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Table of Contents

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Article

Yemeni Riyal Exchange Rate Prediction Using Predictive Models Based on Artificial Intelligent

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USD/YER; RNN; LSTM; ML; Linear Regression Model; Random Forest Regression;
Gradient Boosted Regression.

Abstract

Foreign currency, such as the dollar, plays a fundamental role in controlling market prices in many countries, because the import and export process takes place through these foreign currencies. Predicting the exchange rates of these changing currencies is a task with great challenges. The main purpose of this paper is to build a system based on Artificial Intelligence to predict the exchange rate between US Dollar (USD) and Yemen Riyal (YER) for the next day or several days in the future. The artificial intelligence exploit two techniques, Recurrent Neural Network (RNN) and Machine Learning (ML). The proposed model uses recurrent Neural Network that exploits long short-term memory (LSTM) and machine learning with three models (Linear Regression Model, Random Forest Regression and Gradient boosted regression) to predict the currency USD/YER for the next day or several days in the future with the highest accuracy. The objective function of training and testing the prediction models to find out performance of proposed models by calculating the root mean square error which came out to be very low. The best results were obtained using Random Forest Regression model in root mean square error training that reached 0.0448 and the best result in root mean square error testing was obtained using Linear Regression model that reached 0.1070.

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1. Introduction

Since the last few decades, the foreign exchange markets in the world have witnessed an increase in all parts of the world. The exchange rate is an important parameter and crucial parameter in businesses and companies which has made forecasting of exchange rates an important area in all business sectors. A small change in the exchange rate affects an increase in the prices of the products and this forces the seller to pay more money, which creates problems and a burden on the citizen. Therefore, the economic stability of countries is important in in the stability of the foreign exchange, as economically stable countries have a more valuable currency. And therefore the exchange rate becomes easier to predict, while unstable countries have a less valuable currency, and the currency becomes more difficult to predict. Investors around the world choose economically stable countries to build their companies and deposit their money in their banks in their own currencies. In recent years, the exchange rate in Yemen has become unstable due to economic instability, and this has led to fluctuations in exchange rates, which made predicting exchange rates very difficult. Therefore, in this paper, we decided to build a system for predicting exchange rates between Dollar and Yemen Riyal. There are systems that are used to forecast exchange rates, but they are complicated and their accuracy is weak, which makes prediction less reliable and therefore it was necessary to find more efficient and reliable systems. In recent times, the use of artificial intelligence in many sectors has become very important, especially in the economic sector, such as predicting exchange rates and stock prices in companies or banks. This paper presents a system to predict the exchange rate between the Dollar and Yemen Riyal using artificial intelligence that uses Recurrent Neural Network and Machine Learning due to the high accuracy of prediction. We tested all models on the dataset and found that the best model is linear regression model that has minimum root mean square error in testing prediction that reached 0.1070.

The paper is organized into six section: The second section presents the background material and previous work which is most related to the field of this research. In section 3 the methodology is presented. Proposed techniques and how they're implemented are given in section 4. The experiment results of the proposed method presented in section 5. In section 6, conclusions and the future work of the research are presented.

2. Related Work

We present an overview of literature that relates to work presented here. The change in currency exchange rates sometimes leads to a large loss in trade operations in the event that it was not properly predicted [1]. So, one of the most direction of research in economic sciences is exchange rates prediction using artificial intelligence. Jefferson et al. [2] presented a paper for Canadian–US exchange rate prediction using different artificial intelligence models and applied a comparison between the performance of these models. Kamruzzaman et al. [3] presented three models of neural networks that predict the Australian exchange rate against six foreign currencies. These neural networks showed an ability to predict exchange rates closely. Reference [4] proposed Turkish prediction rate using different neural network models. Weigend et al. proposed prediction models for the German exchange rate against the dollar based on neural network and stochastic walking model, and the results for neural networks were better [5].

Mehreen R et al. [6] presented a paper for exchange rate predictions which made a novel approach to predict exchange rate by using CGP

and RNN called (RCGPANN). Podding et al. [7] presented the results of the German exchange rate prediction model against the dollar, and the results obtained were compared with the regression analysis model. In [8], authors propose a system that making comparison between two different model (ANN and RNN) which used to predict exchange rates Rupees/ US, Rupees/ Euro and Rupees/ Pound Sterling. The paper by [9] presented the results of a prediction comparison between the US dollar and the German dollar using neural networks and linear models. Fernando et al. [10] presented a paper that compared the efficiency of various artificial neural network to stock prices prediction. Multilayer perceptron has been built with Levenberg Marquardt, GRU and LSTM for stock market prediction. In this paper, prediction model of the exchange rates between Dollar against Yemen Riyal has been built using recurrent neural network that uses LSTM model and machine learning with three models (Linear Regression Model, Random Forest Regression and Gradient boosted regression).

3. Methodology

In this section, we will discuss the method that used to build a system for predicting exchange rates between Dollar against Yemen Riyal by using three main phases approach. The following steps summarize the methodology used to achieve the proposed method:

3.1. Dataset Collection

The dataset was obtained from the website [11]. The dataset contains the USD/YER exchange from date 16-jun-2016 to 31-jun-2020. This data consists of 1077 days of data for exchange rates are as listed in the Table 1 and shown in Figure 1.

Table 1. USD_YER exchange rate.

Date	Rate
16-jun-2016	250.1
17-jun-2016	250.15
20-jun-2016	249.935
.....	.....

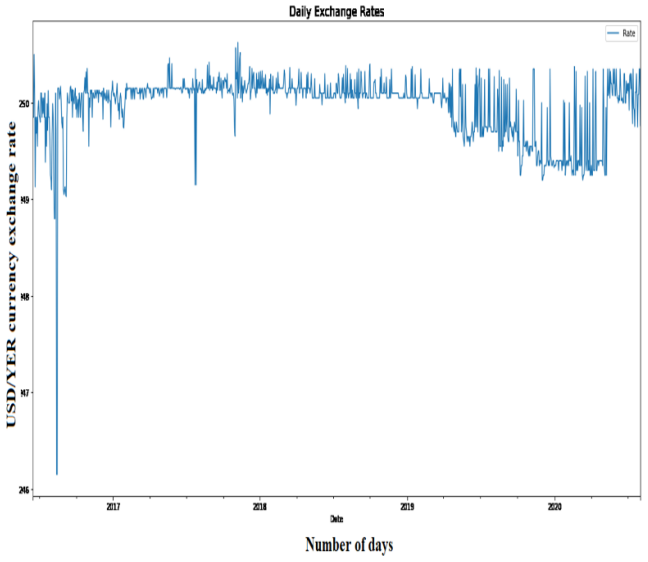

Figure 1. Plot of currency exchange rate value for USD _ YER.

3.2. Training Phase

After preparing data, we start training the model on the collected dataset with the following steps:

- **Load Dataset:** In this step, dataset is loaded to fit the training phase.
- **Data preprocessing:** This step is aimed to normlize the dataset between zero and one.
- **Training Using LSTM model:** In this step the system was trained by the LSTM model and the dataset was divided into 80% for training and 20% for testing. Figure 2 shows the proposed model for predicting exchange rates using the LSTM model.
- **Training Using Machine Learning Models:** In this step the system was trained using Machine Learning Models (Linear Regression Model, Random Forest Regression and Gradient boosted regression). The dataset was divided into 80% for training and 20% for testing. Figure 2 shows the proposed models for

predicting exchange rates using the using Machine Learning Models.

