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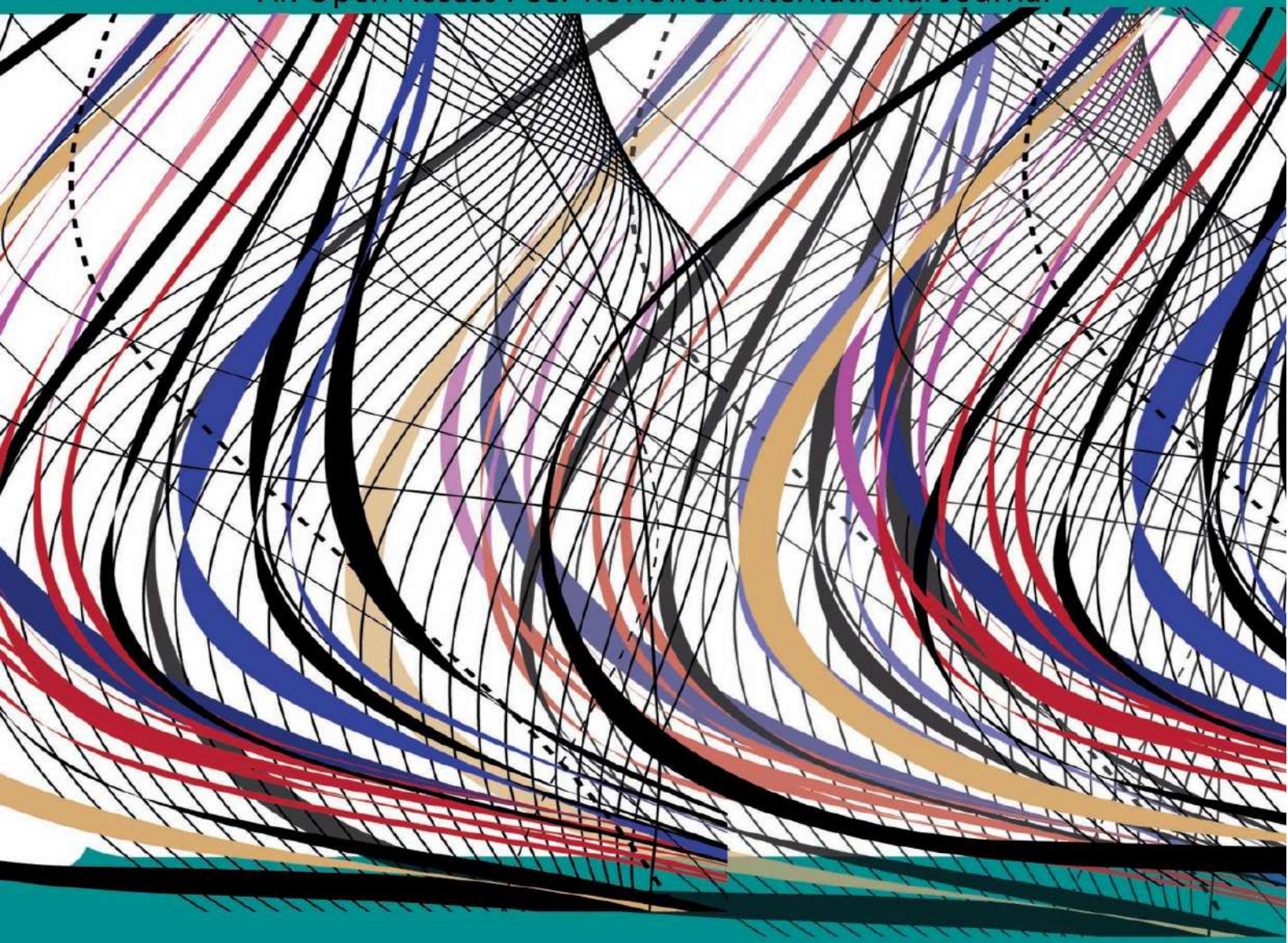

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FOREWORD

I am pleased to put into the hands of readers Volume-7; Issue-7: July 2021 of "**International Journal of Advanced Engineering, Management and Science (IJAEMS) (ISSN: 2454-1311)",** an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers.

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Dinh Tran Ngoc Huy
Editor-in-Chief
August, 2021

Editorial Board/ Reviewer Board

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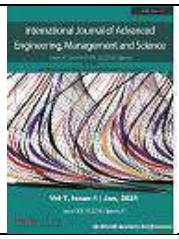

Insurance Industry During COVID-19 Pandemic: A Case of ASKI MBA Insurance Program

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Abstract**—** *This study described the effects of the COVID-19 pandemic on the ASKI MBA Insurance program and showed how the company adapted and managed the challenges the pandemic brought. Using a purposive sampling design, the researchers carefully conducted surveys and interviews on 10 (ten) ASKI MBA employees coming from various departments. Collected data were analyzed using the descriptive method. Results of the study revealed that ASKI MBA decreased sales from 11.078 million in the year 2019 to 2.128 million in 2020 resulting in a decrease in income by the end of 2020 of almost 8.95 million. The findings also gave us an idea of how many policies were produced amid the pandemic, 10,921. This amounts to 21.22% of the total 51,455 policies in force during the pandemic. Given the total number, information also displayed that there were 301 COVID-19 insurance claims. This number represents 0.58% of the total insurance volume. Because of the restrictions in the different areas of operations, ASKI MBA started to transition and adapt to digitization. This involves the online payment of insurance premiums, assessment of claims documents, and delivery of benefits. ASKI MBA will most certainly need to sustain its operational resilience and solvency management plans for some time. This should go hand in hand while fulfilling potentially complicated and evolving clients' expectations while providing critical services to policyholders.*

Keywords**— *Insurance, challenges, claims, clients, coping plans, financial income, pandemic.***

I. INTRODUCTION

People's financial stability is protected by the insurance industry through effective and efficient long-term savings mobilization. The COVID-19 pandemic, as well as the economic downturn, left a huge impact on life insurance and annuity providers. The global crisis brought by the pandemic challenged insurance companies in maintaining the stability and success of their businesses, both short-term and long-term [1].

"Financial institutions play a significant role in the socio-economic growth and development of a nation. Insurance companies, in particular, facilitate a nation's innumerable economic transactions through efficient and effective savings mobilization, risk transfer and indemnification, and financial intermediation processes" [2] [3]. "By mobilizing long-term savings, these companies provide financial security to a nation's citizens" [2].

The Philippine insurance market is currently developing and evolving. With the advent of banks, mutual funds, and financial institutions offering a diverse variety of financial security products, the sector is expected to grow even more [4].

ASKI Mutual Benefit Association, Inc., is a business unit belonging to the ASKI Group of Companies. In 1995,

ASKI started giving financial assistance to its clients for their hospitalization and medical expenses. ASKI also gave donations to the bereaved family of the client in times of death. On June 21, 2006, AlalaysaKaunlaran Mutual Benefit Association (ASKI MBA) was born. On October 5, 2006, ASKI MBA was issued a license to operate by the Insurance Commission (IC). December 2006, ASKI MBA pilot-tested its program in Urdaneta Branch. And finally, in January 2007, operations were officially started [5].

According to "The Philippine Daily Inquirer, the latest Insurance Commission (IC) data showed that the insurance industry's bottom line declined 9.85 percent year-on-year to P28.62 billion during the first nine months of 2020 from P31.74 billion a year ago" [6][7]. This data showed how COVID-19 impacted the insurance industry. Given the uncertainty that exists in these unprecedented times, insurance companies were challenged to maintain business stability and success [8] [9]. This study aimed to describe the effects of the COVID-19 pandemic on the ASKI MBA Insurance program and the challenges faced and its response and coping plans will be discussed in this study. Specifically, it described the demographic profile of ASKI MBA as to their monthly incomebefore and during the pandemic. Likewise, it described the insurance claims granted relating to COVID-19 and the client's insurance-buying behavior before and during COVID-19. Also, it explored the challenges of ASKI MBA during the pandemic and the coping plans and strategies of ASKI MBA during the pandemic

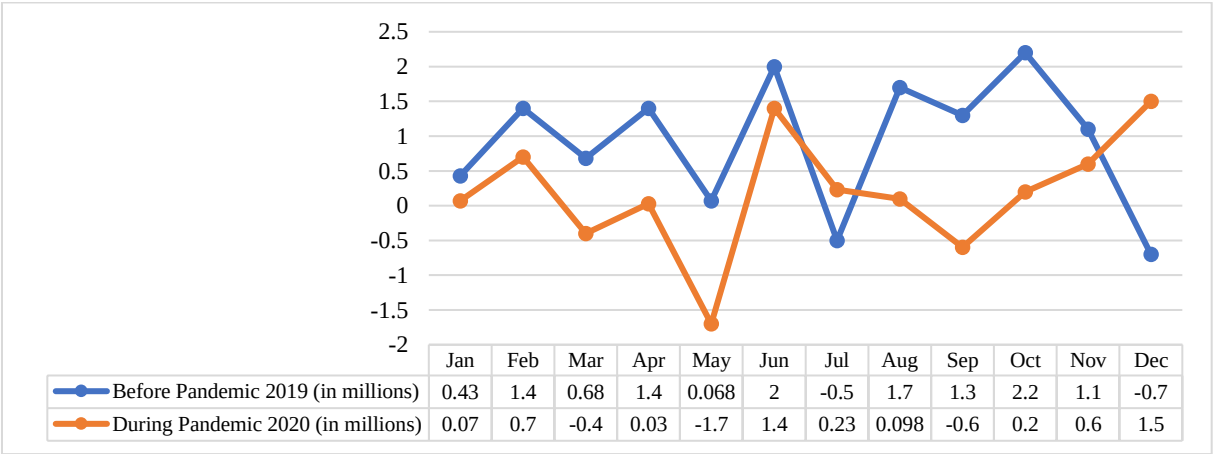
II. METHODOLOGY

The researchers confined their study with ASKI MBA located at 105 Maharlika Highway, Cabanatuan City. Theyhave purposively chosen 10 respondents [10], [11]. This method is typically used in basic qualitative research [12] to identify and select the information-rich cases for the most proper utilization of available resources. Two (2) from the Management Department, one (1) from the Finance Department, and seven (7) from the Operations Department. Questions for this category investigated the financial losses to the company and current relations it has with clients. A survey questionnaire wasprepared and used in data collection. Follow-up questions were asked to clarify the responses of the respondents. The objectives of the research, confidentiality of the organization's information, and other ethical considerations stated in the survey protocols were explained to the respondents before data collection.

III. RESULTS AND DISCUSSIONS

1. Demographic Profile of ASKI MBA

a. Monthly Income



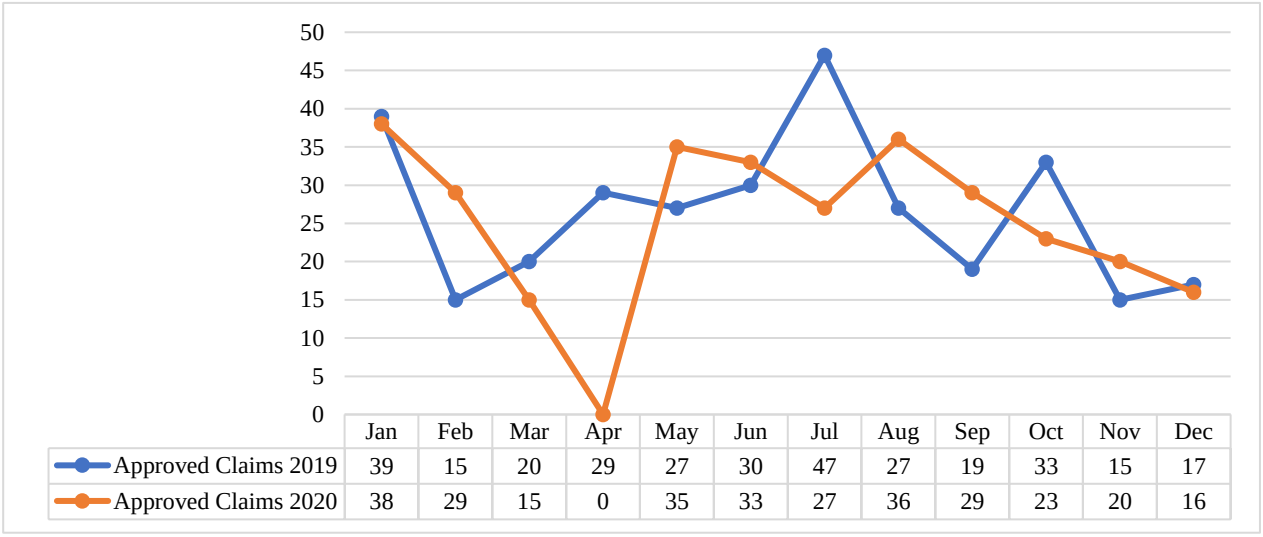
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Before Pandemic 2019 (in millions)	0.43	1.4	0.68	1.4	0.068	2	-0.5	1.7	1.3	2.2	1.1	-0.7
During Pandemic 2020 (in millions)	0.07	0.7	-0.4	0.03	-1.7	1.4	0.23	0.098	-0.6	0.2	0.6	1.5

Fig.1: Monthly Income

The graph shows the monthly income of ASKI MBA before and after the pandemic. The blue line represents the monthly income of ASKI MBA for the year before the pandemic while the red represents the year during a pandemic. As shown in the graph, there is a decrease in the monthly income of ASKI MBA when the pandemic struck. The income of ASKI MBA declined from 11.078 million in 2019 to 2.128 million in 2020 resulting in a decrease in income amounting to 8.95 million by the end of 2020. The trend showed that monthly income in the first half of both years is quite similar; the monthly income in 2020 is lower

than in 2019. Whereas the second half monthly income of both years shows different results.

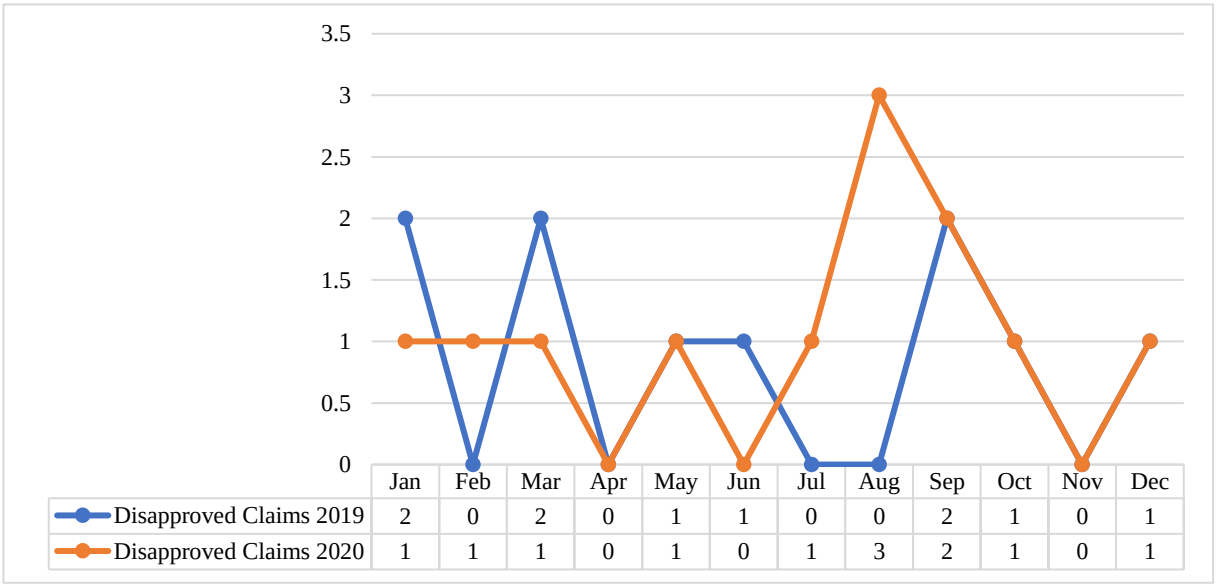
2. Insurance Claims relating to COVID-19



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Approved Claims 2019	39	15	20	29	27	30	47	27	19	33	15	17
Approved Claims 2020	38	29	15	0	35	33	27	36	29	23	20	16

Fig.2: Number of Approved Claims

The blue line shows the number of approved claims before the pandemic while the red line shows the approved claims during the pandemic. While the total number of approved claims of 2020 is not far from the total approved claims of 2019, in April 2020 ASKI MBA recorded zero (0) approved claims that caused a tremendous plunge on the graph. As shown in the graph, there is no pattern in both years as to what month has the maximum and the minimum number of insurance claims.

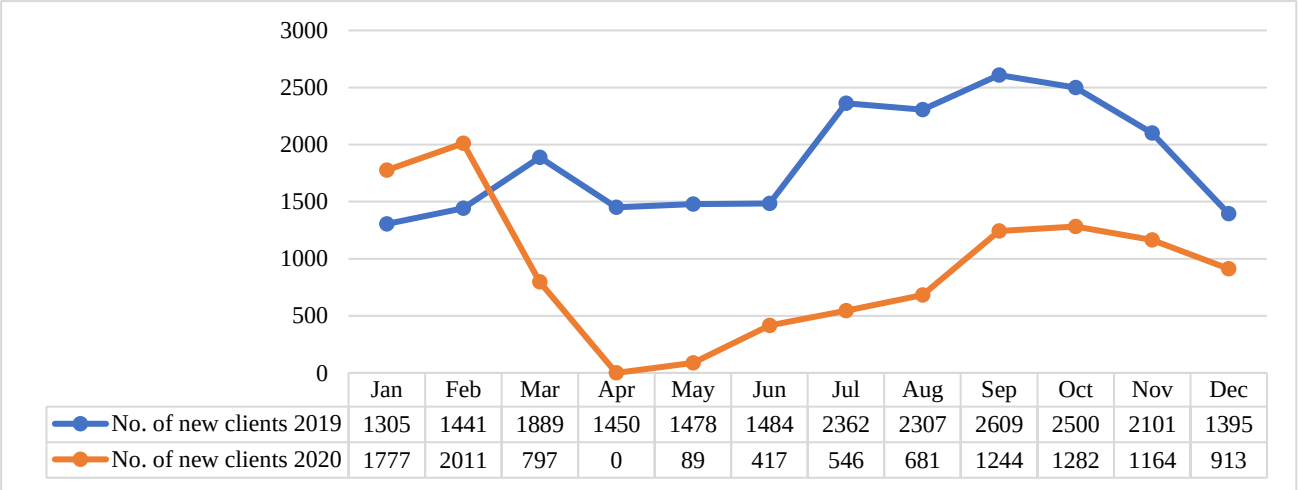


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Disapproved Claims 2019	2	0	2	0	1	1	0	0	2	1	0	1
Disapproved Claims 2020	1	1	1	0	1	0	1	3	2	1	0	1

Fig.3: Number of Disapproved Claims

The blue line shows the number of disapproved claims before the pandemic (2019) while the red line shows the disapproved claims during the pandemic (2020). As shown in the graph, both line graphs present zero (0) disapproved claims in various months. The highest number of disapproved claims was recorded in August 2020. Disapproved claims in both years have the same trend in the last quarter of the year.

3. Client's insurance-buying behavior before and during COVID-19



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. of new clients 2019	1305	1441	1889	1450	1478	1484	2362	2307	2609	2500	2101	1395
No. of new clients 2020	1777	2011	797	0	89	417	546	681	1244	1282	1164	913

Fig.4: Number of New Clients Insured

Figure 4 shows the new clients' buying an insurance policy in the years 2019 and 2020. In 2019, before the spread of the COVID-19, ASKI MBA recorded the highest number of new clients availing of insurance policy on the month of September and lowest on the month of January. The totals are 2,609 and 1,305 new clients respectively. However, in 2020, when the COVID-19 spread throughout the country, a drop in the number of new clients availing insurance policies was recorded. In April 2020, ASKI MBA recorded zero (0) new clients. This caused a tremendous plunge on the graph.

