Kamaludin, 2018). Similarly, user resistance toward any new technology costs more time, money, and effort resulting in a loss of benefits attached to the technology (Davis et al., 1989).Past studies suggest the importance of academics' acceptance of online learning technology in higher educational (HE) institutions. Further, the field of research that focused on factors affecting eLearning acceptance is still in the initial phase that needs to be examined from different perspectives(Holsapple & Lee-Post, 2006; Nanayakkara & Kusumsiri, 2013). Some determinants academic's acceptance of online learning technology have been operationalized using educational theories, while other predictors have been captured through other information systems (IS) acceptance models(Taherdoost, 2018). However, determining an appropriate theoretical framework that can best explain academic's acceptance of online technology is not an easy task. On the assumption that an IS acceptance models could support to develop a theoretical framework to best describe academic's acceptance of technology in the HE context, technology acceptance theories and models are critically reviewed in this study, considering the empirical evidence available to support the suitability of each theory in the study context.

II. A Critical Review of IS Acceptance Theories

It is felt essential to asses each theory independently to understand their appropriateness in explaining academic's acceptance of online learning environments. For this purpose, this paper presents a critical theoretical, and empirical assessment of each prominent theory and its applications in academic's IS acceptance.

Road map of the IS acceptance theory development is presented in figure 1.

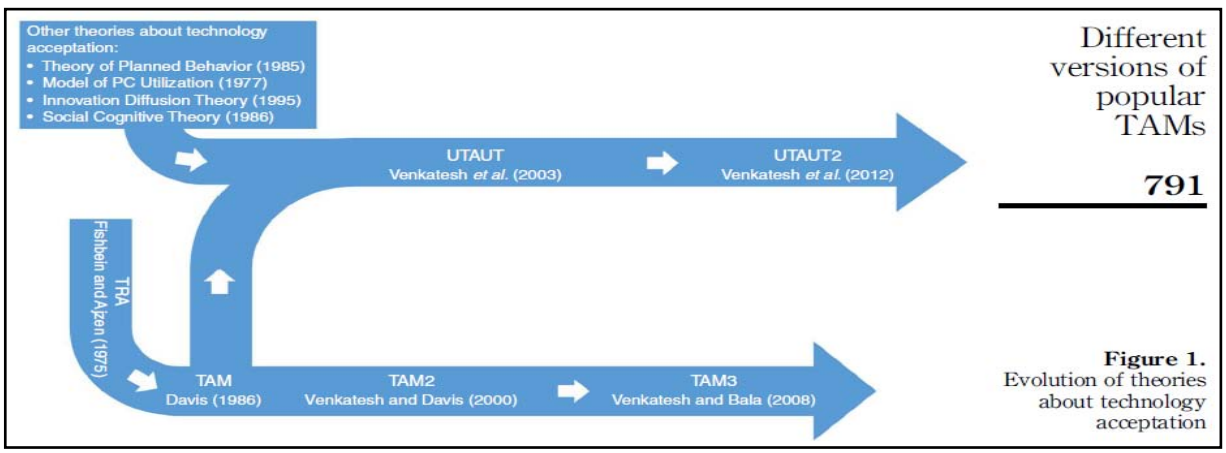

Figure 1: Development of Theories of Technology Acceptance

a) Theory of Reasoned Action (TRA)

TRA was initially developed by Fishbein and Ajzen (1975) for sociological and psychological studies. According to Teo (2013)TRA is the best model to explain teacher's technology acceptance. Few studies have employed TRA as the base theory to explain academic technology acceptance(Johnson & Ma, 1999; Rizzo & Kirkendall, 1995). However, scanty of the literature suggests that TRA was not a popular theory in predicting IS system adoption of academics. In this model, three cognitive components collectively explain technology acceptance behavior of humans. They are, attitude (favorable or unfavorable feeling to act in a certain manner), social norms, (social influence to behave in a particular manner) and behavioral intention (individual's cognitive decision in behaving in a particular method). Moreover, TRA suggests that human behavior is rational, systematic, and volitional. Therefore, TRA is evaluated through the measurement of boundary factors such as volition or will, intention stability over time, and intention. These factors are tested against variables such as time horizon, action, target, specificity and the study context. TRA does not address the effects of habit, ignoring moral factors and cognitive deliberation in predicting technology acceptance, which is the main weakness of this theory. Additionally, usage voluntariness is a critical issue in TRA validation.

b) Theory of Planned Behavior (TPB)