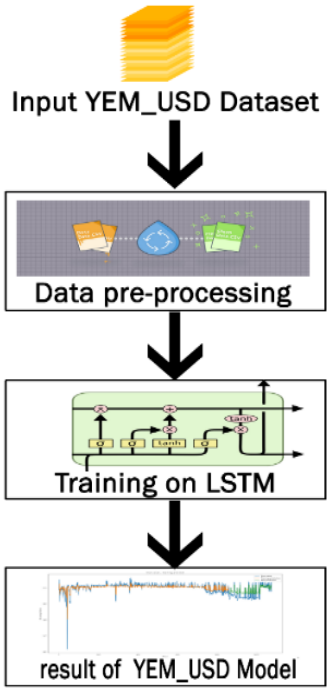

Figure 2. The proposed model for predicting exchange rates using the LSTM model.

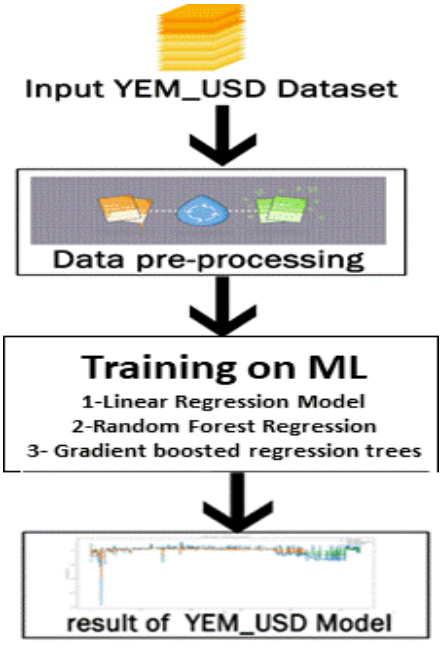

Figure 3. The proposed model for predicting exchange rates using the using Machine Learning Models.

3.3. Testing Phase

At this phase, future data is entered for the system to make predictions based on the training model that was done. The testing phase consists of following steps:

- **Data pre-processing:** This step is aimed to normalize the dataset between zero and one.
- **Prediction phase:** Prediction phase is the last phase, in which all models (LSTM, Linear Regression Model, Random Forest Regression and Gradient boosted regression) produce accurate prediction of USD/YER exchange rate for the next day.

4. Techniques

In this section, we will discuss proposed techniques that used to build an effective system that able to predict the exchange rates between Dollar against Yemen Riyal for the next day.

4.1. Artificial Neural Network

Artificial neural networks are part of artificial intelligence that is used to simulate the human brain and has many practical applications, including pattern recognition and also in the fields of prediction [12]. ANN contains a collection of nodes called neurons which connected together by link called edge as shown in Figure 4. This edge used to transmit the signal between neurons. Each edge has weight value which increase or decrease in self-learning process. ANN has three layers: input, hidden and output layer.

Input layer: Data will input to the neural network by using input layer.

Hidden layer: These layers used to process a data that come from input layer.

Output layer: After processing the data in the previous layer, it is passed on to the output layer.

Each input in the input layer has value denoted by Xn. and every edge in neural network has weight value denoted by Wn.

The value of the output layer denoted by Yn which calculate as the following equation 1:

$$Y = \text{Activation\_function}(\sum_{j=1}^{n} Xj * Wij) \quad (1)$$

The activation function as see in rule1 used to determine if the value will pass (1) or not (0).

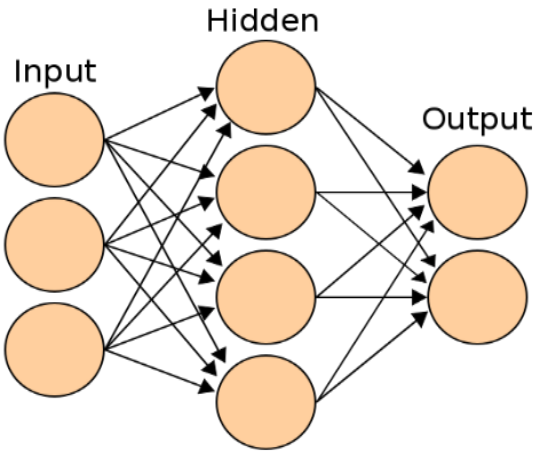

Figure 4. Architecture of ANN.

4.2. Recurrent Neural Network

A RNN is a class of neural networks that differs from other types by contain internal memory which used to store the inputs that come from each node (see Figure 5). This difference making the RNN more precise than others. One of the limitations of recurrent neural networks is that they have short-term memory. This memory was not enough if there are long series of information. So, LSTM built to solve this problem.

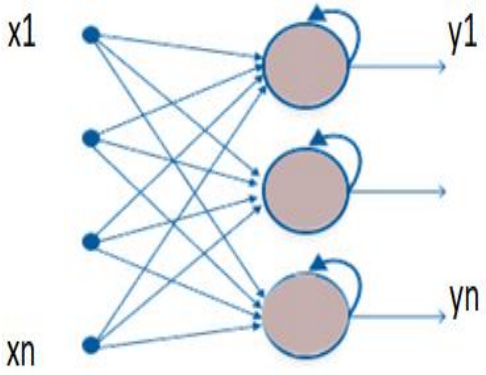

Figure 5. Architecture of Recurrent Neural Network.

- **Long Short Term Memory:** LSTM is specific type of RNN that introduced by Hochreiter et al. [13] which used to learn the long-term dependency. It is containing cell state, input gates, output gates and forget gates as shown in Figure 6.

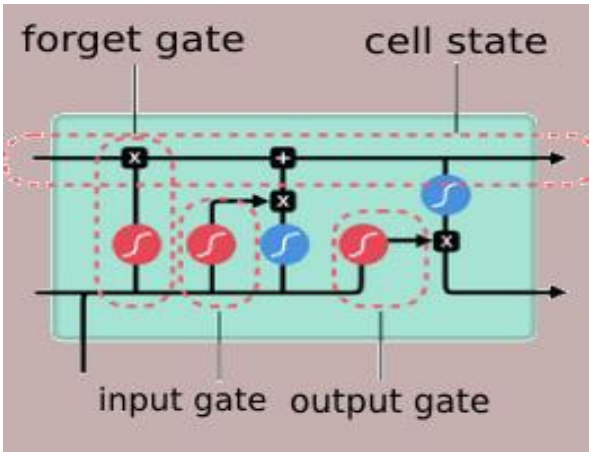

Figure 6. LSTM gates.

- **Input gate.** This gateway is used to discover the value of the input used to update the memory and combines the previous output with the new input and passes it through the sigmoid activation function. An input gate has an equation of the following form:

$$it = \sigma(Wi.[ht-1.Xt] + bi) \quad (2)$$

Were (σ) is the a logistic sigmoid function, *Wi* and *bi* are the parameter to learn, Xt is the input sequence, ht is the hidden state of the encoder at time t. A candidate layer gate has an equation of the following form:

$$C't = \tanh(Wc.[ht-1.Xt] + bc \quad (3)$$

Where *tanh* is the hyperbolic tangent function, *Wc* and *bc* are the parameter to learn, $C't$ - this internal memory of the cell [14].

- **Forget gates.** This gate is used to detect details that should to remove them from block which used sigmoid activation function. If the value of output (ft) is 0 then previous output will remove and keep it if (ft) =1 in the number of $C't$. A forget gates has an equation of the following form:

$$ft = \sigma(Wf.[ht-1.Xt]) \quad (4)$$

- **Output gates.** This gate determines the value of

internal state is passed through (0 and 1) to the output gate. An output gate has been shown in the following equations 5 and 6.

$$ot = \sigma(Wo.[ht - 1.Xt] + bo) \quad (5)$$

$$\text{ht} = \text{ot} * \tanh(\text{C't}) \quad (6)$$

4.3. Machine Learning

Machine Learning methods are part of artificial intelligence which used for prediction. The proposed model uses three ML algorithms including, linear regression model, random forest regression and gradient boosted regression.