4. Challenges of ASKI MBA during the pandemic

a. Operational

The majority of insurance firms have traditionally depended on face-to-face sales and service, as well as operating in physical locations hence the difficulty in dealing with complicated and high-value claims when reviewing physical evidence and receiving expert findings in person. An example of this is the Total Permanent Disability Claims. This claim requires a physical visit and a doctor's endorsement. Collection of premium is also a challenge for ASKI MBA since the community restrictions were imposed.

b. Economic shock to customers

A drop in the number of new clients is an evident challenge for the ASKI MBA. COVID-19's enormous influence on economic activity and employment levels has resulted in a large reduction in consumer purchasing power in a short period. Clients are facing financial difficulties as a result of job losses or reduced income. Based on the experience of the respondents, clients are unable to pay due to said reasons. Potential clients are declining to apply for insurance as it is not their priority especially in this time of the pandemic.

c. Financial Performance and Stability

The pandemic has a significant impact on ASKI MBA's financial situation, notably on the amount of premium and contribution received by the organization, which is its main source of income. Due mainly to the implementation of a moratorium on collections and the difficulties in reaching the clients because of lockdown to several aspects of the business the quantity of premiums and contributions received from the members has suddenly decreased.

5. Coping and strategy plans of ASKI MBA during the pandemic

a. Operational

With the restrictions, ASKI MBA is transitioning and adapting the digitization of customer interactions such as payment collections, benefit claims assessment, and distribution. Acquiring updated infrastructure (computers and servers) for MIS is one of their coping strategies for the efficient flow of communication within the organization. Submission of application and claim documents can be made online.

b. Economic shock to customers

To attract new clients, ASKI MBA engages social media in promoting its products and services. Strengthening the recruitment process of new clients is also one of the strategies of the organization through encouraging their employees through incentives to recruit new clients. In addition, attracting new clients by developing a software program to accommodate no hassle and efficient online enrolment

c. Financial Performance and Stability

For a higher return on the investment portfolio, ASKI MBA began to boost its allocation to long-term investments. Also, it considered the need to conduct analysis and monitoring of portfolios and sensitivity to premium income as their strategy in recovering its financial performance and stability. In addition, ASKI MBA management came up with a plan to develop an online payment scheme, Barya Card. Barya Card is an application made by the ASKI management to make the collection of payments and giving the benefit claims of the clients easier.

IV. CONCLUSIONS AND RECOMMENDATIONS

ASKI MBA decreased sales from 11.078 million in the year 2019 to 2.128 million in 2020 resulting in a decrease in income by the end of 2020 of almost 8.95 million. The findings also gave us an idea of how many policies were produced amid the pandemic, 10,921. This amounts to 21.22% of the total 51,455 policies in force during the pandemic. Given the total number, we were also informed that there were 301 COVID-19 insurance claims. This number represents 0.58% of the total insurance volume. Because of the restrictions in the different areas of operations, ASKI MBA started to transition and adapt to digitization. This involves the online payment of insurance premiums, assessment of claims documents, and delivery of benefits. ASKI MBA will most certainly need to sustain its operational resilience and solvency management plans for some time. This should go hand in hand while fulfilling potentially complicated and evolving clients' expectations while providing critical services to policyholders.The authors recommend to future researchers to focus on the following as a follow-up study: 1. The analysis of other insurance products during a pandemic; 2. Other factors that caused the decrease of income of ASKI MBA not related to the pandemic; and 3. The application of other theories such as SWOT and Value Chain Analysis [13] to be used to analyze the general features and operations of certain insurance businesses.

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Factors influencing consumers' participation in E-Commerce in the New Normal

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Abstract *— This study aimed at describing the factors influencing consumers' participation in the new normal. 100 respondents came from different cities and municipalities in the province of Nueva Ecija, Philippines participated in this research. The descriptive research design was utilized to explore the common factors that influence consumers' participation in various e-commerce sites. Results revealed consumers' participation is influenced by the information quality, ease of use, product delivery, price affordability, and data privacy. Further results revealed consumers' participation in e-commerce requires trust and confidence in online shops. Lastly, this paper has significant associations with the business and commerce industries. and recommendations for further research along this vein.*

Keywords *— **Consumers' participation, e-commerce, influence, new normal, online shops.***

I. INTRODUCTION

The rise of technology in the last two decades particularly the World Wide Web (www) became the catalyst for e-Commerce to rise to popularity a few years ago due to the ease of use and accessibility especially to areas that are more technologically developed and advanced [1]. "The growth of the Internet and the evolution of technology over the last several decades have led to the emergence of new ways of communicating, which are increasingly used as new forms of business transactions" [2]. The internet has changed the way people live, think, and do business. With the emergence of e-commerce, international trade became possible on an individual level. The definition of a free market has found itself in its truest form, with sellers at liberty to position their own products and pricing, and consumers at free reign to choose what they buy. According to the website of BBVA Openmind website, "How the Internet has Changed Everyday Life" [3] offers an immense wealth of possibilities for buying content, news, and leisure products, and all sorts of advantages arise from e-commerce, which has become a major distribution channel for goods and services."E-commerce is electronic transactions, which can be expressed as the buying and selling of products and services and also the transfer of funds, money, data, and information related to the commercial transactions through the internet which also refers to any form of business transaction conducted online" [4]. The most popular example of e-commerce is online shopping, which is defined as buying and selling goods via the internet on any device."Basically, e-commerce permits buying and selling physical products and services through an online platform which makes the commercial transaction of all categories of businesses and consumers convenient" [4].

However, in December 2019, a virus that is suspected to originate in Wuhan, China which is known as the COVID-19 Virus spread out rapidly worldwide and the global economy suffered tremendous losses. According to [5], "the indication of a pandemic doesn't mean that the virus has become disastrous, but it's an indication of the disease has been globally spreading". This current global dilemma changed how people buy and acquire products and services. However, consumers are still hesitant to divulge financial information online or misgivings over the reliability of e-merchants, Filipinos have been skeptical about spending money on the internet[6]. According to

previous researches[7],online shopping is not only influenced by the demographic characteristics of customers such as age, gender, and occupation, also [8]merchant integrity still plays a major positive role in consumer internet shopping. Absence of conviction is one of the main reasons consumers not participating in e-commerce. According to the Global Web Index survey "e-commerce Growth in Philippines Accelerates, which showed more Filipinos plan to do more online shopping after the outbreak"[9].“Home confinement left Filipinos no choice but to purchase food and other essentials on the internet. This triggered an explosion of e-commerce transactions. All this means that most global marketplaces had to seriously alter their operations and online strategies. Surely all this increased demand brings increased revenue for marketplaces, but it is not without certain challenges”[10].

Generally, this explored the factors influencing consumers’ participation in e-Commerce in times of pandemic. Specifically, the factors influencing the extent of participation of the customersto e-commerce during a pandemic.

II. METHODOLOGY

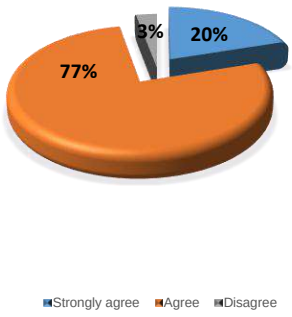
Quantitative research is an approach utilized by the researchers in conducting this study. According to Aggarwal (2008) as cited by [11] & [12] “descriptive research is devoted to the gathering of information about prevailing conditions or situations for the purpose of description and interpretation and this design is not simply amassing and tabulating facts but includes proper analyses, interpretation, comparisons, identification of trends and relationships” (p.87).This study was conducted in the province of Nueva Ecija, Philippines. The researchers want to assess the factors influencing consumers' involvement in social commerce in the context of an area where agriculture is one of the major industries to see how social commerce can be of a possible potential innovation that can be implemented and contribute to the growth of the economy of the province.

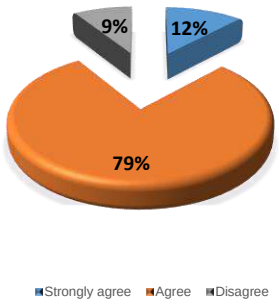
100 working-class individuals in Nueva Ecija were purposively chosen as respondents of this study [13] as cited in [14]. A fully Digitized Online Survey was used in this study which provided us real-time response information and charts

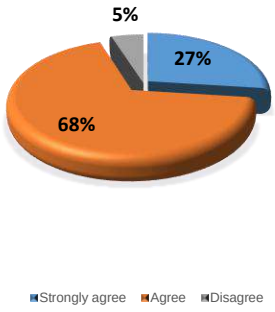
III. RESULTS AND DISCUSSION

A. Information Quality

1.The e-Commerce site is renowned and reliable.	2. Provides accurate information about the products/items that you want to purchase.	3. The product advertisement on the e-Commerce site is very informative and helpful to online shoppers.



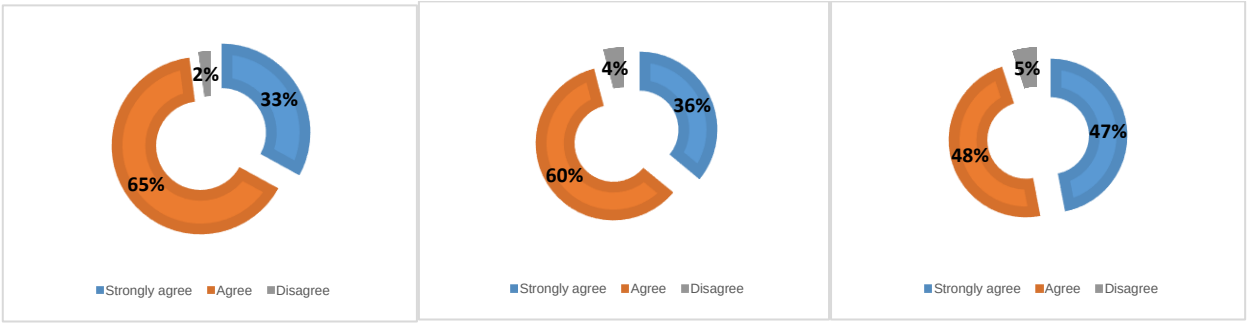




The e-commerce business must provide substantial information on their website in order for the online shoppers to determine and verify the accuracy of all the data posted. It is critical to understand what leads to consumer satisfaction with online information quality. E-commerce systems such as information quality can be leveraged to enhance business benefits, as evidenced by consumer commitment and retention.

B. Ease of Use (user-friendly e-commerce platform)

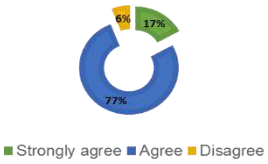
1. The use and operation of a website on the internet are easy.	2. Searching and shopping on this website are useful.	3. Checking the customers' ratings and review about the product on the site is very beneficial.



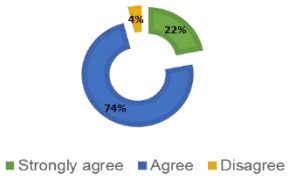
It is very helpful that the e-commerce platform is easy to use by the online users, it created a friendly environment and positive perception between online shoppers and the e-commerce site.

C. Product Delivery (on-time delivery of the product)

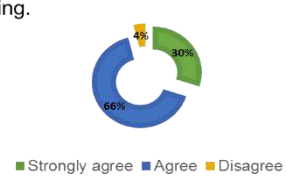
1. The medium of delivery of the product is satisfying.



2. The delivery time defined by the site is attractive.



3. Enables online shoppers' to track or trace the product location from the time of shipping.



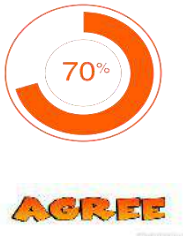
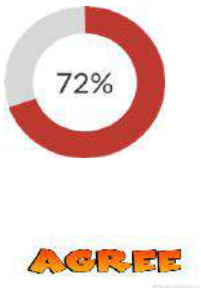
It is very evident that the manner of delivery is very important to online shoppers. An E-commerce site that provides on-time delivery services has a big impact on the customer and it creates good impressions to the e-commerce businesses.

D. Price Affordability (Competitive pricing in the market)

Price Affordability	Strongly Agree	Agree	Disagree
1. Competitive Pricing	32%	63%	5%
2. Fair delivery (Shipping Charge)	19%	66%	15%
3. No Hidden Charges	16%	70%	14%

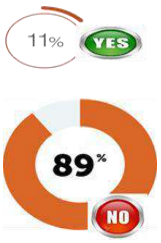
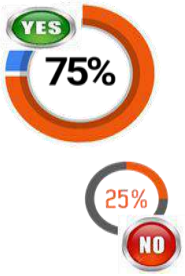
When purchasing things online, it is obvious that the price of the product is the most significant factor to consider. When making such a purchase, discounts, pricing comparisons with brick-and-mortar businesses, payment method, delivery time, and product evaluations, product descriptions, and photographs can all be counted among the most relevant evaluation criteria. In addition, the pricing of goods or products must be competitive in the market, with no hidden costs.

E. Transaction safety (Following the safety guidelines and procedures)

1. E-commerce site provides security measures to protect the customers.		3. The e-Commerce company ensured the quality and safety of the products during the delivery transit and handover of the items.	
2. The e-commerce company follows the safety protocols/guidelines set by the regulators/govt.		4. Using the electronic payment system in the e-Commerce site is very secured and protected.	

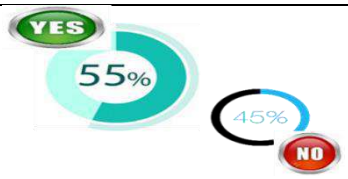
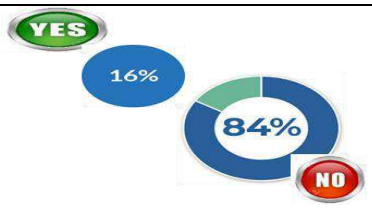
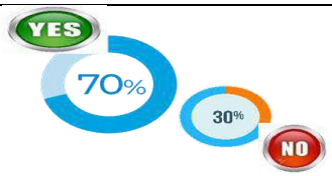
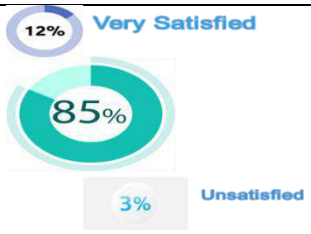
One of the most important structures in e-commerce is online security.Without these, both the online store owner and the online shopper put themselves at risk, especially when it comes to online payment fraud. Aside from financial consequences, data breaches can jeopardize the credibility of an online store.

F. Data Privacy ((Republic Act No. 10173, otherwise known as Data Privacy Act)

1. Is there a data privacy policy on the website of the e-commerce site/platform?	2. Did you experience a security breach that resulted in unauthorized access to your accounts?	3. Does the e-Commerce site use a strong password or another advanced identification method to protect the customer's personal information or identity?	4. Does privacy concerns influence your online shopping decision on an e-Commerce site?
			

The growth and trust in e-commerce business are entirely dependent on the site's security and privacy policies, and the most important factor in the development of an e-commerce business is to build trust among users. A comprehensive and secure system is required to maintain privacy in the e-commerce business. When a client's data is not secure and is at risk, users create skepticism in e-commerce.

G. Consumers' Participation in e-commerce

1. Have you ever received or purchased a faulty or defective product from an e-commerce site?	
2. Have you ever experienced buying from a fraudulent merchant?	
3. Is there a HIGH DEGREE of confidentiality and protection on the e-commerce platform or store?	
4. What was your overall impression in the e-commerce platform or store?	

Consumers' participation in e-commerce requires trust and confidence in the e-commerce sites. As a result, a high level of confidentiality and protection that customers receive in e-commerce stores is extremely important.

IV. CONCLUSIONS AND RECOMMENDATIONS

Results revealed that in terms of factors influencing consumers' participation, among all the e-commerce components, data privacy contributes to higher consumers' participation.It was found out that consumers' privacy concern influenced their decision to participate more when there is strict data privacy and policy that protect their personal identity and transactions on e-commerce platforms.The following are the recommendations of the study:E-commerce businesses may use the results of this study to review, develop and strengthen their client information system, data privacy guidelines, and transaction safety; Online businesses may look into the outcome of this study to innovate new products that can be useful to people from different walks of life, and The government may study the results of this research to draw insights on how they can further develop their programs and laws to pass intended for the e-commerce industry to help revive and sustain economic growth.

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Impact of Maintenance on the Quality of Pig Farms

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Abstract**—** *The 21st century clearly demonstrates the role that quality plays both in small businesses and in international companies, globalization has brought with it more demanding customers and an increasingly wide market, where the only thing that can allow companies to stay in said market is to offer consumers quality products. Juran (1993) stated "quality is simply the suitability for use satisfying the customer's needs".*

The pig sector and its derivatives are an important source of employment that contributes to the development of society by guaranteeing food security and supplying the needs of the population. However, many times the quality of work in pig farms is not the best, while the importance of these farms is increasing.

The present investigation took place in the company Agroindustrias de Córdoba S.A de C.V. This company has the need to develop a quality control protocol, since the industrial maintenance that the company carries out is having a negative impact on the quality of the pigs that Agroindustrias de Córdoba S.A de C.V sells.

This research aims to assess the impact of industrial maintenance on the quality of work in the Agroindustrias de Córdoba S.A de C.V farm in order to generate a more efficient quality control protocol.

For the development of the research, methodologies such as total quality and mode analysis and failure effect were considered, to name a few.

Keywords**— *Quality, Pig Farms, Maintenance.***

I. INTRODUCTION

Quality is the principle of continuous improvement; in the eighties the high competitiveness in the market Western companies discovered the great benefits that quality brings. After years of work, Japanese companies found the key to be classified as number one in the market: offering quality products and services (Tarí, J. J. 2000).

A work quality control system with solid operation is an essential factor not only in economic performance, but also in production, allowing important achievements in the market.

In Mexico, the pig industry has been of great interest, since in 2016 the Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) declared that in the following years around 10 billion pesos would be invested in the sector pig, which shows clear economic growth in the country (SADER 2016).

It is important to note that the growth of the pig industry is increasing, since according to SAGARPA the annual average growth is 1.5%, and there is even a commitment to achieve 3.2% in the coming years, this thanks to the beginning of exports that Mexico makes to countries like China, and even some other Asian countries (SADER 2016).

However, the quality of work in the pig industry is not the best, which consequently is generating a significant deficit

in the quality of the products that farms offer to the market, it is clear that pig farms must improve their work processes To increase the quality of the finished products they offer, this is why the present assessment of the impact of industrial maintenance on the quality of work in pig farms is used.

II. OBJECTIVE

Assess the impact of maintenance on the quality of the work of Agroindustrias de Córdoba S.A de C.V in order to generate a quality control protocol.

Identify what are the quality characteristics that pigs must have when they are transferred.

Evaluate the processes that are carried out in pig farms, through a Failure Mode and Effect Analysis (FMEA) of the process.

Calculate the Risk Priority Number (PRN) through the results of the FMEA.

HYPOTHESIS

A quality control protocol will allow pig farms to raise pigs in optimal conditions. In addition, through the assessment of the impact of quality, it will be known which maintenance deficits that are reflected in the quality of your pigs.

JUSTIFICATION

The state of Veracruz, Mexico has 796,223 head of pig cattle; of which 7 out of 10 are on farms, while the central zone of the state of Veracruz represents 7% of the total number of pig heads (INEGI 2014).

The quality control control protocol would be an essential tool for farms, since they would increase the quality of their pigs and thereby benefit the 55,735 head of pigs in the central area of the state of Veracruz, in addition to the protocol of quality control would increase the quality of pigs by up to 86%.

Even pig farms could reduce their corrective maintenance costs by up to 37% from applying the quality protocol.

PIG SECTOR ANALYSIS

In all 21st century companies, maintenance represents an important investment that generates great benefits, among the most significant, quality stands out.

The quality of the products allows companies to position themselves in the market.

In the world, the pork industry is an important source of economic income, only in Argentina is pork production the most efficient, since pork is among the first three most consumed meats.