TPB was developed by(Ajzen, 1985). In this model, TRA was extended with a new variable called perceived behavioral control (PBC). In this framework, perceived behavioral control is determined by the resources available, significance of available resources and opportunities and skills available to achieve a behavioral outcome. Similar to TRA, TPB assumes that behavioral intention (BI) affects technology use behavior. However, in TPB, the actions of an individual that are not accounted by volitional control is discussed under perceived behavioral control. Therefore, the introduction of the variable PBC is a key advancement of this model against the limitations excited in TRA. Another benefit of adding a component such as PBC is that it permits adding factors like self-efficacy. TPB model suggests that PBC directly influence the actual behavior, in addition to its indirect effect on actual behavior through behavior intention (BI)to use a particular technology. Thus, in TPB three factors namely perceived behavioral control, subjective norm, and attitude, affect the behavioral intent of an individual which ultimately trigger actual use behavior of technology. However, this model has several problems. Firstly, a favorable attitude to use a system may not be significant in a setting where technology access is an issue. Next, TPB appears more appropriated to explain voluntary use of technology since the outcome behavior can be predicted in the presence of factors affecting individual's voluntariness in technology acceptance behavior. The applicability of TPB in explaining the academic acceptance of the technology was validated by Teo and Beng Lee (2010) and J. Lee, Cerreto, and Lee (2010).

c) Theory of Interpersonal Behavior (TIB)

The theory of Interpersonal Behavior (TIB), focuses on clarifying complexities in human behavior when affected by emotional and social factors(Triandis, 1977). In this model, weaknesses of TRA and TPB is addressed by adding habit, affect, and facilitating conditions in to already available predictors. In this, social factors are elaborated as social roles, social norms and self-concept. According to TIB, human behavior is not completely planned, nor it is automatic; nor it is entirely autonomous or completely social. TIB is different from TRA since it attempts to explain variance in total when TRA explains change in behavior with minimum factors. Scholars supporting TIP argue that even the smallest amount of variance is vital to explain, especially if the behavior in consideration is critical. In this model, behavioral intention is formed by factors such as emotions, habits, and social factors. The TIB claim behavior in three levels. In the first level, beliefs, attitudes, and social factors affecting human behavior is molded by personal characteristics and previous experience. The second level describes how cognitive, affective, and social factors along with normative beliefs influence intention to use a particular technology. The third level predicts human behavior through behavioral intention, past experience, and situational factors. The complexity of the model is considered as the main weakness, and it lacks parsimony compared to TRA or TPB. Further, TIB does not provide operational definitions for the variables, leaving it to the researcher. The application of TIB in explaining the teacher's acceptance of educational technology is evident in the studies of Misbah, Gulikers, Maulana, and Mulder (2015).

d) Technology acceptance model (TAM)

The TAM (Davis et al., 1989)is derived from the TRA framework; however, due to the unspecified theoretical status of TRA subjective norm was removed from the TAM model. This model explains technology acceptance using three independent factors, namely perceived usefulness, perceived ease of use, and attitude to use technology. According to TAM authors, perceived usefulness, perceived ease of use has a significant impact on attitude. The behavioral intention mediates the relationship between attitude and actual usage. In TAM, all other factors affecting acceptance are encompassed into a single component called an external variable. The external variable could have one or more determinants (i.e., System characteristics, user perceptions, training) other than TAM variables affecting technology acceptance. Perhaps, TAM is the most cited framework in technology acceptance. It has been used by many researchers testing acceptance of vast variety of technologies such as, academic use of online technology (Gibson, Harris, & Colaric, 2008; Teo, Lee, Chai, & Wong, 2009; K.-T. Wong, 2013; Yuen & Ma, 2008); e-banking (Lule, Omwansa, & Waema, 2012); clinical applications (Li, Huang, Xu, Li, & Lu, 2012); consumer technology (Kim & Woo, 2016). As a result, TAM received a considerable amount of empirical support during past few decades suggesting its robustness in technology acceptance. However, TAM does ignore the impact of social influence on technology acceptance. Therefore, critics argue that TAM cannot be used to test technologies outside the workplace. Further, as evident in most empirical studies, high prediction of usage is achieved by adding external variables to the TAM model. Furthermore, TAM does not consider the impact of intrinsic motivation of individual in accepting technology. Therefore, its ability to predict technology adoption in customer contexts is debated by critics, who state that technologies are used by individuals not only to carry out tasks but also to satisfy their emotional needs. Thus, lacking affective components/variables are considered as the main weakness of this model.

e) Extended TAM (ETAM)