Linear Regression Model: The Linear Regression is a part of machine learning, that is used to fit predictive model to a data can be used to predict future data. A linear regression model looks as a line has an equation as follows:

$$\hat{y}=w[0]*x[0]+...+w[p]*x[p]+b \quad (7)$$

where x[0] to x[p] are the features, w and b are the parameter to learn and ŷ is the prediction model [15].

Random Forest Regression: Random forest is a part of machine learning was introduced by Breiman in 2001, by integrating between classification and regression tree [16]. The Random forest is construct by integrating the multiple decision trees randomly, that trains several trees in parallel. The results are aggregated, through model averaging as shown in Figure 7.

Gradient Boosted Regression: The gradient boosted regression is a machine learning technique, which is a grouping of trees in a sequence where each tree corrects the errors of the previous tree, making the model smaller in terms of memory and making predictions faster and thus the model becomes more powerful. Figure 8 shows the structure of Gradient boosted regression.

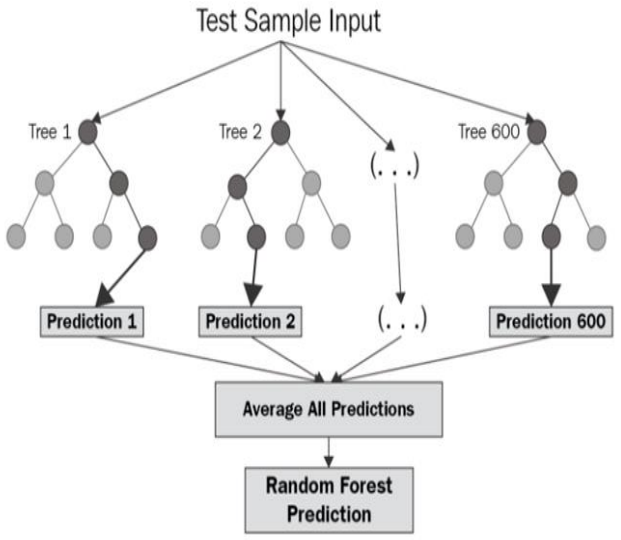

Figure 7. Random Forest structure.

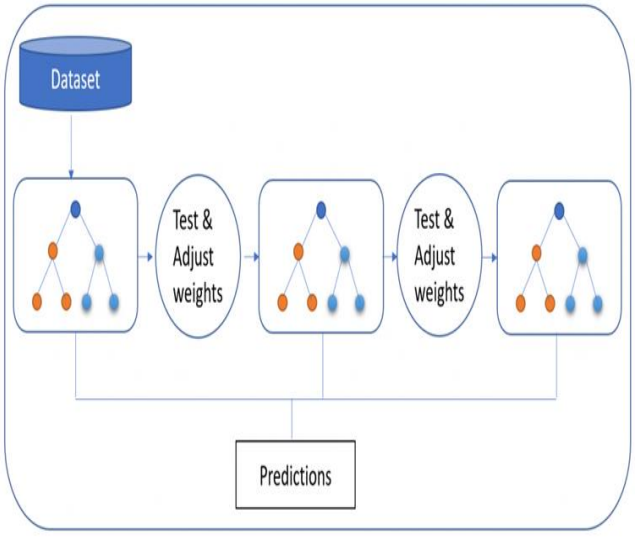

Figure 8. Gradient boosted regression structure.

5. Results

In this paper, exchange rate prediction model has been built between US Dollar (USD) and Yemen Riyal (YER) for the next day and or several days in the future using predictive models based on Artificial Intelligence. The proposed models, namely Recurrent artificial neural network model (LSTM) and Machine learning models (Linear Regression, Random Forest Regression and Gradient boosted regression) can be used to build an effective system that able to predict the USD/YER exchange rate for the next day. Every model shows independent performance. There are

two different currencies Dollar and Yemen Riyals presented in our dataset. We have selected one dollar against Yemen Riyal. Data was analyzed using proposed models and was provided experimental evaluation of these models in Table 2. The Table 2 summarizes the results for the training sets and the prediction results in the testing sets with 100 epochs and 20 batch sizes by using proposed models (LSTM, Linear Regression, Random Forest Regression and Gradient boosted regression) to predict the exchange rate of USD/YER for the next day. As demonstrated in the below table, the best result was obtained using Random Forest Regression model in root mean square error (RMSE) of training that reached 0.0448 and the best result of prediction in root mean square error of testing was obtained using Linear Regression model that reached 0.1070.

Table 2. Prediction performance of the model.

Model	RMSE training	RMSE testing
LSTM	0.2485	0.3580
Linear Regression	0.0531	0.1070
Random Forest Regression	0.0448	0.1185
Gradient boosted regression	0.0450	0.1157

The result of prediction values of training and testing can be seen in Figure 9. From the below plot we can note that the blue line denoted to the actual daily USD/YER exchange rate values, the yellow line represented the data which used as training data and the green line represented the predicted values for testing set.

6. Conclusion

The main conclusions of this paper is to predict USD /YER currency exchange rate for the next day by using predictive models based on Artificial Intelligence techniques. This paper describes tow artificial intelligence techniques, RNN and ML, and presents a comparison between LSTM and models of ML (Linear Regression, Random Forest Regression and Gradient boosted regression). The objective function of training and testing the prediction models are to minimize the error in the model. The best result with the Random Forest Regression model in RMSE of training that reached 0.0448 and the best result of prediction of testing was obtained using Linear Regression model that reached 0.1070. In the future searches, we will propose another types of currencies such as Euro and Pound Sterling to predict exchange rate between Yemen Riyals and them. Also will propose others algorithm that will give better result.

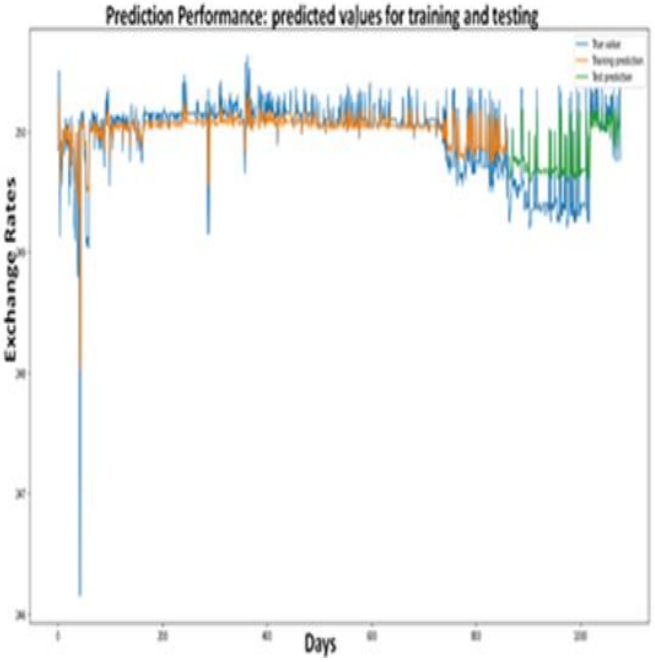

Figure 9. Prediction Performance of USD/YER currency: actual USD /YER vs predicted values for testing set.

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Article

A Review of IoT in Education: Benefits and Challenges

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Keywords:

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Modern Digital Tools;
Attendance Tracking
Student;
Student assessment

Abstract

Internet of Things (IoT) has emerged as a new technology with the aim of improving diverse sectors. Due to the ubiquity of IoT devices, academic institutions and schools are seeking to incorporate IoT into education activities. The goal of this paper is to review the current state-of-the-art in order to explore the revolution that has been occurred since the incorporation of IoT in education. Besides, the possible opportunities that could be gained for students, instructors, and admins from the adaption of IoT in the educational process are classified.