Therefore, in Argentina, pig production has been prioritized in the development agenda, to such an extent that the Ministry of Agriculture, Livestock and Fisheries (MAGyP) has prepared the Master Plan for the National Pig Sector 2010-2020, whose main objective is to promote of the production, marketing and consumption of pork (Beyli, 2012).

In Mexico, the main producer of pork meat is the state of Sonora, only in 2008 it contributed 21% of the country's pork production, the main strategies of Sonoran pig farms is the constant updating of both production and processing processes maintenance (Soto, E. E, et al 2010).

On the other hand, the state of Veracruz barely reaches the sixth place in pork producers in all of Mexico, this due to the maintenance deficit in the facilities and work procedures, which as a consequence generates low-quality pork (SEDARPA 2012).

The swine unit of Agroindustrias de Córdoba SA de CV is an integrated model, since it ranges from the reproductive process to the fattening of the pigs that it markets and distributes, therefore the pig production process must be of high quality to be able to offer the best to the market, however, commonly the maintenance that is carried out is not adequate, which puts the quality of the pigs at constant risk.

III. METHODOLOGY

The population to be analyzed in this research is finite, since when focusing the research on a certain company such as Agroindustrias de Córdoba, the population is very limited.

It should be noted that the total population is equal to 6 individuals, who are personnel of the maintenance area in Agroindustrias de Córdoba S.A de C.V.

Sample size.

Because the population is subdivided into equitable groups in the three sites that the company has, the sample to be used is the stratified one, it should be noted that the sample size was obtained by means of the well-known statistical formula for finite population, where the assigned margin of error was equal to 0.05%.

Finite statistics formula:

$$n = \frac{Z^2 P\, Q\, N}{(N-1)E^2 + Z^2 PQ}$$

- n = Sample size
- Z = Z value normal curve (0.993)

• P = Probability of success (0.50)

• Q = Probability of failure (0.50)

• N = Population (6)

• E = Sample error (0.050)

Substituting values we have:

$$n = \frac{(0.993^2)(0.50)\ (0.50)\ (6)}{(6-1)(0.05^2) + (0.674^2)\ (0.50)(0.50)}$$

$$\frac{(0.986)(0.25)\ (6)}{(5)\ (0.0025) + (0.993)\ (0.25)}$$

$$\frac{(0.245)\ (6)}{(0.0125) + (0.248)}$$

$$\frac{1.45}{0.260}$$

Therefore the recommended sample size is 5.

The technique applied to collect the data and information was the documented analysis, since the instrument used to collect the information was a survey.

ANALYSIS OF THE INFORMATION

Which is the machinery that most frequently require corrective maintenance?

In the study company Agroindustrias de Córdoba S.A, it is considered that 20% of the time the most critical equipment is raised panels and 80% are evaporative panels.

Know the frequency of corrective maintenance interventions in the company. It is extremely relevant for the development of the quality protocol.

The study reveals that 40% suffer from a breakdown every 2 months, while 60% break down every 6 months.

Tables 1, 2 and 3 present the failure mode and effect analysis of the most critical element for pig farming.

To calculate the risk priority number, the variables are determined:

Severity: Indicates the effect of the failure on the client. It is measured on a scale of 1 to 10, where 1 indicates a consequence with no effect.

Occurrence: Indicates the number of times the fault is repeated, its measurement is made on a scale from 1 to 10.

Detection: Indicates the probability that the fault will be found before the process is completed.

Table 1 Evaporator Failure mode and effect

No.	Potential failure mode	Potential effect of failure
1	System does not work	Pigs in high temperatures, the effect can be fatal
2	Water is not evenly distributed throughout the panel	Mineral build-up The pump is exposed to a short circuit Unnecessary electricity consumption
3	Restriction of airflow to the booths.	Pigs in high temperatures Loss of production (Death of pigs) Higher electricity payments
4	Evaporated water cooling cells	Concentration of bicarbonates, carbonates, sulfates or hydroxides, components that are found at various levels in many water sources. The components can concentrate in the recirculation system, resulting in an increase in pH- Without rinsing the tank, the pH of the water can become caustic, to the point of destroying the cellulose in the panel The panel may begin to look spongy like cotton, losing its firmness.
5	Sediment accumulation	Sediments turn into rocks that clog airways

Table 2 Evaporator Potential cause of Failure

No.	Potential cause of failure	Current verification and / or control
1	Lack of maintenance to the structure Lack of maintenance to the distribution system, tank and pumping system	Not have

2	Accumulation of minerals in the panel Lack of maintenance Panel maintenance was performed while the pad was not wet	Not have
3	High concentration of minerals circulating in the panel precipitating the surface	Not have
4	Wrong water pH	Not have
5	Accumulation of minerals in the panel Lack of filter maintenance Wrong water pH	Not have

Table 3 Risk priority number (NPR)

No.	Severity	Occurrence	Detection	NPR
1	10	3	2	60
2	7	5	4	140
3	10	2	6	120
4	9	1	6	54
5	7	8	9	504

IV. RESULTS AND DISCUSSION

A) Recommended actions:

1) Add a water softener that removes minerals from the water and even replaces them with sodium.

2) Add an acid to the water to lower the pH to 7 or slightly below. Will increase calcium solubility and will neutralize bicarbonates, resulting in less panel scale.

3) Have a water sanitation program that provides residual chlorine of 5 ppm (Particles per million) in the fresh water source. It does not mean that chlorine should be put into the recirculation tank. The high concentration of chlorine will significantly reduce the life of the panel

4) Perform preventive maintenance by evaporative panel generally every month, while the filter must be serviced at least twice a month.

5) Perform preventive maintenance at least every two months to the pumping system

B) Prevention and control of diseases

Disease control and prevention can be addressed to several topics, depending on the importance given to each group of diseases:

a) Pig production is, ultimately, food production, and there are animal diseases that put public health at risk. Therefore, one of the main groups of diseases to prevent and / or control is that of zoonoses (for example, trichinellosis, cysticercosis, toxoplasmosis, brucellosis, salmonellosis and leptospirosis).

b) Other diseases that, due to their endemicity, cause significant production losses (for example, infectious pleuropneumonia).

c) In a third group, many diseases are within a legal framework because they imply a serious problem for regional animal health and international trade due to the productive losses they cause. In this case, prevention and control measures are determined or guided by national bodies.

C) Product transport (pigs)

The transfer process is extremely important and a critical point also for Agroindustrias de Córdoba, since, as noted in the survey, the employees revealed that it is very common for there to be losses when the pigs are transported.

The vehicles must be designed and built in such a way that the animals are loaded and unloaded comfortably without causing damage or injury, with aeration in accordance with the climate and the demands of the different species to be transported and whose washing and disinfection is practical and efficient.

The floor should be made of metallic or other smooth material (not presenting bare iron), to which a rigid grid mesh with non-slip properties for animals will be attached.

The waste must drain through the use of hoses of sufficient quality and thickness, with a diameter not less than 3 inches, and whose bottom opening is no more than 20 centimeters from the ground.

When dealing with trucks with more than one floor, the draining of the upper part must necessarily be implemented in the same way as in trucks with one floor.

The doors should be in such a location that they guarantee a smooth entry and exit of the animals. The guillotine doors offer easy handling and security, being advisable the double guillotine door with rear location.

In those units that have a ramp door, a checkered mesh of rigid material with non-slip property for animals and folding will be attached.

In order to ensure proper air circulation, the side must have a sufficient number of openings on each of its sides, without projections that could harm the animals. The lower part of the sides or baseboards will be totally closed, without openings up to a minimum height of 35 centimeters.

In the case of a load of animals of different categories and / or species, they must have internal divisions of metallic material or other similar appropriate, mobile to allow an adequate closure to avoid displacement.

D) Avoid:

1) Stressful handling in the establishment in the pre-transport stage. The trip should be calm and not long.

2) The waits in pens before loading and unnecessary stops should be reduced.

3) Prolonged transport, since it only generates fatigue and even gradual loss of glycogen for pigs.

4) Mobilization of animals under extreme weather conditions.

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The Cost and Quality of Bottled Water in Refilling Stations and Tap Water in Cabanatuan City: A Comparative Study

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Abstract**—** *This study compared the quality of tap water given by the Cabanatuan City Water District – Prime Water Cabanatuan to replenished filtered water and bottled water obtained from water refilling stations. Water samples, in particular, had been tested in the lab for microbiological, physical, and chemical quality. Parameters include heterotrophic plate count, total coliform, thermotolerant coliform/Escherichia coli, total dissolved solids, pH, and turbidity. It was found that water supplied by Cabanatuan City Water District – Prime Water Cabanatuan City is cheaper, safe, and passed the Philippine National Standards for Drinking Water of 2017 compared to bottled water samples from refilling stations. However, despite the availability of potable water provided by the city water district, it is difficult to convince the public to adopt the behavior of drinking tap water instead of bottled or refilled purified water.*

Keywords**— Bottled water, comparative study, microbiological, refilled purified water, tap water.**

I. INTRODUCTION

Water is required for the survival of living organisms and the planet's long-term viability. People will spend whatever it takes to get clean drinking water since it is a basic need for survival. The local corporate body that operates and maintains a water supply system in one or more provincial cities or municipalities is known as a water district or a water utility. "Residents and properties within the boundaries of water districts are responsible for acquiring, installing, improving, maintaining, and running water supply and distribution infrastructure for domestic, industrial, municipal, and agricultural applications and water districts are responsible for ensuring that their concessionaires have access to safe drinking water" [1]. However, the threat of contaminated water has always existed. Purchasing bottled water and drinking water from refilling stations has become a standard method of acquiring clean and safe drinking water in the Philippines. This condition exists not just in locations where water utility pipelines do not reach, but also in areas where water district service is provided. Some people use tap water for daily tasks and cleanliness, but they prefer bottled or purified water for drinking. According to new research from WHO and UNICEF, universal access to safe drinking water, sanitation, and hygiene is a human right included in the 2030 Sustainable Development Goals, but it can only be achieved if countries monitor and manage affordability (WHO, 2021) [2]. "The Philippine National Standards for Drinking Water are followed by local water districts and water refilling stations, and the latter is supervised by the Local Government Unit. Furthermore, only an enterprise

with a current Food and Drug Administration (FDA) License to Operate (LTO) is permitted to prepare bottled water for trade or commercial distribution. (DOH AO 18-A, 1993)" [3]. The use of purified water as a source of drinking water has increased over time (CCWD Customer Satisfaction Survey, 2006-2020) [4], and it is critical to quantify the economic impact on Cabanatuan City families. While there have been studies comparing the quality of tap versus bottled water, none have yet been conducted in the City of Cabanatuan to compare the quality and cost of bottled water sold in refilling stations to tap water supplied by the local water utility. The general objective of this research is to compare the quality and cost of tap water of Cabanatuan City and bottled water from refilling stations. Hence, a comparative study was conducted to describe the quality based on the current version of the Philippine National Standards for Drinking Water as to Microbiological Quality and Physical-Chemical Quality and compared the cost of refilled purified water, bottled water from water refilling stations, and tap water as drinking water

II. METHODOLOGY

This research used the quantitative research approach using the experimental design, comparing the quality of water, and comparing the cost. This research both utilized primary and secondary data. Primary data was collected from microbiological, physical, and chemical analysis results conducted by the researchers, while the secondary data is the current market cost of the drinking water. "In natural sciences and even in social sciences, quantitative research is based on the aspect of quantity or extent. It is related to the object that can be expressed in terms of quantity or something that can be counted" [5], thus a quantitative approach was used in this study. For microbiological, physical, and chemical analysis of water, a sample from one random water refilling station from each of Cabanatuan City Water District – Prime Water Cabanatuan City's 5 service areas, and one random tap water sample from a household from the same service areas. Samples from the water refilling stations are bought as bottled and as sold, while samples from tap water employed standard sampling procedures. All samples were analyzed at the CCWD Water Testing Laboratory. The comparison of the cost was based on the average price of purified water from refilling stations and the current rate of tap water in Cabanatuan City. Results of laboratory tests were evaluated based on the latest version of the Philippine National Standards for Drinking Water [6]. The cost of each type of drinking water and which costs less or more was presented using the costs collected from the Water Refilling Stations and the Local Water District current water rate [7]. Their costs were computed and compared according to the Daily Nutritional Guide Pyramid (Food and Nutrition Research Institute) [8]. for the number of water intake per person. Costs per household per month using the types of drinking water were compared as well based on the average household size in Nueva Ecija (Philippine Statistics Authority,2013) [9].

III. RESULTS AND DISCUSSION

Microbiological Analysis

Methods recommended in the Philippine National Standards for Drinking Water of 2017 and Standards Methods for the Analysis of Water and Wastewater 2nd Edition were employed [10]. A bottled water sample from water refilling station 4 failed in Heterotrophic Plate Count (HPC) analysis, the sample from water refilling station 2 failed in total coliform analysis, and sample from water refilling station 3 failed in all parameters including the presence of thermotolerant coliform /*Escherichia coli.* All samples from tap water passed within the microbiological standards of the PNSDW 2017.

Table 1. Microbiological Analysis Results

Parameters	Heterotrophic Plate Count	Total Coliform	Thermotolerant Coliform / E.coli
	(CFU/mL)	(MPN /100mL)	
Sample ID			
Water Refilling Station 1	240	<1.1	<1.1
Water Refilling Station 2	250	2.6	<1.1
Water Refilling Station 3	790	>8.0	>8.0
Water Refilling Station 4	>6500	<1.1	<1.1
Water Refilling Station 5	27	<1.1	<1.1

Tap Water 1	<1.0	<1.1	<1.1
Tap Water 2	<1.0	<1.1	<1.1
Tap Water 3	<1.0	<1.1	<1.1
Tap Water 4	58	<1.1	<1.1
Tap Water 5	27	<1.1	<1.1
PNSDW 2017 limits	**<500**	**<1.1**	**<1.1**

Physical and Chemical Analysis

PNSDW 2017 standard for pH and total dissolved solids (TDS) for water refilling stations is different from that of tap water. The pH value for water from refilling stations should be 5-7 while the TDS levels shall not exceed 10 mg/L to validate the efficiency of the treatment process - reverse osmosis or distillation process. Bottled Water samples from water refilling stations 1, 2, 4, and 5 exceeded the standard levels for pH. It should be considered that most water refilling stations market their product as alkali water. Bottled water samples from water refilling station 2 exceeded the standard for TDS, whereas all samples passed the standard limits for turbidity. All tap water samples from the distribution system passed within the PNSDW 2017 limits for pH, TDS, and Turbidity.

Table 2. pH, Total Dissolved Solids and Turbidity Analysis Results

Parameters	**pH**	**Total Dissolved Solids**	**Turbidity**
		mg/L	NTU
Sample ID			
Water Refilling Station 1	8.16	9	0.19
Water Refilling Station 2	8.07	47	0.38
Water Refilling Station 3	7.21	8	0.30
Water Refilling Station 4	8.31	1	0.17
Water Refilling Station 5	8.05	8	0.18
PNSDW 2017 limits	**5.0-7.0**	**<10**	**<5.0**
Tap Water 1	8.39	175	0.38
Tap Water 2	7.35	181	0.51
Tap Water 3	7.56	366	0.39
Tap Water 4	7.32	186	0.24
Tap Water 5	7.36	194	0.41
PNSDW 2017 limits	**6.5-8.5**	**<600**	**<5.0**

Cost Comparison

PARAMETERS	**per 500mL bottle**	**19 Liters refill**	**PRIME WATER**
	Php	Php	Php
Water Refilling Station 1	10	25	
Water Refilling Station 2	6	25	
Water Refilling Station 3	10	25	
Water Refilling Station 4	10	20	

Water Refilling Station 5	10	25	
Average Cost in water refilling station	**9.2**	**24**	
First 1000 Liters			**279.9**
Cost per Liter	**18.40**	**1.26**	**0.28**
Daily Nutritional Guide -8 glasses or 2 liters per person			
Daily Cost Per person	**36.80**	**2.53**	**0.56**
The daily cost of an Ave. Family Size according to PSA	**184.00**	**12.65**	**2.80**
The monthly cost of an Ave. Family Size according to PSA	**5,520.00**	**379.50**	**84.00**

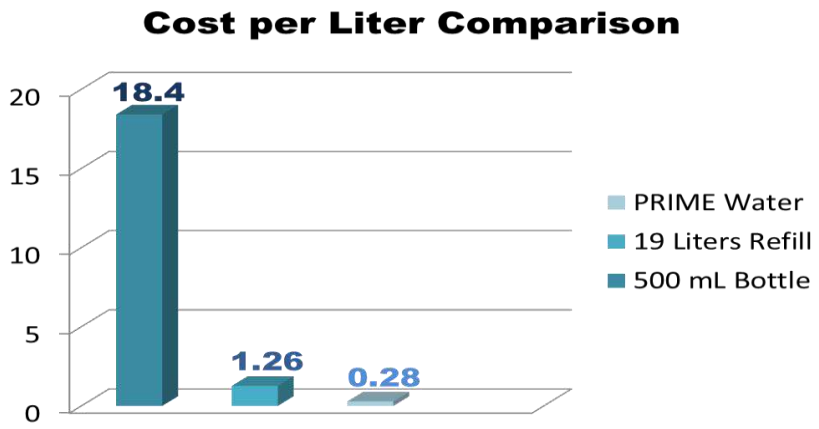

Fig.1: Cost per Litre Comparison

Figure 1 shows the cost comparison per liter of the three most common types of water consumed by the population. Based on the cost computed from the data available, the price of the 500 mL bottled water averaged from five refilling stations in Cabanatuan City scored the highest price with ₱18.40 per liter of consumption. The average cost per liter of 19 liters refilled water container was the second-highest among the three with ₱1.26 per liter and the cheapest one is the tap water provided by Prime Water with the cost of ₱0.28 per liter.

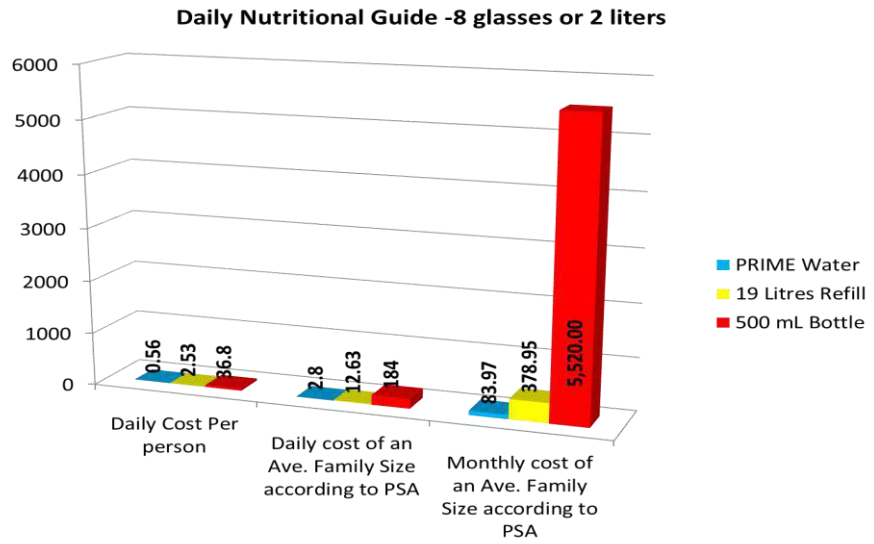

Fig.2: Cost Comparison Based on FNRI Daily Nutrition Guide

Figure 2 shows the price comparison between a single person's daily expense and average family size with five members daily and monthly expenses that goes to the drinking water if they follow the minimum amount of water intake suggested by the Food and Nutrition Research Institute guideline in drinking water which is at least 2 liters or 8 glasses a day. Like in figure 1, data showing the comparison of the daily cost a single person consumes, the 500 mL bottled water costs the highest with ₱36.80 for 2 liters of drinking water, followed by the 19 liters refill water container with ₱2.53 and the cheapest once again is the tap water provided by the PrimeWater with ₱0.56, which almost cost nothing compared to both 500 mL bottled water and 19 liters refill container. Following the same guideline used from the previous graph, data states that an average family with five members consuming two liters of water per person per day will have a ₱184.00 drinking water expense from 500 mL bottled water and ₱12.65 drinking water expense from 19 liters refill water container, while it will only cost them ₱2.80 drinking water expense provided by PrimeWater. Figure 2 shows the cost comparison that an average family pays for drinking water for a month. The graph shows the significant differences in cost per month between the three most common types of water consumed. Consuming tap water provided by PrimeWater will cost a family with five members only ₱84.00 per month which is so much cheaper compared to the remaining two. If we compare the ₱5,520.00 amount of 500 mL bottled water consuming family's cost with the PrimeWater consumer, we can see that the tap water consumer saves ₱5,436.03 which is a huge amount of money considering the current situation these days.