In the ETAM(Venkatesh & Davis, 2000), TAM was extended with new factors. This alteration improved its predictive power, specificity, and adaptability. ETAM studies have gone in two directions. The researches on the first root focus on the precedence of perceived usefulness and behavioral intention. In this, social influence (social image, subjective norm, voluntariness) and cognitive factors (output quality, job relevance, result demonstrability) were added. There this model was outperforming in both mandatory and voluntary environments. The second set of studies focused on studying constructs that influence perceived ease of use. Two groups of antecedence of perceived ease of use have been discussed in these studies. They are adjustments and anchors. Anchors include general beliefs such as "enjoyment" and "objective usability" regarding the use of computer systems. The adjustment set includes direct experience of given system use such as self-efficacy, external control, anxiety, and computer playfulness. ETAM was found in some studies of academic's acceptance of online technology (Fathema, Shannon, & Ross, 2015; Teo, 2009; Waheed & Jam, 2010).

f) Igbaria's Model (IM)

The IM(Igbaria, Parasuraman, & Baroudi, 1996)explicate that both external and internal motivators influence individuals' technology acceptance decision(Igbaria, Schiffman, & Wieckowski, 1994). This model postulate "perceived enjoyment" as an intrinsic motivator and "perceived usefulness" as an extrinsic motivator which influences "attitude" and "use behavior". Also, the model assumes that pleasure or fun, computer anxiety, computer satisfaction, usefulness directly and indirectly affects technology use. Other relationships highlighted in this model are that perceived usefulness influence perceived enjoyment and computer anxiety has a negative effect on perceived usefulness and enjoyment. An application of IM was found in the study of Teo and Noyes (2011) in examining the use of technology among preservice teachers.

g) Social Cognitive Theory (SCT)

This theory is inspired by social psychology. In the SCT(Bandura, 1986), acceptance is predicted by integrating a set of personal, behavioral, and environmental factors bi directionally. Therefore, all three factors influence each other in a reciprocated manner. In SCT, the behavior is discussed as an issue on performance, usage, or adoption. In this, personal factors are defined as cognitive and demographic characteristics of a person that portray his or her personality. Environmental factors include aspects in the social and physical environment around the individual. Some variables encompassed in the SCM are Anxiety, self-efficacy, Affect, performance, or outcome expectation. K. T. Wong, Russo, and McDowall (2013) employed SCT in studying teacher's acceptance of the interactive whiteboard. Anderson, Groulx, and Maninger (2011) validated SCT by studying teacher's technology use in the classroom.

h) Innovations Diffusion Theory (IDT)

The model IDT(Rogers, 1983) introduces four factors such as time, channels, communication, innovation, and social system that affect the diffusion of innovative technology. IDT framework has been widely used in acceptance studies in individual(Brahier, 2006; Y.-H. Lee, Hsieh, & Hsu, 2011) organizational(Alias & Zainuddin, 2005; Frank, Zhao, & Borman, 2004; Nanayakkara, Kusumsiri, & Perera, 2016) and global contexts(Nahar, Kakola, & Huda, 2002; Zhu, Dong, Xu, & Kraemer, 2006). In IDT, three major components are integrated to predict adoption behavior. They are adopter's characteristics, features of the innovation, and adoption decision process. Adopters are identified in five groups based on their similarities in their adoptive behavioral characteristics, namely, innovators, early adopters, early majority, late majority, and laggards. Features of the innovation are described through factors such as relative advantage, complexity, trialability, compatibility, observability that influence acceptance of any innovative technology.IDT further suggest that innovation adoption process should follow the five-step approach of confirmation, acquired knowledge, decision, execution, and persuasion of the adopter through effective communication for a prolonged period(Rogers, 1983). Compared to other acceptance frameworks, IDT has less power in explaining technology use behavior (outcome), which is the main weakness of this model.

i) Perceived characteristics of Innovating Theory (PCIT)

This framework extends IDT theory by adding three components namely, innovation characteristics, perceived voluntariness, and actual behavior. The PCIT(Carter & Belanger, 2004) postulate that perceived voluntariness, and innovation characteristics effect the actual behavior of the individuals in accepting or rejecting technology. Innovative characteristics encompass; image, results demonstrability, and visibility, providing evidence that results demonstrability and visibility are components of observability, which positively corelate with the use and acceptance of the technology. Scanty of literature was found to validate the appropriateness of PCIT in using for academic acceptance online learning environments.

j) The Motivation Model (MM)