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1. Introduction

The development and growth of the internet is naturally exponential. In the past 25 years, internet has continuously expanded to connect people from all over the world through computers, laptops, smart phones and other devices. Nowadays, with the development of the global internet, various devices such as household appliances, automobiles, different electrical devices and various smart devices can also use internet services to communicate, which leads to the creation of the Internet of Things (IoT). IoT enables different real-world objects called "things" to communicate with each other on the global internet using services that support Internet Protocol (IP) through wired or wireless communication networks. These things can perceive the surrounding environment and act on it autonomously, meanwhile transforming the surrounding physical world into a very large information and knowledge base [1].

The term “Internet of Things” was firstly coined by Kevin Ashton in 1999. Various terms are derived from the literature of IoT technology, including Internet of Everything (IoE), Industrial IoT, Internet of Anything, Internet of People, Internet of Services, Web of Things, Machine-to-Machine communication or Internet of Signs, Internet of Data or Internet of Processes [2].

According to [3], IoT stands for "anything at all, depending on requirements". Cisco defines IoT as a network of connected physical objects. Cisco pointed out: "IoE integrates people, processes, things and data, together to make connections of network more valuable than ever and relevant before turning information into actions that can bring new capabilities, unprecedented economic opportunities, and richer experience, to individuals, companies, and countries [4].

IoT network connects different types of devices, such as personal computers, tablets, PDAs, laptops, smart phones and other handheld embedded devices. These devices collect useful information through various sensors and data collection technology, and then transfer it to other processing equipment for interpretation and decision-making [3].

The core function of the IoT lies on the ability of devices to exchange information without any necessary human intervention. This phenomenon is called as communication of Machine-to-Machine (M2M) [5, 6]. IoT-based systems communicate via wireless technologies [7], such as Radio Frequency Identification (RFID) [8, 9], ZigBee [10], Wireless Sensor Network (WSN) [11]. Figure 1 shows the connectivity between devices to exchange information.

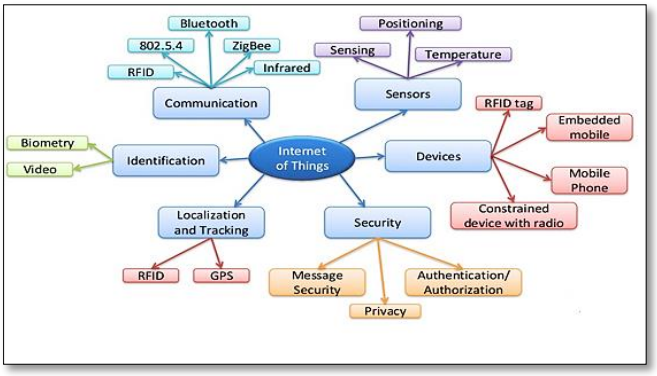

Figure 1. IoT connectivity [1]

IoT applications have been used in multiple fields such as smart retail, medical services, smart home, customer service, industrial Internet and environmental monitoring. Now, due to its ubiquitous nature, schools and academic institutions are seeking to incorporate the IoT into educational activities to benefit teachers, students, employees, and the entire education system. For this purpose, many researchers conducted to suggest applications of IoT to solve various models, objectives, specializations and concepts in the field of education [12]. The main purpose of this work is to discuss the usefulness

and applications of the IoT in the field of education. Moreover, we focus on opportunities of IoT in field of education especially with all interconnected actors (instructor, students and staff) in the education process. In addition, we discuss the challenges of IoT in field of education. The rest of the paper is organized as follows: Section 2 presents the literature review; Section 3 presents the IoT in learning process, Section 4 presents the benefits of IoT; Section 5 presents the challenges of IoT; Section 6 presents the conclusion of paper.

2. Literature Review

Educational technology has played an important role in connecting and educating students. IoT technology has a significant impact on the education field. IoT does not only change the traditional learning and teaching methods, it also changes the infrastructure of educational institutions [13]. IoT technology may play an important role in improving education at all levels including universities, colleges and schools. From students to teachers, from classrooms to campuses, everything can benefit from this technology. There are many researchers discussed the IoT in education.

M. Kassab et al. [12] summarized and categorized the existing benefits and challenges of integration of the IoT with education field, and proposed a framework to appropriately position and promote new research activities. They conducted a systematic literature review to extract, evaluate, identify and synthesize some published researches about the symbiosis of IoT in education to answer some research questions and determine the state evidence with in-depth analysis.

IoT is the most challenging platform to specify the association of physical objects in the near future. M. Al-Emran et al. [14] highlighted the latest developments in the adoption of IoT applications in education and provided various opportunities and challenges for future experiments. The authors summarized the horizons of IoT technologies in education in general, medical education and vocational training in particular, in addition to discussing wearable technologies and their relationship to education and education with green IoT.

A. C. Martín et al. [15] analyzed the current situation of smart education. A study of the development of published papers on smart education, its technologies, keywords and methods of data collection and analysis, education level and localization. The developed systems in the selected papers were also reviewed, and their quality and feasibility evaluated. At the end of the research, they identified the opportunities and the most important areas for improvement. They concluded that, despite the vagueness of the term, there do exist developments today that can make educational technology more suitable for learners, thereby providing a foundation for smarter ways of learning.

A. M. Alalade et al. [7] provided a little insight on the basic knowledge of the IoT, its architecture, its core fundamentals, and furthermore contributed to understand the application of the IoT in the education field. This research was carried out in a more advanced and state-of-the-art IoT-centric teaching plan, which included smart laboratories, smart classrooms, and the entire smart campus.

D. D. Ramlowat and B. K. Pattanayak [1] addressed the importance of IoT technology in the field of education to improve efficiency of teaching and learning process. They focused on the innovations suggested by several authors about implementing IoT resources in the field of education, such as distance education, computer science education, consumer green education and

medical science education. The interrelationship between IoT and the cloud-computing paradigm discussed in education.

S. Pervez et al. [16] discussed several aspects of IoT with respect of productivity levels, which helps contemporary learners and educators to learn from the results of the processed data. They showed the different learning trends and the success rate of these application methods. They also discussed the various educational perspectives that must be incorporated when developing educational curricula to meet the requirements of society's smart literacy. The results assisted decision makers and recommended the use of more professional methods to improve the better teaching model platforms in specific communities.

Das et al. [17] studied and discussed some of IoT-based applications in depth, such as smart classroom, smart e-learning, smart library, etc. In addition, they discussed the technologies needed to enable urban and rural residents to use an education system based on the IoT. They tried to address this gap and find a new direction to help integrate the knowledge of rural and urban students and empower people through the power of IoT. Their work discussed the importance of applications and technologies required to build a smart education system, and helped researchers think about new applications and technologies based on the IoT.

3. IoT and Participates in Education Process

Now, due to IoT's ubiquitous nature, academic institutions and schools are seeking to incorporate IoT into educational activities to benefit students, lecturers, administrators, and the entire education system. Many researchers discussed IoT's opportunities in education and classified it. M. Kassab et al. [12] identified three dimensions to classify benefits of IoT in education field and discussed its benefits for each dimension such as perception, learning principles and education sitting (mode). Figure 2 shows the three-dimensional scheme for IoT in field of education. A perception is a way to look at something, to understand or interact with. More specifically, perception refers to the stakeholder role, which requires the IoT system to provide one of its services in an educational environment. Stakeholders have a goal with respect to the system, one that can be satisfied through its operations. They have identified three different main stakeholders from the extracted scenarios. Each of the main stakeholders has a perception when they interact with IoT technology when deployed in the education field: student, instructor and staff(Admin) [12]. However, the authors presented IoT applications and services in education in relation to the three stakeholders involved in the educational process according to their perception in general without classifying IoT services for each participant in the educational process in a detailed manner.