IV. CONCLUSIONS AND RECOMMENDATIONS

Four bottled water samples sold at the 5 water refilling stations did not meet the pH limits set for water refilling stations. Three of the 5 samples did not meet the microbiological safety standards, and 1 of these 3 showed a positive result for the presence of both total coliform and thermotolerant coliform/*E.coli*, the indicator for fecal contamination. Potability of supplied drinking water by Cabanatuan City Water District – PrimeWater Cabanatuan City was demonstrated by conformity to the microbiological, physical, and chemical standards set by PNSDW. The cost of bottled water serve in every 500ml was the most expensive of all three categories. Based merely on the price that the water refilling stations are offering, the 19 liters water refillable containers are 14 times cheaper versus the 500ml bottled water. Cabanatuan City Water District - PrimeWater Cabanatuan City serves the cheapest drinking water. The researchers urge that the Local Government Unit implement water quality monitoring, for corporate social responsibility [11], particularly at water refilling stations that practice "Bottling," based on their findings and conclusions. Although the water may be safe and meet regulations after treatment, additional factors may have an impact on its safety once it is moved to containers. Cabanatuan City Water District – PrimeWater Cabanatuan City should also engage in public awareness campaigns about the safety of tap water and the economic impact on households, in order to address the declining use of tap water as an exclusive source of drinking water by Cabanatuan City concessionaires. Tap water is less expensive than water

purchased at refilling stations, which will have a significant financial impact on customers and improved standard of living, particularly in regards to water safety [12].

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Challenges of Small Businesses in using Digital Platforms for Promoting their Products

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Abstract*— *Small businesses can expand by adopting the correct digital marketing approaches, tools, and strategies on digital platforms, where there is a greater opportunity for smaller enterprises to advance to the next level. Digital marketing agencies are typically hired by business owners who do not know how to put up digital marketing campaigns on their own [1]. Digital marketing services are in charge of keeping organizations online while working within their budget constraints. Businesses, regardless of their size, should always ensure the promotion of their clients' enterprises in order to maintain continual technological innovation. When innovative technology becomes a mainstay for larger firms, the hurdles for small enterprises grow much more difficult. This study described the business owners' preparedness and knowledge in different digital platforms. Results revealed that only a few business owners know how the digital world works. Most of them were only in the basic skills of their knowledge in the digital platforms. They have inadequate online payment options because of high processing fees, poor internet connection, and limited knowledge on how to use the application. Another challenge for the business owners was competition in Digital World for paid ads versus organic and poor brand credibility.

Keywords*— *Consumers, digital platforms, internet, promotion, small business owners.

I. INTRODUCTION

Small businesses played an important role in today's global economy because they were one of the primary contributors to our country's economic progress, particularly in terms of job creation. The majority of small business owners are always seeking fresh ways to bring their brand in front of potential clients. Even before the pandemic, using digital platforms in business is a terrific way to communicate with current clients and recruit new ones in this digital world.

Digital platform marketing has become the most potent method of marketing for small business owners nowadays since it can reach practically everyone, everywhere, at any time. The majority of efforts in digital platform marketing are focused on creating content that attracts attention and motivates readers to share it with their social media networks. Because the majority of people now have social media accounts, social media has become the most accessible forum for everyone [2]. Small business communication has improved, and brand awareness and new product launches have become easier to promote. Furthermore, digital marketing provides a low-cost platform for small enterprises to undertake marketing efforts, as social networking websites allow people to communicate with one another and develop networks.

As it connects small business owners and customers, digital platform sites increase visibility on the internet, which helps advertise products and services. They are also

excellent for developing social and business networks, as well as exchanging ideas and expertise. Nowadays, customers ha ve the ability to chat about a brand and publish their thoughts on the goods and services on the company's website as well as on social media [3]. As a result, small businesses have little choice but to recognize digital marketing's power and treat it with extra attention and respect. Because social media has such a significant impact on customers' purchasing decisions, every business should make the most of it. By giving your business brand a social media touch, you can not only generate more profit but also connect with new customers better by being open to their suggestions and comments in order to serve them better. It simplifies digital marketing.

Because they can communicate with the right audience and present their unique products and services to potential clients, small business owners have a lot of business growth chances with digital marketing platforms [4]. Digital marketing allows offline firms to reach a broad audience beyond their physical reach, allowing them to abandon traditional advertising in favor of less expensive digital advertising [5]. Small businesses that begin in the digital world recognize the importance of online marketing in today's world. As a result, they should place a greater emphasis on marketing in the digital era, which comes with its own set of obstacles. Unfortunately, most small businesses struggle to build a strong online presence, which is a challenge they can't afford to ignore. The internet world has changed dramatically and continues to change, making small business owners' digital marketing strategies more complex than ever [6]. Since these topics are new, the researchers find relevance in conducting this study that aimed to describe business owners' preparedness, knowledge, and tools used in different digital platforms, the small business and consumers' response to friendly options, the problems encountered by the small business owners on how to convert leads into paying customers and the solutions offered to address the current problems of small business owners to gain the trust of the audience.

II. METHODOLOGY

This study used a descriptive research design with researchers' made instrument as the main tool in collecting the data. A total of 350 people were picked as respondents of the study such as business owners, digital marketers, customers as professionals, parents, and students who have knowledge about the usage of digital platforms. Digitized online surveys via google forms and email were used in gathering data from the respondents.

III. RESULTS AND DISCUSSION

1. Business owners' preparedness and knowledge in different digital platforms.

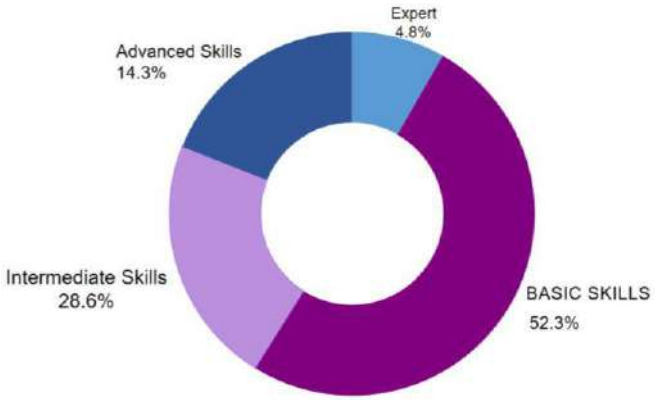

Fig.1. Levels of Skills of Small Business Owners in Using Digital Platforms

Figure 1 (Pie Chart) presents the levels of skills of small business owners in using digital platforms in promoting their businesses. As to levels of digital skills, 52.3% of the small business owners have basic knowledge on how to optimize and manage digital platforms. Thus, they know the basic features of their personal accounts on Facebook, Instagram, and YouTube. Based on the survey the researchers found out that only 28.6% of the Intermediate skills have knowledge in using these business digital platforms, intended to target a specific audience for business campaigns. The 3rd level is the Advanced Skills which garnered 14.3%. These are the business owners whose digital skills have cognition about the power of paid ADs, video editing, content management, and account optimization, and more. Thus, only 4.8% fall to the Expert Category when it comes to the level of digital skills. Meaning only a few business owners know how the digital world works.

However, these digitized applications may require familiarity in varied situations. Where pieces of training for making videos is a must, in order for small business owners to ensure familiarity with the system. The use of this application quite necessary when having an online business especially you can't hire manpower to manage the digital platforms' business accounts that require conceptualization, content creation, and management, cross-promotion, layout artwork, video editing, search engine optimization down to technical system concerns. Exploring the benefits of mobile technology to SMEs will help business owners hook their customers easily without spending too much on budget. It is also crucial to small business owners to provide easy payment options for their customers especially if potential buyers are of old age and

have limited access or skills in making an online payment as shown in Figure 2.

2. Business owners' and consumers'responses to friendly payment options.

Fig.2. Access to Multi-Channel Payments

Based on our survey about 48% of small business owners have limited online payment options because of high processing fees, poor internet connection, and having limited knowledge on how to use the application. While 29% of potential customers are using 1 to 2 apps use for cashless transactions. The rest have no access to the App provided by telecommunications or companies and just do the traditional payment transactions. Switching to an integrated payment platform, business owners can save time and reduce errors by having transaction records updated automatically and in real-time. This also boosts their processing efficiency while allowing the owners to focus more on significant matters for the business growth. Based on our interviews with the respondents having at least two payment channels will help increase the sales of small business owners because of its hassle-free transactions.

3.Problems encountered by the small business owners on how to convert leads in paying customers.

The most important challenges small businesses are facing today based on the gathered data are shown in the figure. Our study showed that there are a handful of challenges impacting small businesses in terms of advertising and marketing using digital platforms.

Fig.3: Problems Encountered

Based on this research, competition in the digital world for paid ads versus organic reach ranked as number one on the problems encountered by small businesses. Brand's credibility landed second in our survey. Researchers learned that credibility is important in building a successful online business whether your online business is a spin-off of an already-existing enterprise or a new solely online venture, how customers perceive your small businesses plays a critical role in the business success. Strong brand credibility can help everyone from e-commerce stores to freelancers earn and keep their online customers' trust [8]. Another problem encountered which ranked 3rd was the customers prefer to see, feel touch the actual product before they purchase. There are people who do not like to do online shopping because they prefer to go to the store by themselves and see the actual goods. Mostly, women love to shop a lot and prefer traditional shopping to online shopping. Small business owners may conduct new ways to overcome it by promoting their business online [9].

IV. CONCLUSION AND RECOMMENDATIONS

The challenges encountered [10] that small business owners face now in using digital platforms are vastly different from those that they faced in the past while using traditional advertising. It's critical to have a shared awareness of the issues that small business owners are currently confronting. Because of the global expansion of the digital economy and society, small business owners must be trained with a variety of digital skills in order for their companies to succeed [11]. Digital platforms are especially crucial currently because of the significant influence they have had on small enterprises. Small business owners must rethink and reorganize their operations, focusing on how to include social media, mobile connection, data analytics, and cloud computing into their business models [12]. Small business owners must integrate digital transformation into all aspects of

their operations in order to provide value to customers and maintain business continuity. Using digital platforms to market your business provides opportunities for numerous enterprises to reach the crowd in this digital era. Small business owners with strong digital abilities can take advantage of a greater range of opportunities as digital technologies, platforms, and gadgets continue to evolve. Digital platforms are especially crucial currently because of the significant influence they have had on small enterprises. Small company owners with the necessary digital skills can advertise or sell their products online using their smartphones by simply uploading them. It is possible to attend or organize digital platform seminars or training in order to gain a better understanding of how digital platforms work and how they will be optimized. This might be done on a regular basis to keep small business owners informed about current digital technology advances. Small business owners must create appropriate brand messaging material. Make an appealing presentation of it by encouraging target consumers to interact with the brand's message. The proprietor of a small business should never stop learning. They must continue to improve and grow their social media abilities in order to advance and use them in their business to effectively reach out to the community [13]. They put a strong emphasis on developing these skills by enrolling in short courses such as Social Media Management and Digital Marketing, which they can use to create outcomes, understand the true business impact, and improve small business owners' ability to tackle problems. More players (online application payment service providers) are needed to make it easier for small company owners and customers to make payments. The local government tap with the private company's network providers can play a vital role in this project. Online payments are even assisting in the faster delivery of stimulus monies to customers. When it comes to audio or video, some people prefer to listen rather than read. Encourage customers to provide comments. Adding more feedback to the business's product/service could help it improve.

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War Field Spying and Rifle Firing system with UGV's Approach

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Abstract— *Our country has been through war since 1947, through the will of Indian soldiers to defend our country has led us to be victorious but we have lost many precious lives. At present our enemy has concentrated more on robotic based technology to counter us, although the love, courage and will does not imply to a robot, India has been emerging with latest technology like Agni missile to counter. War field spying robot with UGV's is the latest technology which most nations are associated with to defend the lives of their soldiers. Our robotic model has been designed such that it gives live location at server end to keep surveillance, empowered by PIC microcontroller and NodeMCU manually designed to give complete and hassle-free use. It's connected with IR sensor, bomb detector and buzzer. The IR sensor gives the hinderance information and bomb detector has been implied to fund underground mines. The server end connected through blynk gives all the information required. Thus, it can be very helpful only to counter the enemy but also to make strategic preparations in time of war.*

Keywords— ***Surveillance, PIC microcontroller, NodeMCU, IoT controlled embedded system.***

I. INTRODUCTION

The main aim of Defense is to protect the border and to confirm that no infiltrators or criminal enters our country. defence is deployed in terribly laborious and sensitive areas at Border also as for internal security duty. Keeping visible the realm of responsibility given to Defense and handiness of men, typically it's not in the least potential to protect some vulnerable purpose around the clock, at that point it becomes imperative to develop an electronic system through that the weapon are often operated remotely or mechanically. to beat this downside, we've got designed a singular system i.e., IOT controlled / auto firing device which may be sited at such places and is capable to fireplace automatically and remotely whenever any unwanted person enters an unattended purpose / place. In modern days, still we tend use the rifle for manual firing there's no automatic firing rifle out there in Defense and state police.

Here we've got designed one ROBOTIC model and automobile firing system, that provides automatic firing, controlled by web. it's very helpful for Defense. Our country has been through war since post-independence. Though the will of our soldiers to protect the countrymen has led us to be victorious, but we have lost many precious lives. At present our enemies have concentrated more on robotic based technology to counter us all though the love courage and will does not imply to a robot, India has been emerging with latest technology (like Agni prime) to counter. The unmanned ground vehicle is counted as most emerging robotic warfare model in the interest of most countries. The aim was to build a prototype model capable of all time surveillance with upgraded hardware to counter a situation. The machine comprises of night-sight remote camera which may send recordings of the conflict field to hinder any damage and misfortune to human existence. Military people have an enormous danger on their lives while getting into an obscure domain. The robot can fill in as a material machine for the safeguard area to downsize the deficiency of human existence and can also thwart prohibit exercises. it'll work with every one of the tactical

people and military to get a handle on the state of the region prior to coming into it. The utilization of GPS is developing fast as of late. Not exclusively in military and science capacities, be that as it may also in common use, GPS assumes a critical part in a few frameworks.

II. LITERATURE REVIEW

[1]. Global positioning system have been used to any movable machine to locate, navigate, and control the motion. GPS guidance system enabled are working robotic model to do all these functions. GPS would be enabled by 8-bit NodeMCU and a simple android blynk application designed to control a low cost IoT devices is used at the receiver end to control.

[2]. Design and development of robotic model built on a steel frame with four DC motors common peripherals interface microcontroller and 8-bit NodeMCU was implemented. The PIC microcontroller is connected to DC motor to get the motion control. NodeMCU enables internet and GPS helping to send the information.

[3]. The low-cost implementation design was studied. The paper is basically about the connections of UGV help us in relay connection and basic idea of UGV working model.

[4]. Haptic technology is used to get a wireless communication model which would help in working of robotic model. The idea was to save human from landmines, bombs and detect the threats so that the lives of human could be saved.

[5]. The paper shows the uses of wireless camera to give surveillance of live view. The threat can be viewed from these cameras and immediate action can be taken. Since Bluetooth have a limited range, we decide to get connected with robot by the help of internet. Mobile camera was to do low-cost implementation.

[6]. The implementation of 8-bit NodeMCU was taken in the view of getting connected to internet. The android blynk application is used for the controlling of vehicle with the help of DC motor connected to PIC, which is connected to NodeMCU which in turn receives the RF signal through blynk application.

III. PROPOSED SYSTEM

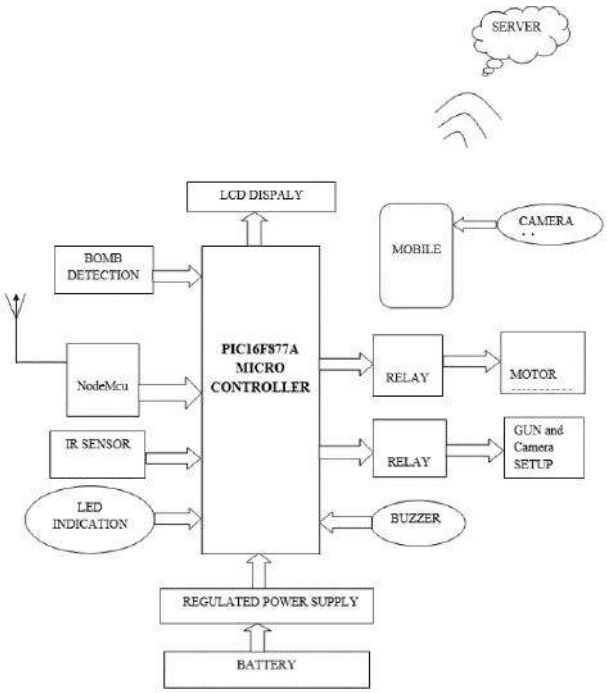

Fig.1: Block Diagram of Proposed System

The system consists of two parts, the rover and the user end. For the movement of UGV we are using Blynk android application which is integrated with NodeMCU through Arduino IDE. The construction of NodeMcu controlled Robot consists of a frame which is used for mounting the components such as D.C motor, battery, and wheel. The front and back wheels are fitted in the base of the frame. The power for driving the motor is taken from

the battery. The receiver circuit is fixed inside the vehicle. The receiver having four relays. These relays output is connected to the D.C motor. As soon as power supply is given to the system controller peripherals, timer, LCD, NodeMcu module will get initialize. NodeMcu module needs to be connected with android Blynk app in order to operate the vehicle and control the direction of gun and camera with triggering. There are different buttons to for every action like forward, reverse, left, right, stop, direction control of gun and triggering of bullet. Bomb detection sensor (Metal detector), IR sensor is connected to controller and controller keeps monitoring the sensor status. If Bomb detection sensor found any metal near to the sensor, then sensor output will go high, and controller detects, then the vehicle will stop and RED LED starts blinking at 250msec rate. After the blinking of LED one can identify using camera so that vehicle is stopped due to bomb detection. During the movement of vehicle, if IR sensor detects any object in front of the vehicle, then controller will stop and blinks the RED led's at 1sec rate. By seeing RED led blinking rate in the camera one can identify what is the status of the vehicle. In this system for triggering mechanism, gun ejector is used, once trigger button is pressed from transmitter side, receiver controller will give 1sec supply to the ejector, then ejector will pull back the trigger button in the gun. At that time bullet will come out to reach the target. The surveillance is done through IP webcam android application and putting the IP address in browser.