In this model (MM) technology acceptance is predicted using two factors(Davis et al., 1992). They are intrinsic motivation and extrinsic motivation. Extrinsic motivation is defined as the perceived valued outcome derived by performing an activity through the system. Improved job performance or time-saving, rewards and

recognition are typical extrinsic motivators for system users. Intrinsic motivators are defined as psychological reasons other than apparent benefits obtainable from the system use. Typically, fun, enjoyment are internal motives of system use. The MM hypothesis that output quality and "perceived ease of use" influence "perceived usefulness" and "perceived enjoyment". MM authors postulate that, due to the mediated relationship between ease of use, output quality, and perceived usefulness, the former two variables have indirect relationships with behavioral intention to use technology. Scanty of literature was found to validate the appropriateness of MM in using for academic acceptance of online learning environments.

k) The model of PC Utilization (MPCU)

This model fits to test technology acceptance from the perspective of personal computer utilization. MPCU assess actual behavior of humans in computer usage. Therefore, the component "behavioral intention to use" is excluded in this model. Additionally, this model does not consider the effect of habit in PC utilization since it supposedly has a tautological relationship with an individual's current use of computers. MPCU assess the influences of factors such as "facilitating conditions", "social influence", "complexity", "affect", "long term value of use", "perceived consequences" and, "job fit" on the computer use behavior of individuals. The use of MPCU in predicting academicians use of computers was confirmed by Ifenthaler and Schweinbenz (2013).

l) Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003)compared eight IS acceptance models and synthesizes UTAUT framework to assess an individual's acceptance or rejection of technology. The base models of UTAUT are Theory of Reasoned Action(Fishbein & Ajzen, 1975), the Motivational Model (Davis et al., 1992), the Model of PC utilization(Thompson et al., 1991), the Theory of Planned Behavior(Ajzen, 1991), the Combined TAM and TPB (Taylor & Todd, 1995), the Technology Acceptance Model(Taylor & Todd, 1995), the Innovation Diffusion Theory (Moore & Benbasat, 1991)and the Social Cognitive Theory (Bandura, 1986). Based on the predictive variables of these models, four factors such as performance expectancy, effort expectancy, social influence, and facilitating conditions were identified in the UTAUT to explain behavioral intention to use technology. Further, UTAUT hypothesis moderating effects of individuals' age, gender, experience, and voluntariness on the UTAUT relationships. Many empirical studies validated the appropriateness in UTAUT in predicting academician's acceptance of technology (Gunasinghe, Hamid, Khatibi, & Azam, 2018; Gunasinghe, Hamid, Khatibi, & Azam, 2019; Pardamean & Susanto, 2012; Radovan & Kristl, 2017; Raman et al., 2014; Shen & Shariff, 2016; Sumak, Polancic, & Hericko, 2010; Šumak & Šorgo, 2016; K.-T. Wong, Teo, & Russo, 2013).

m) Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

The UTAUT model was extended by Venkatesh et al. (2012) and named it UTAUT2. The UTAUT2 consist of seven significant factors, of which three are new. The existing constructs (performance expectancy, effort expectancy, social influence and facilitating conditions) and the novel constructs (hedonic motivation, habit and price value) collectively predict an individual's intention to use technology. Its authors suggest that this model is more suitable to test the IS acceptance in the consumer setting. However, UTAUT 2 have been empirically validated in studies of (Admiraal et al., 2017; El-Masri & Tarhini, 2017; Raman & Don, 2013) explaining academic's acceptance of online learning technology.

n) The Unified Theory of Acceptance and Use of Technology 3 (UTAUT3)

The UTAUT3 framework Farooq et al. (2017)was introduced by extending the UTAUT2 framework. The UTAUT3 encompasses eight (8) drivers of technology acceptance, namely, performance expectancy, effort expectancy, social influence, facilitating conditions, habit, hedonic motivation, prize value with an additional independent variable namely personal innovativeness in IT. The UTAUT 3 was initially tested in an educational setting in testing the acceptance of lecture capture system of executive business studies in Malaysia.

III. Discussion

Scholars have developed multiple theories and models to understand human behavior in different contexts. Studies of technology acceptance have gained popularity over the last few decades, and this resulted emergence of various adoption models rooted through numerous disciplines. For instance, innovation diffusion theory (IDT) arose from sociology, whereas the "theory of resend action" (TRA) emerged from social-psychology and social cognitive theory (SCT) aroused in psychology. However, all these theories have proved their significance in predicting human behavior related to technology adoption. Same time, these theories focus on different aspects of human behavior applicable indiverse settings. For instance, IDT explains the behaviors of humans. However, models like TRA or TPB is focused on adoption decisions where organizational characteristics play a crucial role.