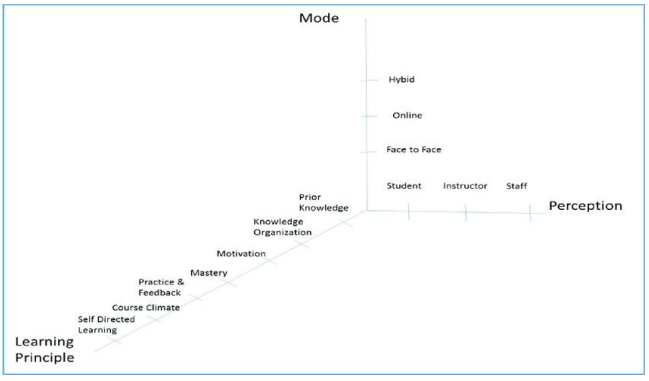

Figure 2. The three-dimensional scheme for Internet of things in education[2]

IoT has the potential to greatly change the educational process and the relationship between the participants in education process. In this paper, we focus on IoT in field of education specifically, IoT opportunities for each service

related to the stakeholder involved in the educational process separately. Figure 3 shows IoT opportunities for the services of the three stakeholders involved in the educational process.

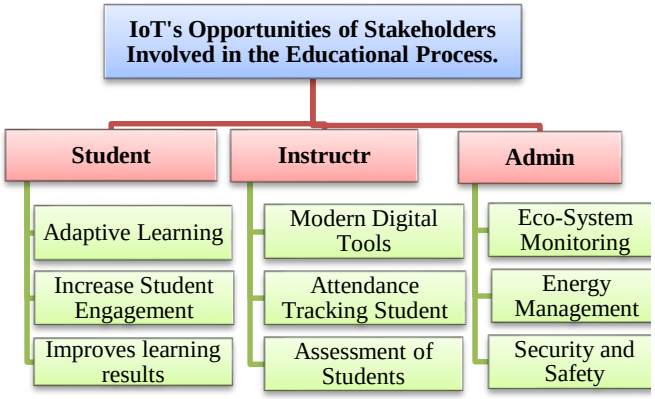

Figure 3. IoT's opportunities of stakeholders involved in the educational process.

4. IoT Benefits of Student

The definition of student includes scholar, learner, and pupil. A student is one of the key chain links in the education process. We can study the opportunities of the IoT in education specifically, for students. Moreover, IoT can provide students with disabilities with the help and support they need to achieve a good quality of life and allow them to participate in social and economic life. In this section, we will discuss the most important opportunities of IoT provided from a student's perspective with/without disabilities as follows:

4.1. IoT-based Adaptive Learning

There are many opportunities that have made learning adaptive according to student's needs. IoT not only provides learning, but also supports learning. IoT may create a customized learning environment according to students' individual learning style, personality, level of achievement, strengths, feelings, interests, or cultural background of the students. Moreover, IoT helps to make learning available when needed by the student and at the time when the student needs the information or knowledge. The most important and newest opportunities based on IoT which have made learning adaptive discussed and proposed by many researchers such as the use IoT to assist students with disabilities, personal learning and ubiquitous learning.

Sula et al. [18] implemented the performance of a new system based on IoT and P2P technology for supporting learning process and improving the life quality of children with Autism Spectrum Disorder (ASD). They used SmartBox device and JXTA-Overlay platform to monitor the children and create P2P communication between children, caregivers and therapists.

R. Mehta [19] talked about five ways of IoT to change education and the field of learning from special education. Anyone who is slightest interested in the education of special children will know the role of bibs of technology. Children with autistic respond very well to tablets, as do children with other diseases. Children with ADHD, dyslexia or other learning disabilities can greatly help them through any available technology. Along with this, smart schools also have a system for educating people like special students. The public will therefore have more understanding and openness to special individuals. It is easier for special children to work in a neutral environment and alone.

Sula et al. [20] proposed an intelligent auxiliary environment system that used heuristic diagnostic teaching process. The purpose was to identify each student's mathematics learning ability and their creative characteristics. The proposed system used computers, sensors, RFID tag readers and SmartBox devices to support the learning of students with autism spectrum disorders by providing a case-by-case basis-based personalized feedback and practices.

M. C. Domingo [56] proposed an appropriate learning environment for learners with special educational needs. IoT created a user friendly environment for people with disabilities and helped for their social integration. The smart devices and applications facilitated the management and execution of daily activities made them more.

With regard to personal learning, A. Uzelac et al. [21], a smart classroom was proposed, which can measure the level of interest of students by using cameras and microphones to monitor their behavior. The influence of different parameters in the physical environment (such as temperature, environmental noise and CO2 level) on students' attention is also analyzed. This helps to customize the way of personalized learning plans.

S. Meacham et al. [22] proposed an IoT system that enabled a large number of students in lecture class and laboratories to conduct personalized education. The proposed system based on a case study based on the work of a medium-sized university in the UK.

M. Kravčík et al. [23] mainly focused on IoT and related technologies to study how to improve this filed. They claimed that proper interpretation and analysis of big educational data, which can make personal learning and training experiences more accurate, personalized and adaptable, thereby making them more effective, attractive and efficient. The information collected through a rich palette of available allows for better personalization and adaptiveness of learning.

Recently, the concept of personal learning environment (PLE) has emerged, opening new doors for more effective learning and overcoming many limitations of the traditional TEL model. According to Chatty et al. [24], they provided details of the theory, design, implementation, and evaluation of mixed and match personality learning environment framework (PLEF). The main purpose of PLEF is to help learners to use various digital media and data to create custom learning mashups.

Finally, learning can be adapted to the student's needs by ubiquitous learning which means students will able to learn from anywhere at any time. A. Labus et al. [25] focused on integrating wearable technology into the e-learning structure so that ubiquitous learning can be achieved through devices interactions and collaborative work. They proposed an integrated model that enables this goal to be achieved. The proposed model consisted of physical wearable technology infrastructure, software to run devices, and cloud computing platform.

An attempt of transferring learning from traditional form to e-learning was proposed by

K. Papadokostaki et al. [26]. They explore the experience API specification and examine how it can be used for the implementation of adaptive learning applications to make ubiquitous learning real for different learning level

R. Xue et al. [27] proposed a framework based on IoT to construct ubiquitous learning environment. This framework was divided into three main layers including application layer, network layer, and perception layer. Besides, its architecture was clearly presented, and its applicability was articulated through an example.

K. Mershad and P. Wakim [28] proposed "Remote Lectures" to enhance LMS framework through the utilization of IoT infrastructure. Communication towers were used to transmit multimedia and data to distant locations. Some IoT devices were installed in the classroom to record and transmit the delivered lectures and its related material such as lecture notes, interactive exercises to the LMS of the enrolled students. Their proposed gave students more flexibility in managing their schedules. However, the proposed feature allows students to capture all important resources related to the lecture from anywhere and at any time.

4.2. IoT-based Increase Student Engagement

Utilizing IoT infrastructure in learning increase the growth of student's engagement in the learning process. Student engagement is a multifaceted theory that constitutes of three factors; behavioral, emotional and cognitive engagement. Many researchers discussed opportunities for IoT to make education more enjoyable and attractive, which leads to maximizing student engagement in education. The most important is making the learning process more interactive, just like playing the game or providing interactive environments between students themselves and between students and teachers.