IV. RESULTS AND DISCUSSION

Fig -2 UGV Module

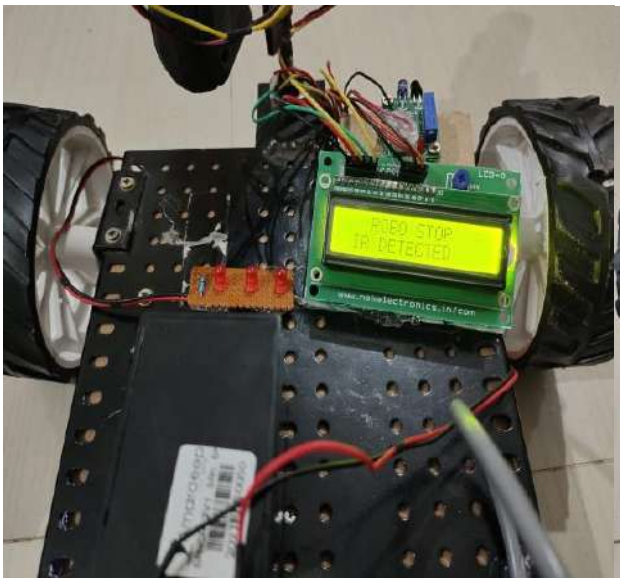

Fig-3 IR Detection

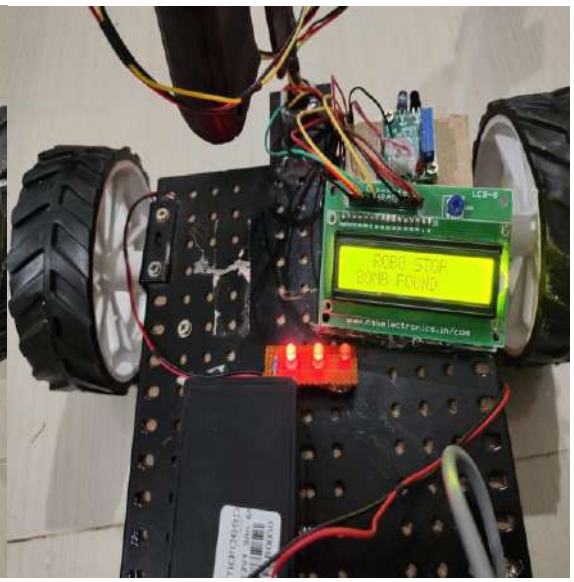

Fig-4 Bomb detection

Fig-5 Surveillance through wireless camera

The whole assembly is based on a metal slab(plate) to which holes are drilled through out to fit screws. Four wheels are attached to the sides of the plate and the two rear wheels are connected to the 12V DC motors for movement. A cardboard of the same size as that of the metal slab is placed and fixed on top of the slab which aids in fitting of the components. The cardboard is used to provide isolation between components and the metal plate to avoid any losses and as metal plate is not ideal to fit any electronics on top of it. The PIC microcontroller, Relay modules, and all the hardware components are fitted beneath the robot prototype. The wireless camera used here is mobile is fitted to a servo motor which aids in the rotation of the camera and is fitted at the front of the Rover. IR Sensor is attached at the front of the Rover for getting the job of obstacle detection done.

In this project a surveillance rover module which can perform multiple tasks such as object recognition, live video streaming and surveillance. This project proposes a low-cost module which can perform complex tasks such as the object detection with minimum resources. Object detection and surveillance is based on IoT controlled embedded system. The communication between the user and the rover module is achieved through internet via an Blynk android application. This module can be implemented for a variety of surveillance applications.

V. CONCLUSION

Triggering mechanism has been successfully tested with 360 rotations to encounter enemy.IR sensor gets activated as soon as it detects obstacles and bomb detector activates when metal found. The efficiency of the system is based on the hardware we have used integrated with microcontroller. The wireless camera will give the report of UGV's surrounding. The system focuses on creating an alert for the controller. The system can be deployed for security and surveillance in border areas.

SOME OF THE ADVANTAGES FROM THE ABOVE RESULTS

a) The Motorized arm is more effective in the specialized field.

b) Speedy reaction is accomplished.

c) Straightforward in development.

d) Simple to keep up with and fix.

e) Cost of the unit is less when contrasted with other mechanical technology due to PIC microcontroller

f) No fire danger issue due to over stacking.

g) Relatively the activity cost is less.

h) Constant activity is conceivable ceaselessly.

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Performance of a two Chambers Reactor for the Treatment of an Oily Effluent by Electro flocculation

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Abstract— *This work had as objective the development and analysis of a continuum flow reactor and measure its efficiency in the treatment of residual water of the biodiesel purification process using electro flocculation. The reactor was designed with two interconnected chambers with an 0.2 cm opening between then and reaction volume was 0.883 L and an electrolytic area of 351 cm². The electrodes were all aluminum, which were arranged in parallel and with 0.5 cm spacing, whose power was supplied by a DC source. As design variables, the influence of electrical potential (U) and residence time (τ) on: current density, final pH, removal of oils and greases, COD (Chemical Oxygen Demand), turbidity and total solids, in addition to quantification of the sludge mass obtained and the energy cost of the reactor. The best performance was for a potential of 6.0 volts and a τ of 29.43 min, with 90% removal of oils and greases, 53% COD and 4.38 g of sludge, culminating in an energy consumption ranging from 0.708 kWhm^{-3} to 4.73 kWhm^{-3}. In addition, by visual analysis of the formation of bubbles and the removal of turbidity (94%), it was concluded that the division of the reactor in two chambers reduced the secondary contamination of the treated effluent*.

Keywords— ***electrochemical process, continuous system, effluent treatment, environment.***

I. INTRODUCTION

The biodiesel production process, for the most part, is based on the use of homogeneous catalysts, usually Sodium Hydroxide (NaOH) or Potassium (KOH) (Lage et al., 2019; Gunaya et al., 2019). In this production route, water is generally used to purify the synthesized biodiesel, which at the end of the process generates a proportion of three liters of wastewater for each liter of synthesized biodiesel (Manique et al., 2012). Therefore, this effluent is alkaline and contains a high content of oils and greases (Chavalparit and Ongwandee, 2009; Meneses et al., 2012).

However, this wastewater contains low concentrations of nitrogen and phosphorus, making an eventual biological treatment, in itself, ineffective (Asia, 2003; Oliveira et al., 2018; Menezes et al., 2017). Other treatment alternatives using only metal salts such as polymers and polyelectrolytes have been used, however, they are expensive, generate excess coagulant materials, and can even lead to secondary pollution (Jun Lu et al., 2015).

Lately, an electrochemical technique has been studied, which although it is still little applied industrially, has aroused a lot of interest due to its simplicity of operation and application in different types of treatment, for example: in textile effluents (Manenti et al., 2014), in waters that show color (Bani-Melhem and Smith, 2012), waters containing pharmaceutical residues (Chou et al., 2011), effluents contaminated with heavy metals (Zhu J et al., 2011), oily effluents (Chavalparit and Ongwandee, 2009; Meneses et al., 2012; Fernandes et al., 2015; Ammar et al., 2019). This is electro flocculation (EF), whose technique is the sum of three sub-processes: coagulation, flotation and electrochemistry (Moussa et al., 2017).

As shown in Fig.1, in an electrochemical reactor containing a set of sacrificial electrodes immersed in the effluent, an electric potential (U) is applied and as a consequence, an electric current is generated in the medium.

Electronic mobility initially allows oxidation of the anode, releasing the metal (M) in ionic form (Mn^{+}). These will then react with hydroxyls (OH^{-}) generated at the cathode, forming M (OH)n, which is the main coagulation agent in the medium, in addition to forming other compounds such as: $M(OH)^{2+}$, $M_2(OH)^{24+}$, $M(OH)^{2+}$, $M(OH)^{4-}$, $M_6(OH)_{15}^{3+}$ (Holt et al., 2002; Yang Liu et al., 2018). Parallel to coagulation, there is the formation of hydrogen gas (H_2) at the cathode and oxygen (O_2) at the anode, which are responsible for the flotation phenomenon, that is, most of the coagulated material that is not decanted, adheres to the bubbles and is carried to the reactor surface (Tezcan Un et al., 2013).

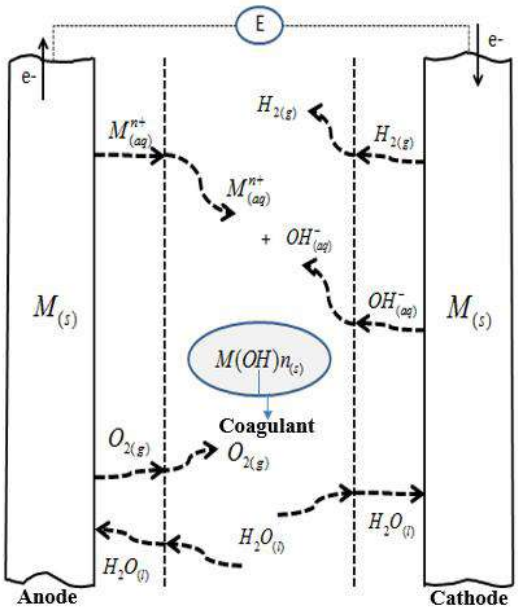

Fig.1: View of the components generated between two sacrificial metal electrodes (M), in the electro flocculation process. (Designed by the author).

Lately, a lot of work has been done to improve the design of EF reactors, aiming to improve the efficiency of contaminant removal (Abdelwahab et al., 2009; Chaudhary and Sahu, 2013; Hamdan and El-Naas, 2014; Fernandes et al., 2015; Ammar et al., 2019). With EF experiments, it has been observed that the flotation of particulate material to the reactor surface can be considered a critical step in this process, since the coalescence between bubbles and contaminating particles needs to be effective for the set to reach the top of the reactor (Leite, 2009).

According to II'In and Sedashova (1999), this contact is controlled by hydrodynamic interactions between bubbles and particles, which, in turn, requires intrinsic care with the electric field generated in the medium, with the rate of agitation and with the flow of reactor supply, otherwise the bubbles will burst and contaminate the effluent again (Fig.2).

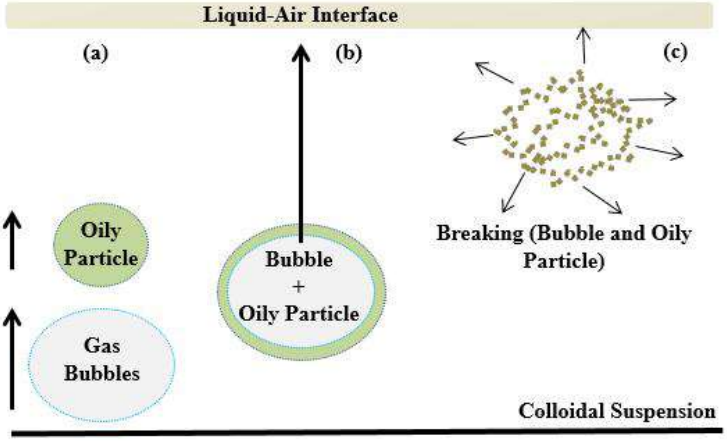

Fig.2: EF flotation process: a) pollutant and H_2 and / or O_2 gas bubble isolated; b) gas bubble and pollutant adhered and emerging to the surface; c) particles of the pollutant diffusing in the liquid medium after the bubble ruptures. (Designed by the author).

However, what has been observed is that even with the strict attention given to the control of these parameters, gas bubbles tend to burst naturally, due to the pressure difference that they are subjected to when reaching the reactor's liquid surface. Therefore, in order to minimize the effect caused by the explosion of gas bubbles, this work aimed to develop an electrochemical reactor with continuous flow and consisting of two chambers, to analyze it for efficiency in the treatment of wastewater for the purification of biodiesel.

II. MATERIALS AND METHODS

2.1. Electro flocculation reactor design

Fig.3 shows the schematic drawing of the EF reactor with the electrodes connected to a direct current source (DC), as well as the numbering of each component, as detailed in the legend. The reactor has the following dimensions: 10 cm long, 23.5 cm high and 4.7 cm wide. The total volume is 1,034 dm³ and the reaction volume is 0.883 dm³. There are also two streams, one for feeding and another for the outlet of the treated effluent, in addition to a 25º inclined gutter at the top, for the drainage of wet sludge, coagulated and flotated material.

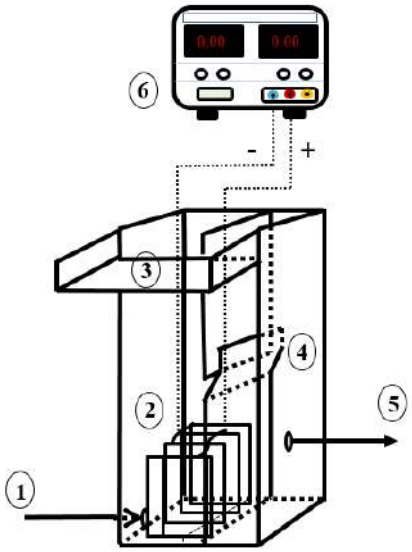

Fig.3: Design of the EF reactor coupled to the DC source: 1-effluent inlet, 2- electrochemical cell chamber, 3-sludge removal channel, 4 - second reactor chamber, 5 - treated effluent outlet, 6 - DC source. (Designed by the author).

The electrochemical cell is composed of four aluminum electrodes whose purity is 96.89%. Each electrode is 0.1 cm thick and has a total area of 128 cm². They were distributed alternately, respecting a fixed distance of 0.5 cm between anodes and cathodes, as studied by Meneses et al., (2012) and Fernandes et al., (2015). The effective reaction area was totaled 351 cm².

The passage of the effluent from the first to the second chamber occurred through an opening of 0.2 cm located at half the height of the reactor (Fig.4). This idea was supported by the observations made by (Georg et al., 2008). Who affirms that a gas bubble suspended in a viscous medium is basically spherical and follows an upward and rectilinear trajectory, since the upward vertical tensions, drag Force (F_d) and Thrust Force (F_t), which act on the particle (bubble + pollutant), prevail over the gravitational Force (F_g) and horizontal frictional forces (F_f).

Therefore, knowing that the biodiesel effluent has a viscous aspect, it was deduced that most of the particles must emerge in the first chamber of the reactor and that a minority follows a horizontal path towards the second chamber.

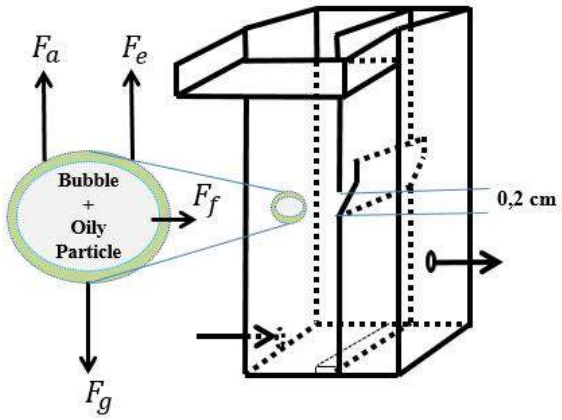

Fig.4: Highlight for the access between the EF reactor chambers and the field of hydrodynamic forces that act on a coagulated particle (contaminant + bubble). (Designed by the author).

2.2. Analytical Techniques

The pH was measured with a bench pH meter of the brand pH Meter, model Instrutherm pH - 1900, with automatic temperature compensation and reading range from 0.0 to 14 and accuracy of 0.01. The electrical conductivity was measured by direct reading with a TECNOPON conductivity meter, model mCA - 150, with a measurement range between 0.01 and 2000 µScm $^{-1}$ and resolution of 0.1 µScm $^{-1}$. Turbidity was measured with a HACH turbidimeter, model 2100P, with a scale of 0.0 to 1000 NTU and precision of 0.01 NTU. The concentration of total solids (TS) was determined by the gravimetric method, using a SOLAB oven, model SL 102, with a capacity of 150 L and automatic programming, whose drying temperature of the samples was (103 ± 2) ºC. The concentrations of oils and greases (O&G) and the chemical oxygen demand (COD) were determined with an Agilent Technologies spectrophotometer; model Cary 60 UV-vis. For COD, samples were previously digested in a

MARCONI DRY BLOCK MA4004 digesting block, at a temperature of 150ºC for a period of 2 hours. The oils and greases were previously separated by hexane extraction. All analyzes were adapted from the American Public Health Association (APHA, 2005) and Gobbi (2013).

2.3. Waste water from biodiesel purification

The wastewater was obtained synthetically at an ambient temperature of 25ºC. Soybean oil (2.01 gL^{-1}), biodiesel (4.01 gL^{-1}) and glycerin (1.36 gL^{-1}) were inserted in the reactor feed tank, with a capacity of 8.0 L, according to values determined by (Chavalparit and Ongwandee, 2009), for biodiesel wastewater. The mixture was subjected to mechanical stirring at 700 rpm, with a Stainless Steel 304 stirrer, model DLMYP2011-100, for a period of 30 min, until an apparently stable emulsion was obtained, with an alkaline pH ranging between (9 - 11). The brand soy oil (LISA), 100% vegetable, was purchased in local stores, while biodiesel and glycerin were synthesized by the transesterification process, via homogeneous catalysis, at the Chemistry and Biomass Laboratory (LQB or CBL) of the Science Center and Technology, UFCG, Brazil. 1M aqueous solutions of HCl and NaOH, previously prepared, were used to adjust the pH of the emulsion to 8.0, the pH of the experiment. According to (Mansoorian et al., 2014; Gatsios et al., 2015; Moussa et al., 2017), for pH values between 6 and 9 a good formation of coagulating agents in EF is achieved. Conductivity was measured right after adjusting the pH.

2.4. Reagents and solutions

All chemical reagents were of analytical purity grade and were used without pretreatment. The effluent was prepared with local water supply, whose average conductivity was 217 μScm^{-1} and pH equal to 7. The solutions used in the physical-chemical analyzes and for pH control were prepared with pure material, using water distilled with an average conductivity of 1.0 μScm^{-1}.

2.5. Experimental planning

The performance evaluation of the reactor was carried out with the control over two system factors: Residence Time (τ) and Electric Potential (U), varying between the levels, low (17.6 min and 3.6 volts) and high (29.43 min and 6.0 volts), as shown in Table 1.

Table 1: Factors and experimental levels.

Exp.*	τ	U
	(min)	(volt)
1	17.66	3.6
2	17.66	6.0
3	29.43	3.6
4	29.43	6.0

*Experiments

The levels were chosen based on studies by (Fernandes et al., 2015), which analyzed an electrochemical reactor with a tubular geometry and aluminum electrodes for treating oily water, yielding removals above 80% for oils and greases. In this study, the volumetric flow rates of the reactor inlet varied between 0.03 and 0.05 $Lmin^{-1}$. Therefore, for these two extremes, knowing that the proposed reactor useful volume was 0.883 L, the theoretical residence times were calculated (Table 1), using Eq. (1) (Gardiman Junior et al., 2019).

$$\tau = \frac{V}{\nu} \quad (1)$$

Using τ in (minutes), V the useful volume of the reactor in (L) and ν the volumetric flow of the reactor inlet in ($Lmin^{-1}$).

As response variables were analyzed: the density of electric current (DC), the final pH, the concentrations of O&G, COD, TS, turbidity, in addition to the sludge mass and energy consumption (EC). All were analyzed for behavior over the treatment time, with O&G, COD, turbidity and TS being analyzed as removal efficiency (%), calculated from Eq. (2) (Fei Liua et al., 2019).

$$(\%) = \frac{C_0 - C_i}{C_0} \times 100\% \quad (2)$$

Adopting (C_0) the concentration measured at time $t_0 = 0$ min and (C_i) the concentration of the variable analyzed at time t_i different from zero.

The behavior of the electric current (I) generated in the reaction medium was also monitored in the DC source, whose values were applied to Eq. (3) to calculate the energy (E) spent with the EF reactor, which was used to calculate energy cost (EC) using Eq. (4).

$$E\left(kWh/m^3\right) = \frac{U \times I_m \times \Delta t}{V_t} \quad (3)$$

$$EC\left(R\$/m^3\right) = E \times t_i \quad (4)$$

E is given in ($R\$m^{-3}$), t_i the tariff defined by the energy concessionaire of each state or country given in $R\$(kWh)^{-1}$, U the potential difference in (volts), I_m the average electric current in (A), V_t the volume of effluent treated in (m^3) and Δt the time interval of experiment in (h).

Thus, based on the levels and factors presented, four tests were performed in triplicate, totaling twelve experiments. These were performed at random, according to (Montgomery et al., 2004).