When theories like SCT assimilate the effect of the perceived outcome on when predicting human behavior; other frameworks such as TAM solely rely on individual's perceptions (believes) that determine technology adoption. Some models like IDT, TPB, and TAM, have unidirectional causal relationships lined up from external factors to cognitive beliefs that affect

attitudes and behavior. In contrast, theoretical models such as SCT has bidirectional causal paths, indicating that external factors, cognitive factors, emotions, and behavior affect each other, continuously.

TIB includes all constructs of TPB and more (i.e., habit and facilitating conditions) adding to its explanatory power. Therefore TPB, TIB frameworks are conceptually similar. But TPB is commonly seen in acceptance studies in predicting individuals' technology acceptance behavior than TIB. Similarly, some others theories like TAM and IDT have overlapping factors such as perceived ease of use (TAM) vs. complexity (IDT); perceived usefulness (TAM) vs. relative advantage (IDT). Further, the notion of facilitating conditions (UTAUT) is captured as perceived behavioral control in TPB, compatibility in IDT, or facilitating conditions (MPCU).

In most IS acceptance studies, a distinction between affection and cognition is not recognized. Therefore, Taherdoost (2018)stated that most technology acceptance theories and models are agnostic about any distinction in the effects of cognitive /affective factors. Affection is an attitude which typically has the connotations of like/dislike. Cognitive components include beliefs or perceptions an individual hold about a person, issue, or an object.

Perlusz (2004)argue that both beliefs and emotions (feelings/affect) influence technology acceptance behavior with few exceptions from theories such as UTAUT in which all the predictors of technology acceptance are cognitive (beliefs and perceptions).

In technology acceptance theories, emotions are mostly conceptualized as negative effects. For instance, computer anxiety(Chiu & Churchill, 2016; Russell & Bradley, 1997; Saadé & Kira, 2009), fear(Balanskat, Blamire, & Kefala, 2006)worry (MacGregor, 1991) In contrast, positive emotions such as joy, liking, happiness, enthusiasm, contentment were largely ignored in these theories(Taherdoost, 2018).

In terms of behavioral antecedents, some theories have emphasized on internal factors (antecedents) such as perceptions, values, feelings, attitudes, and intentions; while other theories focus on external factors such as social norms/social influence, rewards and incentives, organizational level constrains. Also, certain models have overlooked the operational definitions of the variables included in the model. (i.e.,TIB) which make them difficult to measure.

IV. Conclusion

In this analysis, most prominent technology acceptance theories and their application in testing academic acceptance of technology were reviewed. It appears that IDT, TAM, and UTAUT are the mostly employed theories of academic's technology acceptance. Strong evidence was found confirming the correlations between key constructs of these models. However, most empirical studies either modified or extended the original framework to explain the notion of academic technology acceptance. These studies signify several factors as determinants of academic's acceptance of online learning technology. Intention and attitude are the two main significant factors determining technology adoption behavior, influenced by several other independent antecedent variables such as perceived usefulness (performance expectancy), ease of use (effort expectancy), perceived risk (anxiety), perceived behavioral control (self-efficacy), social influence and facilitating conditions.

The scope of this study is limited to identifying the evidence to support the suitability of IS theories in explaining academicians' acceptance of online learning technology. Thus, this study does not focus on the oretical concepts that explain user behavior beyond "acceptance". (i.e. post adoption behavior or continuous usage behavior). Further, this study does not provide an empirical analysis or a statistical evaluation to judge the suitability of each theory in understanding academics' technology acceptance. Future studies should focus on assessing other aspects of technology-based learning that is essential for successful proliferation of such systems; beyond typical use and acceptance. Finally, to prevent from any emerging gap between concepts (theory) and practice, both researchers and practitioners should make use of existing theoretical bases to develop measures and process models to influence potential users to accept technologies such as online learning environments.