If we consider student engagement in education as the degree of attention, curiosity, interest, inquisitiveness, motivated, optimism, awareness and passion that students/learners show, which extends to the enthusiasm level they must improve and study in their education. Two-sided interactive feature of IoT device makes it an effective tool that facilitate greater student participation in the process of learning. Through various communication technologies available in the IoT learning environment, students can answer questions and provide feedback quickly and repeatedly. Also, the instructors can define various strategies and techniques for education in order to capture the feedback of learners in real time [29]. The principle of improving students' "motivation" is addressed through bridging the communication between teachers and students using the IoT. In this context, based on cloud computing platform technology, combined with internet and web technologies, an innovative interactive platform for ideological education is proposed [30]. The platform includes five functional layers and three-layer architecture. The feasibility of this platform has been verified by studio visual as the development environment and the expression of ASPX documents [30].

S. Satu et al. [31] proposed an educational platform called the intelligence of learning things (IoLT). It is a blended learning method based on the IoT, which can enhance traditional education systems through innovative and interactive learning strategies and technologies. In this platform, different applications and devices can be used to collaborate and share their ideas with stakeholders (for example, teachers and students) through the system using IoT. Therefore, the proposed model able to ensure smarter and more effective method than traditional methods.

J. Henry et al. [32] introduced a computer algorithm used to quantify student engagement based on individual feedback, attendance, and punctuality. The data algorithm uses game points to depict the results to meet the needs of gamification, serious games and edutainment. By including the IoT, they obtained behavioral engagement data related to real-world events. In addition, they introduced the IoT as a tool to measure the impact of the real-world environment on student engagement.

R. Garris et al. [33] proposed an input-process output game model, which focused on the instructional games and it engagement to learners to accomplish better learning outcomes. The proposed model detailed a repeated game cycle that include user behavior, user judgement and feedback of system and encourages interacting with a game.

Z. AjazMoharkan et al. [34] discussed some applications of IoT in education in general, and in e-learning in particular. In addition, they proposed smart learning model based on the IoT and e-learning gamification technology. The proposed educational model was smart and participatory due to the application of gamification concepts, which made learning more attractive.

4.3. IoT Improves learning results of students

IoT can assist institutions to improve the quality of learning and teaching by providing a richer learning experience and real-time actionable insights into student performance.

Bob Nilsson et al. [35] argued that today's education field has used IoT devices such as tablets, e-books, fitness bands, sensors, augmented reality and virtual reality headsets to track and monitor students' various Aspects, such as understanding students' learning patterns.

A. Uzelac et al. [21], a smart classroom was proposed, which can measure the level of students' interest by using cameras and microphones to monitor their behaviour. The influence of different parameters in the physical environment (such as temperature, environmental noise and CO2 level) on students' attention is also analyzed. This helps to customize the way of personalized learning plans.

5. IoT Benefits of Instructor

University professors or school teachers-they are all called instructors. They also get a lot of benefits from IoT in education. When we come to IoT's opportunities and their innovative technics of instructors, it is clear that technological developments have brought some noticeable improvements in the teaching process. [41]. IoT helps instructors to focus on student learning instead of wasting time to maintain large procedure when dealing with students in the classroom. Networked devices can save time and allow instructors to focus on cultivating some extra qualities of students [39]. In this section, we will discuss four of the most important IoT opportunities that can improve teaching process. The Strong Sides of IoT from an instructor perspective as follows.

5.1. IoT-based Modern Digital Tools

IoT offers modern digital tools to better explain new subjects and classroom management. A. M. Alalade et al. [36] discussed different physical applications of IoT in different areas of academia, including IoT in the classroom. Recently, a very powerful teaching platform called smart boards have been used in the classroom. With online presentations and videos, it can help teachers explain lectures more easily. In addition, interactive tools such as educational games and exercises can be used through the smart board, which is very helpful for educating students effectively. Furthermore, they discussed other ways to incorporate IoT in education involves the use of Web-based tools, programs, smart marker, and smart cameras.

J. Vihervaara and T. Alapaholuoma [37] emphasized that IoT is capable to improve vocational education and training in many ways. IoT can be an effective educational tool for building coaching skills of students trying to find answers to undiscovered problems using electronic devices.

The term "classroom management" represents the way a teacher achieves ordered in the classroom. With the help of smart devices such as cameras, microphones and many other sensors, which can measure how students are satisfied with the things they learn about the term, classroom management becomes very simple and easier to understand. Moreover, teacher can know when to talk louder, when the concentration of students is falling down and when to take a break [38]. IoT can help to improve the learning environment in the classroom for higher education. It provides a good level of control and a large amount of sensor data, allowing instructors to adjust classroom conditions according to the subject and time of day continuously. The intensity of natural light and artificial light can be controlled. It can improve air quality and noise levels. By monitoring the ambient sound level at the back of

the room, you can alert instructors when their voice is difficult to understand [35].

5.2. IoT-based Attendance Tracking Student

IoT automates students' attendance tracking instead of manual process done by the instructor, which in turns save some times for instructors. Therefore, IoT-based attendance management system will reduce the overhead of calculating attendance hours [39].

One of the simple techniques that is focused on taking student attendance is proposed by F. Akhter et al. [39]. This system utilizes IoT to collect student attendance and to store them securely in database. The system architecture is constituted of some modules including FRID, NodeMCUV3, and fingerprint sensor which is used as an authentication tool. Whereas, RFID module is responsible for scanning RFID tags and sends data to the central server. The system then able to generate attendance reports based on the collected data.

When students attend the classroom, they can use smart devices (such as Nymi) to automatically record their attendance. The device is a wearable "smartband" that uses the wearer's ECG pattern to verify a student's identity [40]. On the other hand, a face tracking approach was adapted in the work proposed by S. R. Babu et al. [41] to automate students' attendance process. They used techniques such as face recognition, object detection, and convolutional neural networks. The proposed system has reduced training time and computational complexity compared to the current system.

Z. Jiang [42] proposed IoT-based student attendance management system, which employs some key technologies such as embedded development, ZigBee, RFID, and others. Using the RFID technology and WSN technology to capture the student's trajectory, it can provide record and analyze students' activities trajectory, analysis data for the student attendance management system, and grasp real-time dynamics of students.

The system can effectively strengthen the supervision of student activities, reduce the burden of attendance management of teachers and students, and improve the level of intelligent management, which has important practical significance for the construction of an intelligent campus.

P. Tan at al. [43] designed and implemented an IoT-based teaching management system to help teacher to perform automatic attendance record and strengthen student learning motivation. It used an open source hardware platform such as RFID-RC522 and Node MCU to implement a Wi-Fi-supported RFID reader. The proposed WiRF system used to record students' attendance and record their behavior automatically to assist the teacher. The system has a positive impact on student learning in higher education and improves student attendance rate.

H. Rjeib et al. [44] proposed a system of attendance management (AMS) students based on RFID, and an information service system for an academic field that used RFID technology in addition to programmable logic circuits (such as Arduino) and Web-based applications. The proposed system not only save time, but also reduce documentation work without any power consumption.

On another hand, a web-based attendance system is proposed in [45] which use NFC technology that is available in smart phones. The attendance rate will be automatically saved on the server when the student clicks the matrix card on the NFC smart phone. Both students and teachers can check their presences via their smart phone [45].

B.I Ahmad [46] proposed NFC-based smart attendance system to simplify the process of attendance, by simply the lecturer's NFC-based

mobile device in the class or touching an attendance poster. The system presented substantially improved the current attendance registration system and eliminate many paper works involved in it. Other benefits include save the attendance data, facilitate the creation of various attendance reports, and make the attendance decision-making process is simple. Moreover, one of the main distinguishing characteristics of their proposed system is that the hardware required is minimal.