2.6. The continuous electro flocculation system

The set of equipment connected to the electrochemical reactor formed the continuous EF system (Fig.5). The tank (T-01) with capacity for 8L and a coupled

agitation system, contained the biodiesel wastewater, which fed the reactor by a peristaltic pump of the brand BPT tube, model KXF-DC-B08. This contained the valve (V-01), which allowed adjusting the flow at the entrance to the reactor (range from 0.003 to 0.08 $Lmin^{-1}$). A DC source, which connected to the reactor, allowed adjusting the electrical potential and monitoring the variation of the electrical current throughout the process. At the top of the reactor, the sludge generated during the electrochemical process was removed, which was stored in the tank (T-02) with a capacity of 3 L. In the outlet current for the treated effluent, there was the valve (V-02) used to control the liquid level in the reactor, the value of which remained at 14 ± 1.0 cm throughout the treatment process. The treated effluent was collected in the tank (T-03) and sent to perform the physical-chemical analyzes.

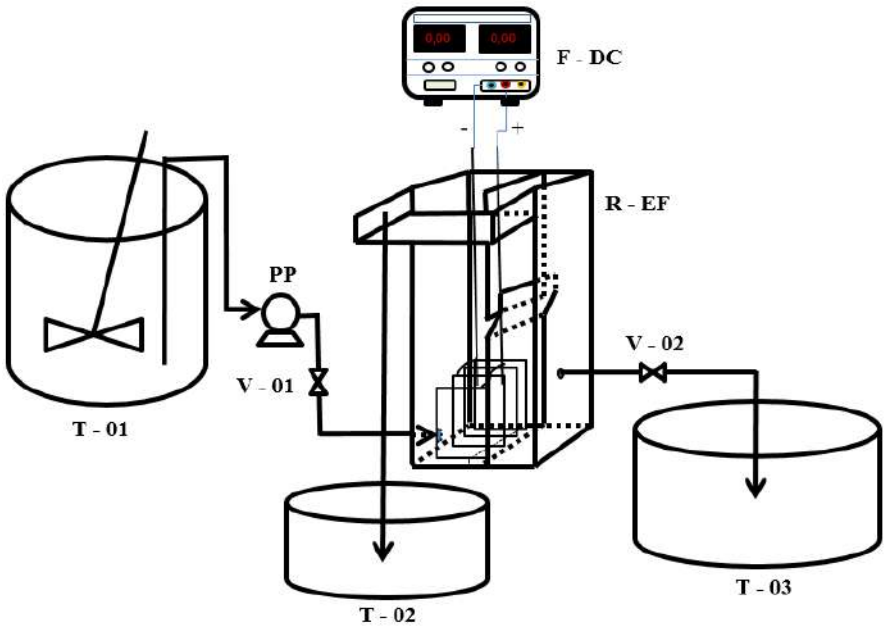

Fig.5: Schematic diagram of the experimental configuration (T-01: biodiesel wastewater tank; PP peristaltic pump; V-01: flow control valve; T-02: sludge tank; R-EF: electro flocculation reactor; F-DC: direct current source; V-02: valve for level control; T-03: tank for the treated effluent). (Designed by the author).

2.7 Experimental procedure

The biodiesel wastewater was synthesized in the T-01 tank, according to the procedure shown in sub-item 2.2. Agitation was reduced from 700 rpm to 100 rpm after preparation and maintained throughout the experiment, to ensure homogenization of the emulsion. A 0.2 L sample was collected to perform the physical-chemical analyzes at zero time. The peristaltic pump was switched on and the volume flow in the valve (V-01) was adjusted, according to the test τ. When the reactor reached the operating liquid level, the valve (V-02) was manipulated to keep it in the specified range. With the hydrodynamic variables controlled, the DC source was connected to the electrical potential of the experiment and a timer was started. Samples of the treated effluent were collected every 5 min to perform the physical-chemical analyzes, and so on, until completing 40 min of the experiment. At the end, the equipment was turned off and the electrodes were washed with soap and water, using steel anchors to ensure the complete scraping of contaminants adhered to the aluminum plates.

III. RESULTS AND DISCUSSION

The physical-chemical characterization of the wastewater purification of Biodiesel was performed and listed in Table 2. It was observed that the conductivity, a very important parameter of the process variables presented values because, based on the initial pH was added a greater or lesser volume of acid and/or alkaline solution to equalize the pH in 8, the pH of the experiments. The initial pH varied between (9 - 11), since the biodiesel and glycerin used in the preparation of the effluent were non-pure and came from a homogeneous catalytic process that used potassium hydroxide (KOH) as a catalyst and methyl alcohol as reagent. Therefore, in addition to the high alkalinity resulting from potassium hydroxide, methyl alcohol contributed to the wastewater to present a high quantity and dissolved organic material.

Table 2: Results of physical-chemical analyzes for wastewater from biodiesel purification.

Physical-chemical parameters	Values
Initial pH	9 – 11
Experiment pH *	8
Temperature (ºC)	23 - 25
Conductivity (μScm^{-1})	936.7-1198
Total Solids (gL^{-1})	1.6317
Chemical Oxygen Demand (mgL^{-1})	1276.03
Oils and Greases (mgL^{-1})	1598.1
Turbidity (NTU)	236.83

* Value adjusted with 1M HCl and NaOH solutions.

3.1 Influence of residence time and electrical potential

The behavior of the electric current density was monitored for each experiment and recorded according to the profiles of (Fig.6). These values were obtained according to (Kobya et al., 2016; Yang Liu et al., 2018), calculating the ratio between the electric current registered in the DC source, over time, by the sum of the reaction area of all electrodes of the electrochemical cell, which is 351 cm². The initial conductivity for the experiments was 1063, 1198, 1192 and 936.7 μScm^{-1}, respectively. According to Moussa et al., (2017), conductivity is essential for the electrochemical processes of wastewater treatment, as it guarantees the conduction of current in the environment and reduces energy consumption.

Exp. (1 and 3) developed on the same average current density, which was approximately 1.6 mAcm^{-2}. Therefore, for a voltage of 3.6 volts, τ did not influence the current density of the experiment. On the other hand, the increase in voltage from 3.6 volts to 6 volts contributed to the increase in the current density of the Exp. (2 and 4) in comparison with the previous ones. This effect derives from Ohm's first law: that the potential (U) is proportional to the electric current (I) in the environment (Walsh, 1993). In addition, according to Faraday's Law, in electrolysis, the electric current is proportional to the amount of metal ions (Al) that are sacrificed at the anode, as can be seen in Eq. (4), (Gamage and Chellam, 2011; Tanneru and Chellam, 2012; Ammar et al., 2019).

$$m_{Al^{3+}} = \frac{M \times I \times t}{n \times F} \quad (4)$$

Adopting m_{Al}^{3+} is the mass of aluminum ions given off at the anode, *I* the electric current, *t* the electrolysis time, *n* the number of electrons in the redox reaction and *F* the Faraday constant. Therefore, the greater the applied potential, the greater the current density and, consequently, the greater the number of ions present in the medium, which contribute to sustaining the current at higher values (Priya and Jeyanthi, 2019).

A comparison between Exp. (2 and 4) shows that for a voltage of 6 volts, the current density has stabilized at 3.6 and 4 mAcm^{-2}, respectively. This shows that the increase in τ caused a sudden increase in current density, as the consequent reduction in flow decreased the interaction between aluminum cations (Al^{3+}) and hydroxy anions (OH^-). This resulted in a medium more saturated in ions than in hydroxy aluminum compounds, contributing to a higher current density value.

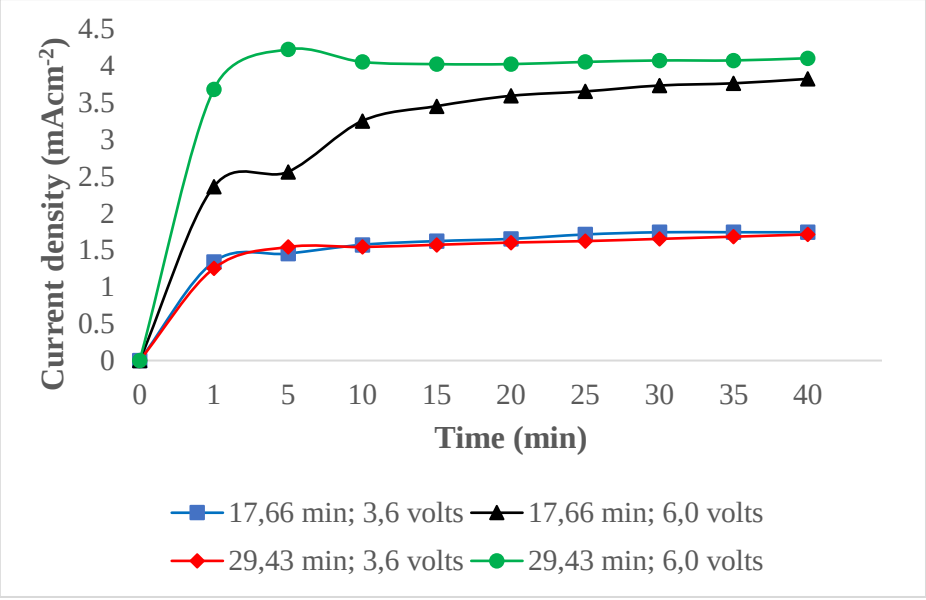

Fig.6: Current density behavior over the treatment time.

The changes in the pH behavior over the treatment time were monitored and recorded according to the profiles in (Fig.7), for an initial pH equal to 8. The graphic analysis shows that the pH decreased for all experiments, stabilizing in the range (6.53 and 7.35), as final pH. Behavior that was also observed by (Meneses et al., 2012; Ammar and Akbar, 2018). With the exception of Exp. (2), the pH hardly changed between the initial 10 min and showed a linear trend for all tests in the interval from 0.0 to 25 min of experiment, from which it became constant until the end of the experiment.

Exp. (1 and 3) showed values approximately equal to 7.0 for the final pH, verifying that for a voltage of 3.6 volts, the τ variation did not influence the final result. However, when the voltage was increased to 6 volts in Exp. (2 and 4), there was a small influence of τ on the final pH. For an initial pH less than or equal to 8.0, the increase in voltage caused the reduction of OH^- molecules, which gave rise to cationic hydroxide species, such as $Al(OH)^{2+}$, $Al(OH)_2^+$, $Al_2(OH)_2^{4+}$, $Al(OH)_3$ (Saur et al., 1996; Ammar et al., 2019). However, the formation of these compounds can be more accentuated, if the time that the anionic species (OH^-) meet with the cationic species (Al^{3+}) is reduced. This is the case of Exp. (2) when compared to Exp. (4), that is, the reduction in τ, which is due to the increase in the volumetric flow at the reactor inlet, favors greater agitation of the medium. Thus, more hydroxy - aluminum compounds are formed and, consequently, the reduction of free hydroxyls decreases the alkalinity of the medium.

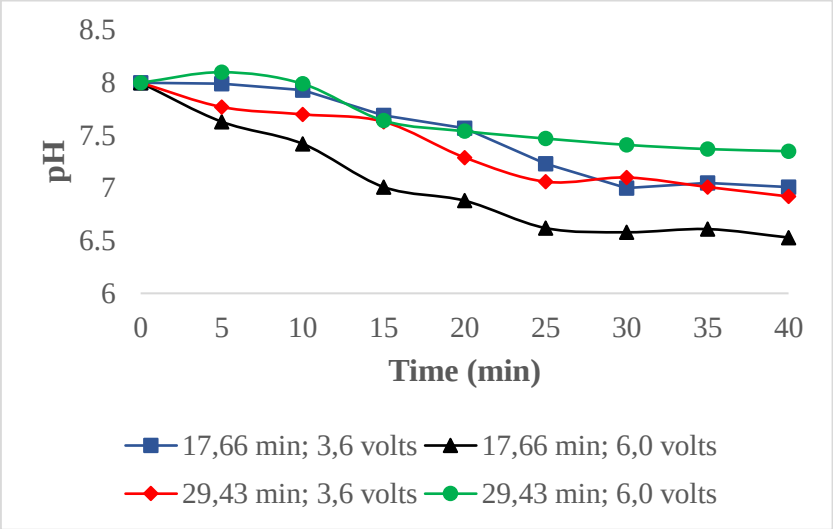

Fig.7: Influence of residence time and electrical potential on the final pH.

In Fig. (8 and 9) the behaviors of the variables, efficiency of removal of O&G and COD, respectively, are presented. The joint analysis of the profiles shows that for a τ of 29.43 min and a potential of 6 volts it is possible to obtain the greatest removals of oils and greases (90%) and COD (53%), approximately.

According to (Ammar et al., 2019), for a pH between 6 and 9, the greater the electrical potential the more insoluble compounds of $Al(OH)_3$ are formed, and the greater the *τ*, the longer the interaction time between the coagulant with the particles oily, allowing greater removal by coagulation and, consequently, by flotation. In addition, a higher τ implies a lower volumetric flow at the reactor inlet, therefore, the less force the flow exerts on impurities that are coagulated, minimizing their fragmentation and, therefore, improving the removal of O&G and COD.

The greater efficiency of O&G and COD removal contrasted with a higher generation of turbidity and TS. For, for the same experimental conditions, more $Al(OH)_3$ is generated and, consequently, more insoluble material is formed and dispersed in the medium. The profiles of turbidity removal and TS are shown in Fig. (10 and 11), respectively. As noted, the best removals (94%) and (49%) were obtained for an electrical potential of 6 volts and an τ of 17.66 min. That is, for the same amount of $Al(OH)_3$ produced and for the same flotation rate, a shorter interaction time between the impurities and $Al(OH)_3$ results in a lower coagulation rate of oily contaminants. As a consequence, only the micro particles with a larger surface area are removed, mostly, by flotation, as well as $Al(OH)_3$, which is also carried to the liquid surface, resulting in less turbidity and TS.

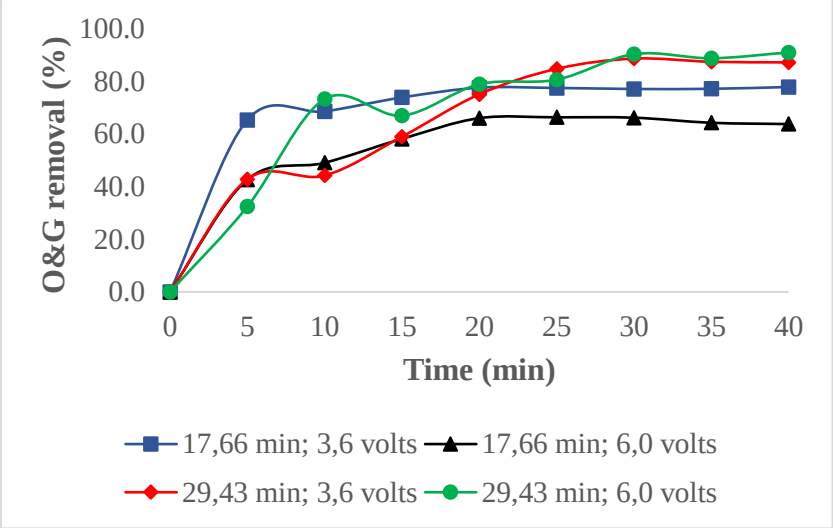

Fig.8: Influence of residence time and electrical potential on the removal of oils and greases.

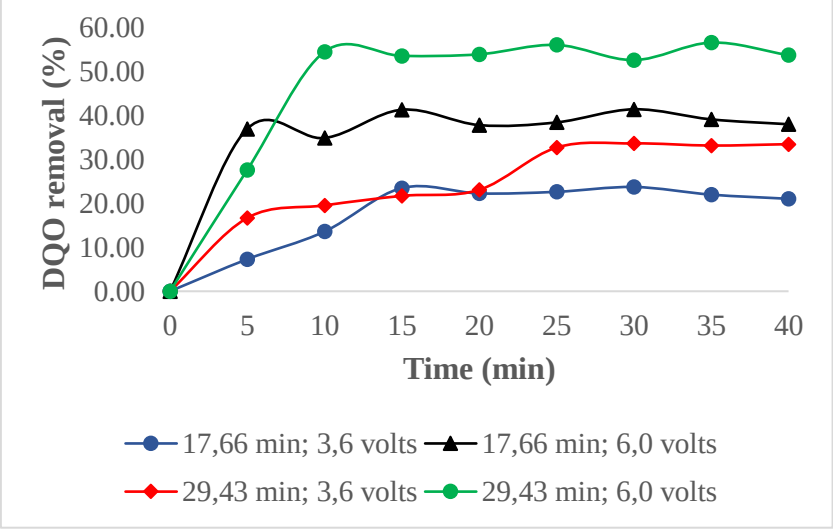

Fig.9: Influence of residence time and electrical potential on COD removal.

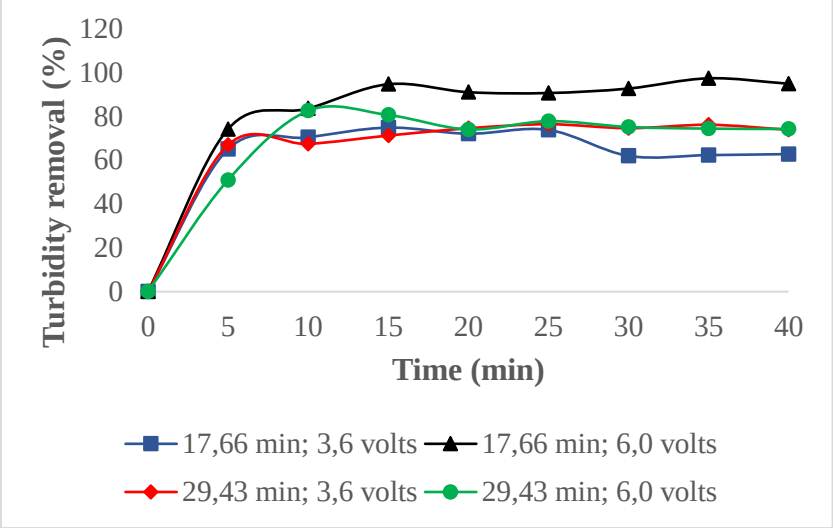

Fig.10: Influence of residence time and electrical potential on the removal of turbidity.

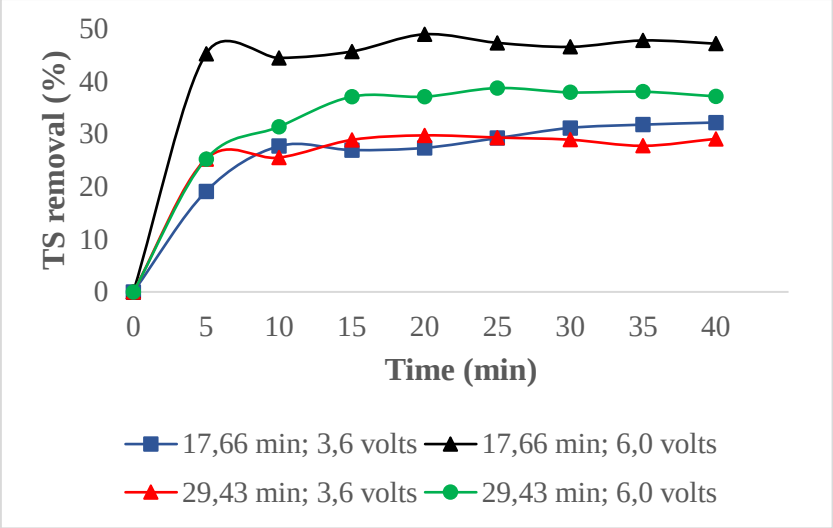

Fig.11: Influence of residence time and electrical potential on the removal of total solids.

The joint analysis on the efficiency of removing O&G, COD, turbidity and TS, allows us to infer that it is in the interval of 0.0 to 10 minutes that the highest rates of removal of impurities from biodiesel wastewater are obtained. In addition, it can be said that the removals become practically constant after the 25 minutes of the experiment. Characteristics that were also observed by (Chavalparit and Ongwandee, 2009; Priya and Jeyanthi, 2019; Ammar et al., 2019).