References Références Referencias

1. Admiraal, W., Louws, M., Lockhorst, D., Paas, T., Buynsters, M., Cviko, A., . . . Post, L. (2017). Teachers in school-based technology innovations: A typology of their beliefs on teaching and technology. *Computers & Education, 114*, 57-68.
2. Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11-39): Springer.
3. Ajzen, I. (1991). The theory of planned behaviour. Organizational Behaviour and Human Decision Processes, 50, 179-211. *De Young*, 509-526.
4. Al-Emran, M., Mezhuyev, V., & Kamaludin, A. (2018). Technology Acceptance Model in M-learning context: A systematic review. *Computers & Education, 125*, 389-412.
5. Alias, N. A., & Zainuddin, A. M. (2005). Innovation for better teaching and learning: Adopting the learning management system. *Malaysian online journal of instructional technology, 2*(2), 27-40.
6. Anderson, S. E., Groulx, J. G., & Maninger, R. M. (2011). Relationships among preservice teachers' technology-related abilities, beliefs, and intentions

to use technology in their future classrooms. *Journal of Educational Computing Research, 45*(3), 321-338.
7. Annetta, L. A., Folta, E., & Klesath, M. (2010). *V-Learning: Distance education in the 21st century through 3D virtual learning environments*: Springer Science & Business Media.
8. Balanskat, A., Blamire, R., & Kefala, S. (2006). *The ICT impact report: A review of studies of ICT impact on schools in Europe*: European Communities.
9. Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of social and clinical psychology, 4*(3), 359-373.
10. Bano, M., & Zowghi, D. (2015). A systematic review on the relationship between user involvement and system success. *Information and Software Technology, 58*, 148-169.
11. Brahier, B. R. (2006). *Examining a model of teachers' technology adoption decision making: An application of diffusion of innovations theory*: University of Minnesota.
12. Carter, L., & Belanger, F. (2004). The influence of perceived characteristics of innovating on e-government adoption. *Electronic Journal of E-government, 2*(1), 11-20.
13. Chiu, T. K., & Churchill, D. (2016). Adoption of mobile devices in teaching: Changes in teacher beliefs, attitudes and anxiety. *Interactive Learning Environments, 24*(2), 317-327.
14. Davis, F. (1986). *A technology acceptance model for empirically testing new end-user information systems: theory and results.* Doctoral dissertation, Sloan School of Management, Massachusetts Institute …,
15. Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
16. Davis, F., Bagozzi, R., & Warshaw, P. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science, 35*(8), 982-1003. doi:10.1287/mnsc.35.8.982
17. Davis, F., Bagozzi, R., & Warshaw, P. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology, 22*(14), 1111-1132. doi:10.1111/j.1559-1816.1992.tb00945.x
18. Dillon, A. (2001). User acceptance of information technology. In: London: Taylor and Francis.
19. El-Masri, M., & Tarhini, A. (2017). Factors affecting the adoption of e-learning systems in Qatar and USA: Extending the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). *Educational Technology Research and Development, 65*(3), 743-763.
20. Farooq, M. S., Salam, M., Jaafar, N., Fayolle, A., Ayupp, K., Radovic-Markovic, M., & Sajid, A. (2017). Acceptance and use of lecture capture system (LCS) in executive business studies: Extending UTAUT2. *Interactive Technology and Smart Education, 14*(4), 329-348.
21. Fathema, N., Shannon, D., & Ross, M. (2015). Expanding the Technology Acceptance Model (TAM) to examine faculty use of Learning Management Systems (LMSs) in higher education institutions. *Journal of Online Learning & Teaching, 11*(2).
22. Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: an introduction to theory and research*.
23. Frank, K. A., Zhao, Y., & Borman, K. (2004). Social capital and the diffusion of innovations within organizations: The case of computer technology in schools. *Sociology of education, 77*(2), 148-171.
24. Gibson, S. G., Harris, M. L., & Colaric, S. M. (2008). Technology acceptance in an academic context: Faculty acceptance of online education. *Journal of Education for Business, 83*(6), 355-359.
25. Gunasinghe, A., Hamid, J. A., Khatibi, A., & Azam, S. (2018). Does the Lecturer's Innovativeness Drive VLE Adoption in Higher Education Institutes?(A Study Based on Extended UTAUT). *Journal of Information Technology Management, 10*(3), 20-42.
26. Gunasinghe, A., Hamid, J. A., Khatibi, A., & Azam, S. F. (2019). DOES ANXIETY IMPEDE VLE ADOPTION INTENTIONS OF STATE UNIVERSITY LECTURERS?-A STUDY BASED ON MODIFIED UTAUT FRAMEWORK. *European Journal of Social Sciences Studies*.
27. Holsapple, C. W., & Lee-Post, A. (2006). Defining, assessing, and promoting e-learning success: An information systems perspective. *Decision sciences journal of innovative education, 4*(1), 67-85.
28. Ifenthaler, D., & Schweinbenz, V. (2013). The acceptance of Tablet-PCs in classroom instruction: The teachers' perspectives. *Computers in human behavior, 29*(3), 525-534.
29. Igbaria, M., Parasuraman, S., & Baroudi, J. J. (1996). A motivational model of microcomputer usage. *Journal of management information systems, 13*(1), 127-143.
30. Igbaria, M., Schiffman, S. J., & Wieckowski, T. J. (1994). The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. *Behaviour & Information Technology, 13*(6), 349-361.
31. Johnson, K. E., & Ma, P. (1999). *Understanding language teaching: Reasoning in action*: Heinle & Heinle Boston, MA.
32. Kim, Y. G., & Woo, E. (2016). Consumer acceptance of a quick response (QR) code for the food traceability system: Application of an extended technology acceptance model (TAM). *Food Research International, 85*, 266-272.