K. Ashwin et al. [47] proposed a method to monitor student attendance by using the RFID tags in the student ID cards. When a student enters the classroom, the system records the student's ID and uses Geo-fencing technique to track their current location on the campus.

5.3. IoT-based Assessment of Students

IoT presents some new methods to assess the students. The benefit of incorporating IoT technology in students' assessment is to automate some of tedious instructors' tasks and save time. As a result, the automation of grading assignments tasks will certainly reduce instructors' efforts and allowing them to focus more on enhancing their teaching skills.

K. Mershad et al. [48] introduced the "Students Assessment" application integrated within the proposed LearnSmart LMS [28]. The application uses IoT tools and services to automatically assess and grade students after completing laboratory experiments. The proposed application exploited the power and ability of IoT to enable lab instructors to monitor students' activity while they are conducting experiments, and then automatically evaluate and grade them. The proposed application is one of the first applications that uses IoT and machine learning tools to assessment student in laboratory experiments.

M. Rhoads and B. Stachowiak [49] in their book on the added value of technology in teaching, conclude that educational institutes and instructors must always invest in better understanding the importance of regularly analyzing assessments in a qualitative method instead of only depend on quantitative results and how it can really assist improve learners' performance, and in constantly pursuing advanced and efficient assessments tools.

M. Farhan et al. [50] developed an IoT-based interoperable model to analysis of different students' response to e-Learning by using data collection workflow and an algorithm for attention scoring. This was applied to students attending video lectures comprising an electronic learning component of their studies.

S. Shapsough et al. [51] proposed a mobile/tablet-based assessment system that uses smartphones and tablets to carry out evaluations and allowed real-time reporting. They used the architecture of MQTT publish-subscribe to provide almost assessment services in real-time to various types stakeholders of educational process including educational planners, teachers, principals, and parents. The proposed system collected and delivered assessment data involve sensor information from mobile devices used by students and teachers. The results of the system analyze generated by the analytical engines by the system were directed in real time to the appropriate stakeholders. A preliminary analysis of the proposed system showed promising results in terms of low power consumption in mobile devices and good scalability.

P. Verma et al. [52] presented a system for students to communicate with each other and objects related to the course. They proposed smart computing-based framework is divided into five-layers to facilitate the automation process of student performance assessment in engineering institutions. The daily activity dataset of students

created based on the sensing ability of IoT nodes. They used GPS and RFID sensors to obtain the location of students and objects, and analyzed the activities of students. The collected data is used to evaluate students' performance in the course.

6. IoT Benefits of Administration

Here we will focus on the potential benefits that would be obtained from IoT-based systems for dean, manager or the provost. IoT has the potential to produce significant gains in higher education institutions, especially in the automation of buildings, maintenance systems, energy management, environmental control, access systems to buildings and spaces, large systems of research environments, academic learning systems and safety systems for students, teachers, staff and the public. Many researchers discussed and proposed different IoT-based systems which offer opportunities for admin such as smart monitoring, increase security and safety, institutional energy management and LMS content can be modified.

6.1. IoT-based Eco-System Monitoring

IoT assists in smart monitoring of buildings including HVAC system, lighting, locks and monitoring students. M. Cata [53] proposed a model for a smart university that uses five main categories of sensor devices. According to many applications inside smart universities, they benefited from IoT services, such as: (1) smart parking that monitor vacant parking, thereby avoiding congestion or accidents; (2) smart lighting that can be based on external natural light data collected from sensors in order to automatically reduce classroom lighting, thereby reducing power consumption; (3) smart tracking, by using RFID technology to evaluate any emergency, so as to monitor the goods and equipment inside the university; (4) smart inventory, which can read QR by using a barcode reader labels to identify any equipment associated with barcodes. Since the health state of students is a key factor in determining the overall academic performance of students, it is essential to obtain high-quality medical services in any educational institution.

With respect to student monitoring, M. Kassab et al. [12] discussed some researches that attempted to monitor students in online laboratory and education settings. Due to the fact that student health state is extremely affect student’s overall academic performance, thus granting access to the health care services is important for establishing effective education. A study [54] showed how to use RFID to build eHealth system to monitor students at risk of hypertension as a wearable device. The system focuses on some health information of various students, such as medical history, electrocardiography (ECG) results, prescriptions, blood pressure, and other vital signs by IoT technology.

6.2. IoT-based Energy Management

IoT has been used in energy management to improve energy efficiency for a more sustainable future. This has led to the introduction of Smart Grid, which is a special form of energy management application in the IoT by many governments [55].

In order to provide a healthy atmosphere for learning and teaching, IoT allows the creation of a green campus environment for universities by reducing monitoring and controlling energy, CO2 emissions and water use [56]. With respect to energy saving, a work published in [57] proposed a green campus architecture to manage computers and air conditioning systems.

As a real example, COMFORTSENSE is an energy management system, which implemented in Campus Luigi Einaudi, University of Turin. The project utilizes the benefits of IoT technologies to advance building energy

efficiency and comfort [58]. The focus of this system is to consider campus areas and university buildings as a “living lab”, and thus collect data through smart phones and wearable devices instead of using traditional data collection ways.

6.3. IoT-based Security and Safety

IOT can improve security and safety. Smart technology can make schools safer. Several academic institutions for instance San Francisco University have combined technologies of IoT to enhance security and safety of campus[2]. For example, wearable wristbands can register entering of students to academic institution premises and classrooms. No more strolling between lessons or during lunch time. This measure also helps prevent unauthorized persons and other intruders from entering the school. In addition, more reliable surveillance cameras are used to monitor corridors and surrounding buildings to ensure the safety of students [3].

A. B. Manduri et al.[4] used the core technologies of edge computing, IOT and cloud computing design the framework of an intelligent emergency alert system. IOT is committed to developing the world smarter and can make a significant contribution to the design of the Framework of Smart Security (SSF) for educational institutions. They tested the proposed system on Cisco Packet Tracer 7. The results showed that the approach used in this system proposed plays an effective role in alerting security not only in institutions of educational but also in other institutions as well.

With the combined technology of IoT and RFID, schools can generate real-time pre-recorded announcements for various emergencies. Educational institutions can immediately close the door in case of panic or emergency. In addition, parents can also track their children's real-time movement, especially the duration of school entry and exit at the same time. At the same time, the staff can ensure that the students are in the classroom they should go to [5].

D. Palma et al. [6] developed an NFC-based classroom access control method to create a real-time classroom control tool. The system of classroom registration is based on a network of a set of connected sensors that collect information about classroom access and display the classroom status on a web-based application and TV panels of university.

7. Challenges with Integration of IoT in Education

IoT technology plays an important role in improving the educational processes. IoT influences on student, instructor and admin, in addition it transforms and improves education methods. Many studies have discussed the benefits of IoT in the educational process, both for the student and for any participant in the education process. On the contrary, there are many challenges associated with applications of IoT in education filed. Some issues are very specific and affect only a small number of people, such as disability, while others are more common [15]. For instance, adaptation to new technologies. According to the analyzed paper, the challenges to education in general that need further research are:

7.1. Security and Privacy

Security requirements have always been an important aspect of education filed. Concerns about security have increased due to the increase in communications and complexity of IoT technology. The "security / privacy" quality concerns are the most discussed because most studies have discussed them [12]. One of the most important security issues facing the education is the exposure of educational institutions to electronic attacks (cyberattacks), which will prevent schools / universities from operating as intended. Due to the

interconnectedness of the large number of devices, Cascade failures may appear, making it difficult to protect simultaneously with all related problems via antenna transmission. Data breaches considered a security challenge. Regarding privacy, whether that monitoring is known or unknown, many devices used in specialized pre-configured IoT will collect different data. But why collect this data, who owns it and where is it going? The legal professions, government agencies that oversee education, and a series of education standards should answer these questions [62].