3.2 Global analysis of the physical-chemical parameters of the effluent

Fig.12 contains the best results for the physical-chemical parameters of biodiesel wastewater after treatment. It is possible to compare the results of the final concentrations of O&G, COD, TS and turbidity, with the respective initial values for effluent, before treatment, in addition to also comparing them with the limits established by Brazilian legislation (CONAMA, 2011).

As already seen, Exp. (4) presented the best results for O&G and COD, with removals above 90% and 53%, respectively. The low COD removal compared to oils and greases is due to the large volume of alcohol used in the synthesis of biodiesel, which cannot be removed by the electro flocculation process (Chavalparit and Ongwandee, 2009). The COD removal efficiency was close to the values obtained by (Siles et al., 2010) and (Chavalparit and Ongwandee, 2009), 45% and 55%, respectively. However, with lower O&G removal efficiency than that obtained by those and by Meneses et al., (2012), for wastewater for the purification of biodiesel. Exp. (2) had the best results for ST and turbidity, with removals above 49% and 94%, respectively.

The analysis of Fig.12 also shows that the only parameter that meets the Brazilian legislation (CONAMA, 2011) is turbidity. Thus, even though the reactor has a good efficiency in removing O&G and turbidity, the effluent needs to undergo a post-treatment before being released into the environment, because the high COD values (589.3 mgL^{-1}) and TS (825 mgL^{-1}) may favor eutrophication of the water environment (Menezes et al., 2017). A suggestion would be the insertion of the same system in series, or a biological system to reduce COD, or even decantation and/or post-reactor PE filtration units to reduce the TS concentration.

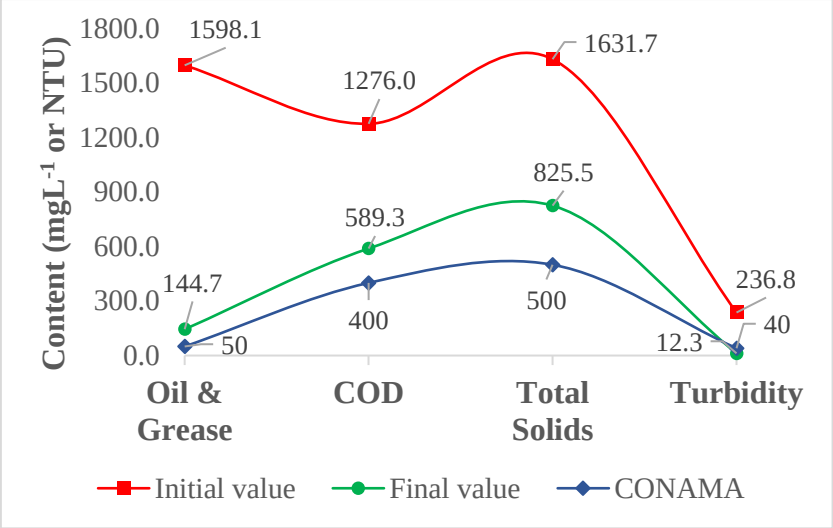

Fig.12: Comparison between the best results obtained for the physical-chemical parameters of wastewater from biodiesel purification.

3.3 Sludge removal

Sludge removal is directly related to the flotation of contaminants previously coagulated and flocculated by $Al(OH)_3$ (Kobya et al., 2016). The EF reactor with two chambers was developed with the prerogative that the flotation occurred practically in the region where the electrochemical cell was located. In (Fig.13) the upper image of the reactor is shown, with emphasis on the $H_{2(g)}$ and $O_{2(g)}$ bubbles, which emerged onto the liquid surface surrounding the coagulated material, called wet sludge. It is possible to notice that the bubbles ascended practically in the first chamber, thus minimizing the contamination of the effluent that flowed into the second chamber of the EF reactor. This statement was ratified by the high removal of turbidity (94%), since it represents all the insoluble organic and inorganic solids in the medium (APHA, 2005), which were largely removed in the first chamber.

The wet sludge collected by the reactor channel was subsequently dried in the oven and quantified for all tests, the values of which were presented in Fig.14. According to the masses obtained, for a voltage of 3.6 volts and regardless of residence time, practically the same amount of sludge, Exp. (1 and 3), was obtained. On the other hand, with the increase in electrical potential to 6.0 volts, Exp. (2 and 4), the amount of sludge removed was practically doubled. However, this amount is slightly higher for Exp. (4), which operated with a τ equal to 29.43 min. Therefore, it can be inferred that a greater amount of sludge is obtained at the same time that significant removals of O&G and COD are achieved.

Fig.13: Top view of the electro flocculation reactor used in the treatment of wastewater for the purification of biodiesel after an experiment. (Source: research' image).

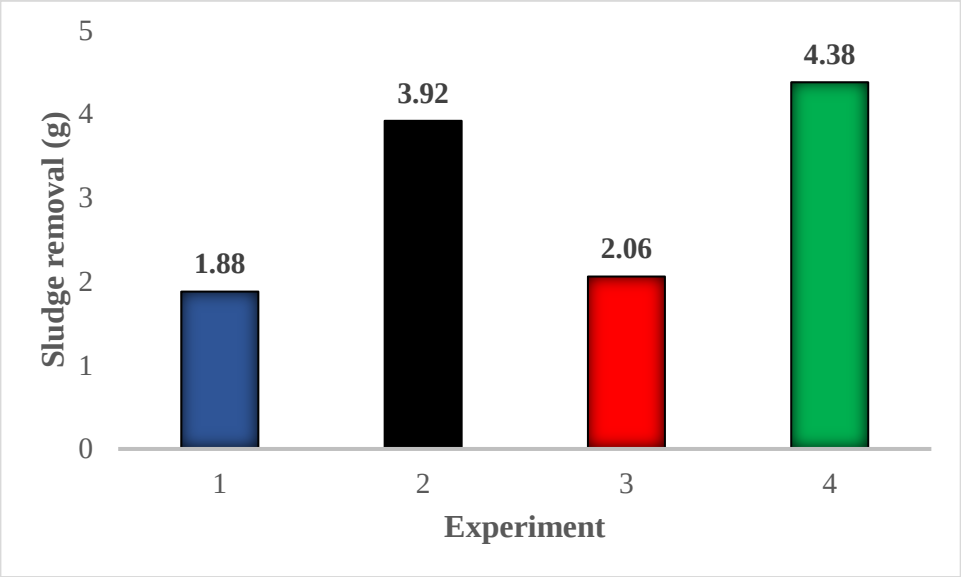

Fig.14: Mass of dry sludge removed in the biodiesel wastewater PE process.

3.4 The energy consumed by the EF reactor

The energy (E) spent in the EF reactor for each m³ of treated effluent was calculated using Eq.3 for all experiments, as shown in (Table 3). For this, it was necessary to determine the volume of treated effluent (V_t) and the current mean (I_m), whose selected interval was between 10 and 40 minutes (Fig.6), a period in which the current density values became approximately constant. With the values of E, the energy cost (EC) per m³ of treated effluent was also calculated, multiplying E by the low voltage industrial tariff, which is R$ 0.49766 per kWh, according to (ENERGISA, 2020) to the state of Paraiba, Brazil.

The analysis of Table 3 shows that the energy consumption varied between 0.708 and 4.73 $kWhm^{-3}$, which is equivalent to between R$ 0.35 and R$ 2.36 per m³ of treated effluent. The highest consumptions occurred in the experiments that obtained the greatest removal of contaminants, that is, Exp. (2 and 4), respectively. Electricity consumption was close to the values found by Chavalparit and Ongwandee (2009); Meneses et al., (2012) and Fernandes et al., (2015), who obtained respectively: 5.57 $kWhm^{-3}$, 0.65–2.33 $kWhm^{-3}$, 2.07 $kWhm^{-3}$, in the treatment of biodiesel wastewater. Energy costs can be minimized by optimizing this reactor, adding, for example, renewable energy generators, such as photovoltaic or wind systems (Rahmani et al., 2017).

Table 3: Results of the energy spent and the cost obtained with the EF reactor for 40 min of experiment.

Experiment	τ	U	V_t	I_m	E	EC
	(minutes)	(volts)	(L)	(A)	($kWh.m^{-3}$)	($R\$.m^{-3}$)
1	17,66	3,6	2	0,59	0,708	0,35
2	17,66	6	2	1,27	2,54	1,26
3	29,43	3,6	1,2	0,57	1,14	0,57
4	29,43	6	1,2	1,42	4,73	2,36

IV. CONCLUSIONS

The experimental results showed that:

1) the EF reactor reached its best removal efficiency when it was operated with a potential of 6.0 volts and with a τ of 29.43 min, in which removals above 90% for oils and greases and 53% for COD were achieved, in addition to greater sludge removal (4.38g). On the other hand, for the same applied potential, when the τ was reduced to 17.66 min, those removals were reduced and the reactor started to obtain better performance for the removal of turbidity (94%) and total solids (49%).

2) the electrical potential (U) and the residence time (τ) are parameters that are intrinsically linked with the greater or lesser formation of the coagulant agent - $Al(OH)_3$ and, therefore, influenced in all the system responses variables.

3) the visualization of gas bubbles on the liquid surface of the first chamber of the reactor and their absence in the second chamber, showed that the section of the EF reactor

in two compartments was important to minimize the contamination of the treated effluent, which left the reactor through the second chamber, the results of which were confirmed with the removal of more (94%) of turbidity.

4) the energy spent with the EF reactor proved to be consistent with other values in the literature, which varied between 0.708 and 4.73 $kWhm^{-3}$ of treated effluent, the last value being obtained for its best performance.

5) wastewater from the purification of biodiesel, still needs to undergo a post-treatment before being released into the environment, because it is an effluent with a high COD, originating from glyceric organic matter and a large amount of residual methanol, which could not be removed by electro flocculation.

6) the EF reactor showed significant efficiency for the removal of insoluble solids - oils and greases and turbidity - when used in the treatment of wastewater for the purification of biodiesel. However, it would be interesting to combine it with another treatment system, for example, an activated sludge, chemical coagulation system, or even a physical separation system, such as filters and decanters, to ensure better COD and total solids removal efficiency.

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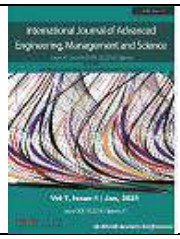

Measuring the Readiness of applying Internet of Thing in the managing education process at high schools in Basra

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Abstract— *Today as the Coronavirus crisis unfolds, several countries impose lockdown and social distancing to prevent a pandemic. The internet has become increasingly important for the reduction of social contact in the business world, health care, education, and industry, especially in educational institutions. This study aimed to identify the level of applying (IoT) in the management education process, identify the point of strength and weakness at high schools in Basra, and specify the current readiness. Depend on a survey, and case study methods to investigate the reality of applying (IoT) at high schools in Basra. We used a number of scientific research tools, including personal interviews and multiple field visits for schools. In addition, design a checklist to collect data necessary to find out the current reality through answer the question about four important indicators (connection, management, security and privacy, cost).*

This study reached a number of conclusions, the most important of which is that most schools in Basra are not ready to use (IoT) in managing the education process. Therefore, they need more focus on these indicators to take advantage of the benefits provided by (IoT) to improve the education process.

Keyword*— *(IoT) Internet of Thing, Wi-Fi, readiness, Smart Classroom, important, challenges.

I. INTRODUCTION

The Internet of Things and related connected objects are becoming a more popular topic around the world, especially in current time to face the pandemic of coronaviruses; the IoT encompasses all sector of life such as health, transport, education, and communications. Due to the novelty of the topic and the lack of clarity of the importance of its application and adoption in facilitating the education process in current situation and more dependent on electronic learning with use. Accordingly, the research came in its importance in order to move towards building a theoretical framework, and a practical one that reflects the identification of reality Application readiness of (IoT) in high school in Basra.

The problem of the study is determined that despite the urgent desire of the competent authorities to apply the things. The application process suffers from several problems, including: The lack of the required infrastructure, Weak communication networks, weak protection and security of students' personal information, the high cost of providing a high-speed connection and the availability of equipment required to implement the Internet of Things. To solve this problem, and determine the current reality of the application we depend in survey and case study method to measure the readiness of apply (IoT) and depend in checklist for the most critical indicator (connection, management, security & privacy, and cost). Through the extraction rate of the apply readiness and the percentage of readiness.

We were chosen the high schools in Basra as a field of study, for several reasons, including that these schools it suffers from a decline in the level of its services and suffers from many challenges in this field, to enhance its ability to provide the best educational services and improve the quality of the educational process.

Therefore this research aimed to (1) Define the internet of thing (IoT). (2) The useful key for using (IoT) in manage education process and the benefits which return for each one teacher and student which facilitate the education process. (3) Determine the challenge, which face teacher and student through applying (IoT). (4) And identify the readiness of high school in Basra to apply (IoT) through specify the challenge which facing them.

The most important finding of the study was that most schools are not ready to implement (IoT) because they do not provide a connection for all students and the necessary device, lack of training; which requires teachers to gain experience. Low security and privacy in the applications they use, which need to be improved more importantly.

II. LITERATURE REVIEW

1- Internet of Thing (IoT) definition

The (IoT)seen as an industrial adaptation of the Internet of Things, is known by various of names, including "(Industrial Internet) as GE terms it, (Internet of Everything) term proposed by Cisco, Rockwell Automation's (IoT Industrial Revolution), IBM's (Smarter Planet) or the European (Industry 4.0) or (Industrie 4.0) (original German term), respectively French (Industrie du Futur), (Industry of the Future). The term Industrial Internet of Things (abbreviated as IIoT, I-IoT, I2OT or I2oT) is used to represent what is expected to revolutionize the industry, by merging the digital and real industry. The Internet of Things is defined as follows":(Turcu & Turcu, 2018)

- A huge network consistence intelligent devices and equipment that connect between itself and human around the world.
- A platform from smart objects that led to the formulation and tracking of complex operations over long distances.

There is no general concept of IoT, according to (Whitmore, Anurag, & Xu, 2015), The technical and socio-technical viewpoints are the two primary conceptualizations. The first, a purely technological viewpoint, sees the (IoT) as a collection and ecosystem of technical artifacts. It's described in terms of these artifacts and their abilities.

While (Patel, Patel, & Scholar 2016)determined the concept (IoT) into three categories: (1) Persons to persons, (2) Persons to device, (3) device to device, communicating via World Wide Web.

The (IoT)is defined as : (Khan, 2018)

- A global network that connects a sector of intellectual and industrial goods development , technologies, and services through the wider community.
- Is a wireless system of advanced devices that enables accurate organization and monitoring of complicated activities over relative distances.
- Focuses on the digitization of all physical resources and inventions from beginning to end, also their incorporation into electronic influence of the external with stakeholders.

As we can see, the definition of IoT is not clear, and the distinction frequently depends on the unique vision of the organization in terms of IoT components that are regarded more important. In other point, various definitions of the (IoT) with different of organizations goals want to achievement.

Sometimes difficult to define the word IoT because there are several different meanings depending on who is doing the defining. The basic idea behind the Internet of Things is to "connect things, allowing the "things" to interact with one another and humans to engage with them." Depending on the circumstances and purpose of use (a global framework for the knowledge society, enabling improved services by integrating (physical and virtual) objects utilizing existing and emerging compatible technological tools").(Bude & Kervefors, 2015)

In a word, it is an accessible and complete network of combined smart devices can operate automatically to collect, organize, resource, acting as the situation need and adaptation with the environment change. The Internet of Things (IoT) is one of the most recent developments in ICT, allowing for global communication and control of sensors, computers, users, and data. (Madakam, 2015).

The concept of (IoT) also known as (Web of Things), which has a huge range of applications such as tracing for healthcare for personal, services for home can make automatically, Nonetheless, there is no clear concept to IoT, and its scope is hazy due to a wide range of implementations of IoT systems. The IEEE project to define the Internet of Things seeks to bring together a generic description, design, and technology to help people better understand the term and its applications. (Alreshidi &Ahmad, 2019)

According to the following, we will define the (IoT) as a number of thing/s objects that connect with each other through a network at any time or place. Talk, analyze, and evaluate information automatically in real time to make the right decision and improve the management of operation education. In addition, achieve the benefit for each individual teacher and student.

2- ***The important of Internet of Thing in management education process:-***

In order to catch courses, the school must have high-speed Wi-Fi and video recorders. International cooperation and social interaction should be encouraged in smart schools. Sensors with an auto-reorder feature must be available for tracking school supplies and inventory. In smart schools, there must be signposts for coping with emergency situations. The standard of the learning environment would improve if the previous IOT devices are used in any school. It will also foster a creative environment among students at the school. The percentage of students who save lives at school will also rise. It would also reduce the amount of time spent on conventional teaching techniques in educational organizations, better management and protection can be accomplished. In every way, the proposed system is beneficial to both students and teachers.(Abdel-basset et al. 2018)

- Students from all over the world will be able to communicate with each other:
- The students can interact with their teachers, bear-leader, and lecturers from anywhere in the world using the new IOT technologies, they can sit in their home or in class and communicate with them in any time.
- Encourage high safety and growth outcomes:
- IoT technologies provide a number of alternatives for energy, environmental organization, mobility and road safety, all of this provides the school with improved educational experiences. For example, schools can save energy by using IOT technology programs to monitoring energy and management it for reinvesting the savings to improve the instructional process.
- Ensure that students learn in a stable and healthy environment:
- Because it is essential to maintain students' safety and protection, the (IoT) provide the school with different electronic devices such as microphones, webcams, monitoring, and security equipment. Which provide with sensor for rapid notice, alarms, and dedicate the require steps to substantial boost the protection and stability of educational organization.
- Obtain Parity for everything:
- The connection among anything in the universe provides students with customized learning programs. Furthermore, accessible computers, resources, and applications make learning more accessible by achieving parity with the classmates.
- Convert students into innovators:
- The Internet of Things (IoT) provides students with various devices to make decisions in order to improve their ability to understand, build, and control themselves.

The Internet of Things (IoT) is changing traditional education into flexible, adaptive, and more successful e-learning with a strong structure that includes a huge number of digital devices associating in the education process. The integration of IoT in learning environments offers up endless possibilities for effective training. It contributes to the development of energy-efficient and cost-effective education systems by automating routine operations outside of the teaching process. IoT has an influence on education in a variety of ways, including student learning interests and curriculum creation, as well as assisting instructors in providing personalized materials and improving student outcomes. There is different application for use (IoT) in education process such as Google Apps (classroom, translate, Google books, etc.), different courses for any subject across website like (edX, Coursera, my Homework , Khan Academy).(Lakshminarayanan& McBride, 2015)

The advantages of IoT in education are as follows:(Bajracharya & Blackford, 2018)

- It helps schools to improve campus security, track critical resources, and improve information access.
- It generates an intelligent lesson plan that can be reached anywhere and at specific moment.
- It reduces the cost of a heating system, ventilation, and air-conditioning system. Through using Intelligent systems It keeps the room at a require temperature without wasting resources. Include auto windows, smart records, and programs that monitor airflow relaying on the number of people in the class.
- Minimize lighting costs across automatically switches the lights based on room occupancy and natural lighting from windows and doors to
- It helps instructors by automating operations like turning on projections and lowering lights when presentations are used, among other things, and so on.
- It aids in the improvement of each student's results.
- All data gathered and kept from each sensor over time is in the server or database, where it could be analysed to identify techniques that are more effective.

- It provides individualized and flexible education, or guidance that is suited to the requirements of the learners.
- It contributes to each student's improved performance.
- It makes for a context-aware, all-encompassing learning environment.
- It strengthens communication between educators and students.
- It boosts a student's success.
- It raises the responsibility of the learner.