33. Lai, P. (2017). The literature review of technology adoption models and theories for the novelty technology. *JISTEM-Journal of Information Systems and Technology Management, 14*(1), 21-38.
34. Lee, J., Cerreto, F. A., & Lee, J. (2010). Theory of planned behavior and teachers' decisions regarding use of educational technology. *Journal of Educational Technology & Society, 13*(1), 152-164.
35. Lee, Y.-H., Hsieh, Y.-C., & Hsu, C.-N. (2011). Adding innovation diffusion theory to the technology acceptance model: Supporting employees' intentions to use e-learning systems. *Journal of Educational Technology & Society, 14*(4), 124-137.
36. Li, C.-G., Huang, X.-E., Xu, L., Li, Y., & Lu, Y.-Y. (2012). Clinical application of serum tumor associated material (TAM) from non-small cell lung cancer patients. *Asian Pacific Journal of Cancer Prevention, 13*(1), 301-304.
37. Lule, I., Omwansa, T. K., & Waema, T. M. (2012). Application of technology acceptance model (TAM) in m-banking adoption in Kenya. *International Journal of Computing & ICT Research, 6*(1).
38. Ma, J., Han, X., Yang, J., & Cheng, J. (2015). Examining the necessary condition for engagement in an online learning environment based on learning analytics approach: The role of the instructor. *The Internet and Higher Education, 24*, 26-34.
39. MacGregor, D. (1991). Worry over technological activities and life concerns. *Risk analysis, 11*(2), 315-324.
40. Mirzajani, H., Mahmud, R., Fauzi Mohd Ayub, A., & Wong, S. L. (2016). Teachers' acceptance of ICT and its integration in the classroom. *Quality Assurance in Education, 24*(1), 26-40.
41. Misbah, Z., Gulikers, J., Maulana, R., & Mulder, M. (2015). Teacher interpersonal behaviour and student motivation in competence-based vocational education: Evidence from Indonesia. *Teaching and Teacher Education, 50*, 79-89.
42. Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research, 2*(3), 192-222.
43. Nahar, N., Kakola, T., & Huda, N. (2002). *Diffusion of software technology innovations in the global context.* Paper presented at the Proceedings of the 35th Annual Hawaii International Conference on System Sciences.
44. Nanayakkara, S., & Kusumsiri, N. (2013). Barriers to Successful Implementation of E-Learning in Design Education. *International Journal of Computer Science and Technology, 7*(1), 25-30.
45. Nanayakkara, S., Kusumsiri, N., & Perera, P. (2016). Adaptation of Diffusion of Innovations Theory for Successful ERP Implementation. *International Journal of Computer Science and Technology, 7*(1).
46. Pardamean, B., & Susanto, M. (2012). Assessing User Acceptance toward Blog Technology Using the UTAUT Model. *International Journal of Mathematics and Computers in Simulation, 6*.
47. Perlusz, S. (2004). *Emotions and technology acceptance: development and validation of a technology affect scale.* Paper presented at the 2004 IEEE International Engineering Management Conference (IEEE Cat. No. 04CH37574).
48. Phungsuk, R., Viriyavejakul, C., & Ratanaolarn, T. (2017). Development of a problem-based learning model via a virtual learning environment. *Kasetsart Journal of Social Sciences, 38*(3), 297-306.
49. Poon, J. (2013). Blended learning: An institutional approach for enhancing students' learning experiences. *Journal of online learning and teaching, 9*(2), 271-288.
50. Radovan, M., & Kristl, N. (2017). Acceptance of Technology and Its Impact on Teachers' Activities in Virtual Classroom: Integrating UTAUT and CoI into a Combined Model. *Turkish Online Journal of Educational Technology-TOJET, 16*(3), 11-22.
51. Raman, A., & Don, Y. (2013). Preservice teachers' acceptance of learning management software: An application of the UTAUT2 model. *International Education Studies, 6*(7), 157-164.
52. Raman, A., Don, Y., Khalid, R., Hussin, F., Omar, M. S., & Ghani, M. (2014). Technology acceptance on smart board among teachers in Terengganu using UTAUT model. *Asian Social Science, 10*(11), 84.
53. Rizzo, T. L., & Kirkendall, D. R. (1995). Teaching students with mild disabilities: What affects attitudes of future physical educators? *Adapted Physical Activity Quarterly, 12*(3), 205-216.
54. Rogers, E. (1983). *Diffusion of innovations*: The Free Press.
55. Russell, G., & Bradley, G. (1997). Teachers' computer anxiety: implications for professional development. *Education and Information Technologies, 2*(1), 17-30. doi:10.1023/A:1018680322904
56. Saadé, R. G., & Kira, D. (2009). Computer anxiety in e-learning: The effect of computer self-efficacy. *Journal of Information Technology Education: Research, 8*, 177-191.
57. Shen, C. M., & Shariff, S. A. (2016, 2016). *Apply UTAUT Model for Understanding the Teacher Perceptions Using Frog VLE.* Paper presented at the Postgraduate Annual Research On Informatics Seminar (Paris 2016).
58. Sumak, B., Polancic, G., & Hericko, M. (2010, 2010/02//). *An Empirical Study of Virtual Learning Environment Adoption Using UTAUT.* Paper presented at the Second International Conference on Mobile, Hybrid, and On-Line Learning.
59. Šumak, B., & Šorgo, A. (2016). The acceptance and use of interactive whiteboards among teachers:

Differences in UTAUT determinants between pre- and post-adopters. *Computers in human behavior, 64*, 602-620.
60. Taherdoost, H. (2018). A review of technology acceptance and adoption models and theories. *Procedia Manufacturing, 22*, 960-967.
61. Taylor, S., & Todd, P. (1995). Assessing IT usage: The role of prior experience. *MIS quarterly*, 561-570.
62. Teo, T. (2009). The impact of subjective norm and facilitating conditions on pre-service teachers' attitude toward computer use: A structural equation modeling of an extended technology acceptance model. *Journal of Educational Computing Research, 40*(1), 89-109.
63. Teo, T. (2013). A Comparison of Non-Nested Models in Explaining Teachers' Intention to Use Technology. *British Journal of Educational Technology, 44*(3).
64. Teo, T., & Beng Lee, C. (2010). Explaining the intention to use technology among student teachers: An application of the Theory of Planned Behavior (TPB). *Campus-Wide Information Systems, 27*(2), 60-67.
65. Teo, T., Lee, C. B., Chai, C. S., & Wong, S. L. (2009). Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the Technology Acceptance Model (TAM). *Computers & Education, 53*(3), 1000-1009.
66. Teo, T., & Noyes, J. (2011). An assessment of the influence of perceived enjoyment and attitude on the intention to use technology among pre-service teachers: A structural equation modeling approach. *Computers & Education, 57*(2), 1645-1653.
67. Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. *MIS quarterly*, 125-143.
68. Triandis, H. C. (1977). *Interpersonal behavior*: Brooks/Cole Publishing Company Monterey, CA.
69. Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.
70. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
71. Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS quarterly, 12*(1), 157-178.
72. Waheed, M., & Jam, F. A. (2010). Teacher's intention to accept online education: Extended TAM model. *Interdisciplinary Journal of Contemporary Research in Business, 2*(5), 330-344.
73. Wong, K.-T. (2013). Understanding Student Teachers' Behavioural Intention to Use Technology: Technology Acceptance Model (TAM) Validation and Testing. *Online Submission, 6*(1), 89-104.
74. Wong, K.-T., Teo, T., & Russo, S. (2013). Interactive whiteboard acceptance: Applicability of the UTAUT model to student teachers. *The Asia-Pacific Education Researcher, 22*(1), 1-10.
75. Wong, K. T., Russo, S., & McDowall, J. (2013). Understanding early childhood student teachers' acceptance and use of interactive whiteboard. *Campus-Wide Information Systems*.
76. Yuen, A. H., & Ma, W. W. (2008). Exploring teacher acceptance of e-learning technology. *Asia-Pacific Journal of Teacher Education, 36*(3), 229-243.
77. Zhu, K., Dong, S., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: determinants of post-adoption digital transformation of European companies. *European journal of information systems, 15*(6), 601-616.

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- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
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15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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