Today many school realized the technology's potential to enhance teaching, learning, and evaluation and Technology is more important for a modern school aiming to be more differentiated, increase acceptance, maximize loyalty, and achieve targeted goals. However, instilling confidence in students is a challenging process. It requires highly educated leadership to be in charge to get perfect methods to educate the students the new and latest invented technologies in this field. As the (IoT) has grown in popularity, several schools have begun to concentrate on the technologies and applications of the IoT. This method is also used at the university level. The Internet has become profoundly embedded in school systems, and e- education become most important in the modern school systems. (IoT) can provide many benefits such us: - (Aldowah, Rehman, Ghazal, & Umar, 2017)

- In all education systems, IoT can improve operational performance.
- IoT can help classroom teaching by enhancing the learning process, increasing learning tools, improving learning methods and techniques, and increasing management performance.
- Reduces management costs learning tools accessible on smartphones, electronic books, for example, are more interesting and interactive.

Incorporating IoT into the educational process has several significant advantages such us: - (Sade , Folasade, & Omoyele, 2015)

- Data collection and analysis is simple for research purposes.

Data was gathered, categorized, and evaluated throughout time depending on their related knowledge to obtain fresh observations or inventions on the object. This approach is becoming increasingly easy as IoT is implemented. Once the procedure has been set up (identifying the item, associating that data, and proposing that data be supplied to other servers for analysis), students may collect information and advance through various study programs from any location. Students will have access to data to improve their analytical accuracy 24 hours a day, seven days a week.

- Enhancement Learning Skills

Use IoT in education process increases students' ability to learn new topics in particular. Students may touch objects, and details about them can be shown for them to learn. Each object will be fitted with an RFID) Radio-frequency identification) tag, which contain all data about this object which student can put it in front of an RFID reader. And use this data to learn foreign language vocabulary.

- Enhanced Mobile

Increase dependence on use (IoT) in the education process, which provide more resources and will be easily shared among students and teachers.

- Competence and Reliability

IoT will minimize misunderstandings that are smoothly committed through minor processes, and it will minimize the risk of impersonation to a reasonable extent because most operation handled driven with efficiencies by this technology, such as manual selecting students for data sharing, and so on.

- Online Education

The use of IoT into the educational process will support or facilitate distance learning. Experts in difficult-to-find fields are made available using this method. Students who are absent from school for health, ethnic, or religious reasons can fully engage in a classroom activity while at home.

- Improved Assistive Technology for Unique Students

Learning gets simpler for exceptional learners that require assistance or support in order to study. Minorities and handicapped learners, according to the IoT, will have access to advanced learning and peer-to-peer contact, as well as student-to-teacher engagement, improving their chances of success.

In the current time, the (IoT) will improve the learning process and bring more benefits for each one of the teachers and students. Learning will be easier, and teachers can complete their tasks more easily. IoT tools are expected to provide a more appealing, versatile, interactive, and quantifiable educational environment that meets the diverse needs of a large number of students and teachers. Teachers will be less waste time on routine tasks. Smart devices can allow students in a limited period to comprehend difficult concepts. They can also track performance automatically and use neuro-sensors to evaluate students. More schools today try to incorporate an (IoT) in their management through the special situation of corona virus and social distance.

3- ***The challenge of using (IoT) in the education management***

Now education struggle and face difficulties and chances because of using (IoT).The swift developing of computing and (IoT) technical Cloud storage, predictive analytics, and establishing a new digital culture are all very beneficial in not only developing the basic values for teaching and research and bringing it to a completely new level of evolution, but also in developing a (IoT) community and promoting a modern digital culture. The Internet of Things (IoT) is increasing digital speed in educational institutions. With more internet options and easy access to instructional content in both structured and unstructured formats, IoT is a significant break from traditional educational models in that it incorporates other areas through boost the impact of large data accessible through social media.

IoT Challenge in Education process is one of the most important technology development drivers, and is one of the sectors with the most possibilities for economic and social development. As a result, all parties involved, from engineers to developers, companies, and consumers, are confronted with a variety of issues that must be solved. (Hassan et al., 2018). The following are part of the educational system's challenges:

- A lack of general frameworks for a universal educational environment.
- Necessary rethink existing psychology, social constructionism, and other educational ideas etc.
- The difficulty of academics to accept modern technologies.
- Difficulty in ensuring security and safety to deploy for different devices in the cloud.
- The cost of building IoT may be prohibitively high.
- Some IoT technologies are incompatible, making it impossible to use them.

As the view for (Gul et al. 2017)applying the IoT in education process can face numerous challenges in to achieve successfully integrating IoT devices in a classroom setting, including network capacity, strong connections (Wi-Fi), web analyses, policy and security, safety, students' access to the system, teacher preparation, and equipment expenses, and other. The following parts go through some of the difficulties:

- Security and Privacy

Using (IoT) data will be kept in network of linked devices across Internet , and when sensors begin to detect and gather data from students, their security and privacy will be threatened. Any cyber attack might expose personal data such as a student's healthcare records, parents financial background, or other personal information.

- Reliable Wi-Fi Connection

Today increase the demand for educational technology, such as strong wireless networks which offered high speed connection for audio and video streaming for manage education process.

- Administration

Some devices and apps are mismatched, making it hard for the organization to build (IoT) system that would be both safe and usable by all users. For efficient IoT deployment, an educational system must guarantee that both its (IoT) equipment and teaching techniques supporting the usage of IoT in the lesson. While technology has dangers and possible stumbling blocks, educational institutions might benefit from studying and experimenting with IoT alternatives.

- Expensive

The entire setup of a Smart educational process may be rather expensive. As a result, the price of facilities and equipment has become an issue.

And (Abdul-Rahman et al., 2020) discuss the challenge as the following:

- **Educational cyber security:** Various data, which is transferred via the Internet, is kept in systems based on these technological advancements. They are largely made up of various devices that are linked to them and begin to compute and gather data from students, putting the students' security and privacy at danger. Any data leak might reveal a student's private information, such as health files, personal economic status, and other personal documents.
- **Credible (Wi-Fi) connection:** the significance of contemporary technology in education, as well as the necessity need for it without interruption with high speed wireless connection and high quality for support education process with multimedia.
- **Intelligence classrooms:** While there are dangers and problems connected with technology, education systems can benefit from studying and engaging with IoT solutions.
- **Cost of (IoT) :**These modern technical advances, including all of essential devices necessary to establish a comprehensive educational system at an inexpensive price, may be utilized to thoroughly prepare educational institution. As a response, the cost of gadgets and equipment has become a new issue for educational professionals and corporations.
- **Healthcare:** Because of the widespread use of security cameras and remote sensors, can be

monitored the student and determine their temperature and can make update the medical history of the student

An education provider may need to discuss numerous issues, for example, system transfer speed, reliable Wi-Fi Interaction, web evaluation, public safety, stability, ease of access of operating systems for understudies, teacher preparing, and equipment cost, among others, in order to successfully incorporate IoT devices in an educational domain. Some of the difficulties are discussed as the below. (Nagamalla & Sastry 2018)

- **Privacy concerns:** Because information is stored on internet and can access from many user which put the security of personal information for student in danger
- **Efficient Wi-Fi Connection:** There is always a demand for new improvements in education, such as fast distant networks that allow data transfer to audio and video streaming in the classes.
- **Management:** unperfected devices and application may prevent to build strong and accessible network in (IoT) which need special technological tools to enhance classroom. Most innovation can content risk and limitation, which need effective management to deal with it.
- **Cost:** The overall cost of establishing an IoT-based educational environment might be high. As a result, the cost of electronics and infrastructure is another measuring stick.

Based on the above we can be brevity the challenge of using IoT in education management in connection problem which related with the strong Wi-Fi, and the number of time the connection disconnect, availability of connection in different country. Problem of security and privacy for using IoT in education management can put the information for students in danger any network penetration due to leak information for the student or for their family. and the more important which force many country the cost for provide the internet access around the country and provide the student with the device to use IoT in learning, finally the training for teacher, managing school, and student which need cost and time and preside the for the important using IoT and benefit which return to them.

III. METHODOLOGY

This study used the survey method through a sample survey that includes the characteristics of whole the society under study, to be able to gather a lot of information in a relatively short period of time . And the good choice of the sample whose characteristics represent the whole society, the generalizations characteristics can be applied to the entire society, based on that we selected a sample of high schools according to the geographical location, from the center of Basra city and the outskirts, which will includes the characteristics of the whole society being studied.(Kothari, 2004)

The chosen the case study method is an integrated system and combines archival searches, interviews, questionnaires, and observation, the case study contributes to a better understanding of the individual phenomena, and the organizational and political processes of society. (Varela et al., 2021)

This research depend on:

1- Interview: With all specialists in the school to talk about the challenge for using (IoT) in the Managing, the educational processto get a clear view of the actual application of the (IoT).
2- An opinion poll and the use of the checklist: in order to identify the most prominent obstacles facing each of (principals, assistants, teachers, students) about the extent of the application of the Internet of Things in managing the educational process

We choice the sample according to survey method which represent the whole characteristic of society according to the geographical location, from the center of Basra city and the outskirts as shown in the table (1).

Table 1: The study sample

No	Name	Location
1.	Al-Hashimiyat High School for Girls	Basra Center
2.	Al-Elaf High School for the Distinguished	
3.	Umm Al Banin High School for Girls	Al-Zubiar
4.	Harir High School for Girls	
5.	KarimaAhl al-Bayt High School	Al-Midaina
6.	Science City High School	

7.	Al-Zawraa high school	Abu Al-Khaseeb
8.	Al-Marwa High School for Girls	
9.	Al-Muhajireen High School for Boys	Al Qurnah
10.	Qurna high school for girls	

Source: prepared by the researcher

It was applied on each school (Manager,2Assistant Director,10 teacher, and30student) in the high school from different situation in Basra as shown in table (1). The study time limits in (1/3/2021- 1/5/2021) to collect information through a checklist prepared for this purpose about the most challenges facing apply (IoT) in managing the educational process which fall under four indicators:

1- Connection.
2- Management.
3- Security and privacy.
4- Cost.

And we extracted the rate of the apply readiness and the percentage of readiness. By using the triple scale in the checklist for readiness indicators challenge requirements to know the degree of importance of each answer to the specific paragraphs in each field. Using the scale graded according to the following data: (ready, partially ready, and not ready; with weights were given for each paragraph of the scale according to the following: (0, 1, 2).

In this research, we relied on the quantitative expression of the answers in the analyzed checklists by using the weighted arithmetic mean to express the extent of conformity to the application. and the percentage of the actual application extent by the Directorate for the purpose of increasing the verification of the weighted arithmetic mean that was reached, and by using the following laws:

1- Weighted arithmetic mean (readiness)=$\frac{Sum\ (Weight*Repetition)}{Sum\ Repetition}$ …….(1)
2- Percentage (readiness)= $\frac{arithmetic\ mean}{Highest\ scale\ weight} * 100\%$ ……..(2)

Readiness rates (2) were considered very well because they indicate total readiness and indicate full implementation, while readiness rates (1) were considered acceptable, indicate medium readiness, and include implemented, partially applied and readiness rate 0 is not applied.

IV. DISCUSSIONTHE RESULT

- **Connection indicators:**

According to the checklist described in table (2), the percentage of readiness was (40%), which the researcher saw as an unacceptable percentage that needs to be improved in order to apply (IoT) in the education process management. Due to the situation in villages and the countryside, internet access is also not available for both students and teachers, and the internet connection quality is inadequate; most networks in Iraq are generation 3G, which needs to be upgraded to 4G or 5G.To use (IoT), speedily wireless network with wide band to transfer data smoothly for support education process.

Most schools have websites and social contact variables where students can access lessons and download videos and documents, but need more improvement by publishing all the lessons throughout the year. The usage of (IoT) necessitates the use of power for thousands devices signaling and transferring data to one another, which consumes power. Therefore, we need to reduce battery depletion and power usage. You cannot rely on (CPU) capacity for all IoT devices, which are restricted and expensive to integration network. This creates even more issues in Iraq, which is suffering from an energy deficit. Aside from power and CPU usage, bandwidth consumption is an impediment to IoT connectivity.

The costs of bandwidth on a communication link is considerable, especially while there are tens of billions of IoT devices on a network delivering request/response signals to your server. To manage all of this data, the big cloud challenge necessitates a large-scale server farm, which necessitates a lightweight network capable of effortlessly transporting data between users and servers. In addition, need servers are completely flexible; you can adjust your bandwidth, capacity, memory, and other hosting plan components at any time to suit your needs. In addition, we need a wide variety of basic security features to secure your files, such as free DDoS protection and robust on-site physical security safeguards.

Table.2: The checklist for Connection indicators

No	The paragraphs	The readiness		
Connection		**Ready**	**Partially ready**	**Not ready**
1.	An internet connection is available for both students and teachers		✓	
2.	Internet connection quality and number of failures		✓	
3.	The school have website and social contact variable to student 24 hours		✓	
4.	Their power utilization management is designed for high-performance devices with processors, screens, and communication interfaces that require different amounts of power.		✓	
5.	A massive server problem necessitates a multiple servers farm to manage large amounts of data			✓
6.	**the weight**	**2**	**1**	**0**
7.	**Repetition**	**0**	**4**	**1**
8.	**Result**	**0**	**4**	**0**
9.	**Apply readiness**	**0.8**		
10.	**Readiness**	**40%**		

Source: Prepared by the researcher

- **Management indicator:**

According to the checklist described in table (3), the percentage of readiness was (20%), an unacceptable percentage that needs to be more interest to enhance it in order to apply (IoT) in education process. because the financial situation for all country school can't provide the student with suitable device to avoid mismatched between them and limit access for only study purpose, therefore it make difficult to manage the system and keep it safe and used for all the user in the server.

The system needed to provide with special procedure to handle with any error in real time Through provide a support and maintenance team to deal with any system error can face the student or teacher on the server. School not provided with camera, which can connected to internet for manage and monitor students, locate position in real time to safe security environment in school, which can prevent any unforeseen occurrences from occurring. Depended on electronic lesson and provide student with graphic textbook, this includes multimedia with capacity to add notes to easy the manage and modify lesson in the suitable way for each individual student to understand the lesson.

Training teacher and student is the important subject need more interest to apply (IoT) they need to know how they could deal with smart devices and distance learning to achieve the benefit they could have from use (IoT). In addition, they should know the challenge, which they face it especially about privacy and security. Moreover, we notice the lack of training courses for each one teacher and student that need more interesting.

Table.3: The checklist for Management indicators

No	The paragraphs	The readiness		
Management		**Ready**	**Partially ready**	**Not ready**
1.	Schools supply students with suitable electronic devices and integrated among them to complete education process.			✓
2.	Provide with the procedures to handle errors in a timely manner and avoid system failure and misused.			✓

3.	Provide school with camera connected to internet to monitor student and locate position in real time.		✓	
4.	Supply students with 3d graphics books that include clips and the opportunity to take notes.		✓	
5.	Training teacher for use this device and dealing with student in smart classroom.		✓	
the weight		**2**	**1**	**0**
Repetition		**0**	**2**	**3**
Result		**0**	**2**	**0**
Apply readiness		**0.4**		
Readiness		**20%**		

Source: Prepared by the researcher

- **Security and privacy indicators:**

According to the checklist described in table (4), the percentage of readiness was (30%), its low percentage to apply (IoT) and need more focus on security and privacy. Security must be a top priority in applying IoT. Must protect the Participants data and provide with assurance from theft for all IoT devices and connected data sources. Depending on secure devices and protocol that protect for any cyber threats, exposing it in real time.

Dependency on (IoT) and deal with huge amount of information require many application and procedures to protect information; any security incident might expose sensitive data about a student's medical history, family's economic background, or other personal details. Therefore, should notify students on where and how their personal information can be used and accessed, and then give capabilities that help students to disable specific forms of information gathering and sharing.

Also should instruct student about security so that participants do not engage in illegal behavior patterns when using their Device. The website of school provide the limit security and privacy across warnings for use information. And use backup for information to save it from any damage can exposed to computer by save it in different location and use Google drive. Not variable any monitor for operation time of the device, which is very necessary to avoid the wrong use for the device. Provide technologies can be Students are watched around the day and each week, and determine their location can be noted at any moment. such as camera and sensor to alarm any breaking in the system security in to school.

Table.4: The checklist for Security and privacy indicators

No	**The paragraphs**	**The readiness**		
Security and privacy		**Ready**	**Partially ready**	**Not ready**
1.	Use Application to protect the privacy information for student and their parents from danger any person's document, a parents economic source, or another private entity.		✓	
2.	Use backup procedures to preserve data.		✓	
3.	Monitor operational time of the devices			✓
4.	notify students on where and how their personal information can be used and help them to disable specific information gathering and sharing			✓
5.	Provide technologies can be monitored student through 24 hours and their position may be detected at every moment.		✓	
the weight		**2**	**1**	**0**

Repetition	**0**	**3**	**2**
Result	**0**	**3**	**0**
Apply readiness	**0.6**		
Readiness	**30%**		

Source: Prepared by the researcher

- **Cost indicator :**

In the table (5) include the checklist for the fourth indicator challenge in (IoT) the readiness was (60%) and it acceptable percentage. Although the use of (IoT) will help to save paper and textbooks, the IoT system will require three important things that will be more expensive:

- *Hardware* refers to a variety of machines that perform critical tasks and functions, such as sensors, control devices, servers, and so on.
- *Software* for receiving, analysing, and storing sensor data
- *Application* that allows users to communicate with and control IoT devices.

For that apply (IoT) need to financial budget for provide the essential need for (IoT) system. The internet access is one of the essential point in (IoT) we notice the more used network in Iraq is old generation 3G and it need more cost from the government and Communication Company to update it for 4G or 5G. For apply (IoT) we need network with high speed to deal with huge data. From the checklist and observation, we notice most family they could provide their children with the device for each one, so they almost share same device to make homework or join classroom, which create problem each time for them. Most school force challenges to provide teacher with require training because the cost of training which need classroom and devices and lecturers. Use (IoT) contributed to reduce the error ratio by automatic education management.

Table.5: The checklist for Cost indicators

No	**The paragraphs**	**The readiness**		
Cost		**Ready**	**Partially ready**	**Not ready**
1.	Cost for variable internet access high for student and their parents		✓	
2.	Cost for the device needed high for student and their parents		✓	
3.	Cost of training teacher for essential skills to use IoT in manage education process		✓	
4.	Reduce cost by digitalize textbook and save paper.		✓	
5.	Reduce cost for error ratio by automatic education management.	✓		
the weight		**2**	**1**	**0**
Repetition		**1**	**4**	**0**
Result		**2**	**4**	**0**
Apply readiness		**1.5**		
Readiness		**60%**		

Source: Prepared by the researcher.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on what was presented in the theoretical framework and field analysis of the results that were reached and discussed, we were reached to a number of conclusions and recommendation as follows:-

1- Poor communication networks available in the country

2- Lack of servers with a wide bandwidth to deal with a huge amount of information and provide high speed in data processing.

3- The lack of the required infrastructure of computers, cameras and smart boards, which is one of the necessary requirements for implementing the Internet of Things.

4- The lack on provided the suitable infrastructure to apply (IoT) make difficult to manage and protect the huge data, it lead to system failure.

5- Lack of awareness among students and even teachers about the importance of the application of the Internet of things and what are the advantages that can be obtained as a result of the application.

6- lack the security and privacy procedures increase the possibility of penetration and leakage of personal data for both students and teachers, which puts privacy at risk

7- Because of weak communication networks, which makes the network vulnerable to any penetration

8- The high cost required to provide devices and equipment and to hold the necessary training courses for the application.

9- Most high school in Basra are not ready to use (IoT) in education process.

10- Enhance the network communication and provide the school with network high speed such 4G, or 5G.

11- The need to raise awareness of the importance of using the Internet of Things and the benefits obtained from its use, whether for the student or the teacher.

12- Provide the school require infrastructure to apply (IoT).

13- Provide the technical support and specify the procedure to deal with any error in real time.

14- Giving the utmost importance to privacy protection programs and archiving process to preserve information.

15- Providing a financial allocation for providing the infrastructure and the require courses to training how to use and deal with the (IoT) application and protect the personal information.

16- A study of the importance of using the Internet of Things and its impact on the quality of education.

17- A study of the obstacles to using the Internet of things and their impact on the possibility of application

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