7.2. Humanization

The ethical role that IoT may play in a person's life is questionable, especially with regard to personal control. IoT applications involve more than just devices that interact with each other. The success of IoT mainly depends on the way of connection technology, rather than the humanization of connection technology. IoT may make people move toward specific habits, thereby reducing people's autonomy, thereby transferring power to companies that focus on gains financial. This means for the system of education that the influential factor is the organizations that controls the tools and techniques used by academic professionals, not the academic professionals themselves. The valid concern is dehumanization in interacting of humans with machines. Numerous studies indicate that the interaction between students face to face will benefit social skills of children, and it will contribute positively to build of character. Hence, going to school is the problem that may arise from the increase in IoT technologies in education as a result of the partial loss of the social aspect [12].

7.3. Scalability

Scalability creates concerns regarding the big data and the cost of implementing IoT in education. The integration of the IoT in education filed is no exception. Incorporating the IoT into education will generate great volume of data. Therefore, the data needs to be managed, analyzed and processed to obtain information and trends. Moreover, there have been several papers focusing on data visualization technology and dashboards. There is still a long way to go to deal with the large amount of data generated in the intelligent education environment, display them correctly and make it easier for students and teachers to understand the data. [26]. With scalability, concerns related to discussion about the cost of IoT technology in education have also become important [30]. Financially, there are immature experiences everywhere [11]. For example, admin, student and teacher training [25], the reduction of public service investment, the current situation of the world economy [1], and the limited resources of universities have prevented the smart campus from becoming a reality [19] The question that arises is how will schools and universities purchase and maintain this equipment? The financial obligations resulting from the shift to an IoT ecosystem focused on education cannot be underestimated. The economic benefits of IoT in education are discussed in the following four selected articles [54].

7.4. Adoption ICT in education

In many developed countries the use of ICTs in education extensively studied, yet in developing countries it is still neglected. In order to help decision-makers take effective measures for its dissemination, researchers and scientists need to examine the factors that affect its accreditation.

7.5. Adapt and Attract Education

Most students use multiple devices and social networks to connect their education to the Internet. More research is needed to understand how students connect to the Internet to increase their learning and application of knowledge. An effective digital curriculum model can guide the current work of using IoT in education. Scientific research aims to improve the existing teaching structure and forms to create personalized and digital curricula in effective manner for ordinary and disabled students to use in informal and formal education; what makes students more interested and attracted is that they go beyond the ideas that are be traditional and the concepts and learning activities to create something novel and meaningful things.

8. Conclusion

IoT improves learning, teaching, and management, and many educational activities. In this paper, a survey of IoT in education activities specifically, to study how this kind of IoT technology with its unique system functions (such as sensing and decision-making) supports and challenges the pedagogical process of all relevant participants (teachers, staff and students). In addition, IoT challenges are showed and explained. As a future work, it is possible to work on enhancing the current work by presenting IoT technologies and tools for each IoT services and opportunities for each participant in the educational process separately and proposed new techniques can solve the challenge of IoT in education.

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Article

Apracadabra application platform for intelligent and immediate-services based IoT technology

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Abstract

Apracadabra application platform visions are to connect multi types of technologies: RFID, sensors, actuators, person's users etc., the opportunity of bring out the IoT technology into reality became possible at the present through the integration of many available technologies, especially in the under development countries (not high infrastructure). The IoT provides many important features, which transformed the internet from communicating with people to the possibility communicating between things "smart devices" to do queries, surveillance and other smart services.

Due to high cost on attaching a sensors or RFID card in some services or providers we propose Apracadabra, Smart Services to contribute on developing societies, would be unable to jump suddenly to the accurate IoT technology concept.

This paper address Apracadabra application platform to be the right solution for under development countries to provide same services as IoT in terms of speed, we can call it the first generation of the IoT. Apracadabra based on attaching an account number or IP address for each user (server - clients), is the services provided by this user will be presented to other interests with the possibility of evaluating those services by the beneficiaries, this platform gives the user's location and all available ways of communicating.

Apracadabra Smart Services (ASS) name came from aladeen Arabic story (Shobic Lubic (شبيك لبيك) or Apracadabra) which means helping others or clients to get whatever they need immediately, it is a mobile devices application running on Android system due to android system widespread and characterized by many features, also we can access Apracadabra through any web browsers.

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1. Introduction

Internet of Things (IoT) is a novel become very important in modern wireless telecommunications. The concept of IoT based on variety of things or objects such as Radio Frequency Identification(FRID) tags, Sensors, mobile phones, actuators, etc. all this device are able to communicate through unique addressing scheme, which allow them to interact with each other, also provide services to all neighbor's nodes to reach common goals [1].

The First information revolution was the computer in starting from 1940, and internet also counted as second revolution, and now IoT is third revolution of information, Currently, the culture of Internet of Things industry has gained high attention over the world, many of high infrastructure countries look to IoT as new strategic industries and new economic growth engines and sensationally start running IoT in many business field like Amazon.

What is the meaning of unique addressing of objects? the addressing or IP addressing is the way of given ID for each device to allow it to exchange information, but having unique IP is big challenges in this third Generation which called ''Semantic oriented", perspective of IoT.

We have three new concepts: things-oriented, internet-oriented and Semantic-oriented technologies and standards, so IoT become the central role in all above mention technologies, as illustrated in Figure 1 [2].

The terms Internet of Things(IoT) derived from Things Oriented for words 'things', thus IoT means Auto-ID [3].

2. Architecture of Apracadabra

The proposed application platform main advantages are the availability to connect many technologies interface, Service Oriented Architecture(SOA) is best software layer architecture proposed for the new growth IoT technology we call it Middle-ware, which consist of five layers, ordered from top to down: application, services composition, service management, object abstraction and the lowest one is the objects itself as illustrated in Figure 2.

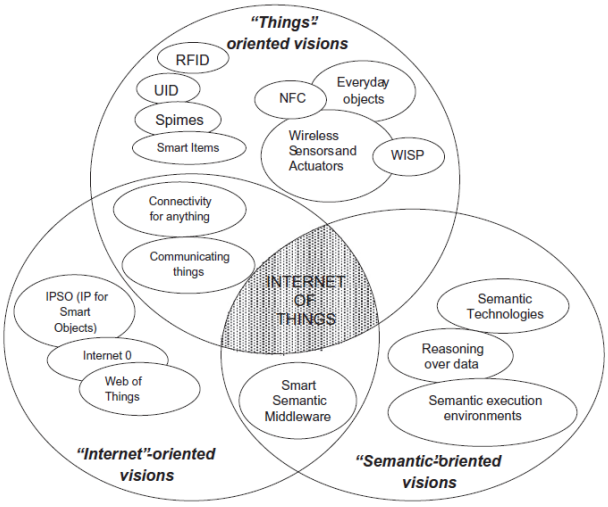

Figure 1. The IoT paradigms [2].

Apracadabra application platform visions are to connect multi types of technologies: RFID, sensors [6], actuators, person's users etc., all these can represent a Units to be connected to could internet(if the services providers wants to connect all items using RFID tags and adopts a RFID reader in his stores then the clients can directly communicate with the item through a middleware), in the RFID tags we can insert all information in concern like price, model, type and size about the items, the RFID reader will work as a middleware between the tag and internet then to the far end or clients. In the sensors case: The Base Station(BS) can work as a middleware to help users or client to collect information from different monitoring environments, on the client side the users can search or access the services application interface from android smart phone or even through any web browser such (IE).

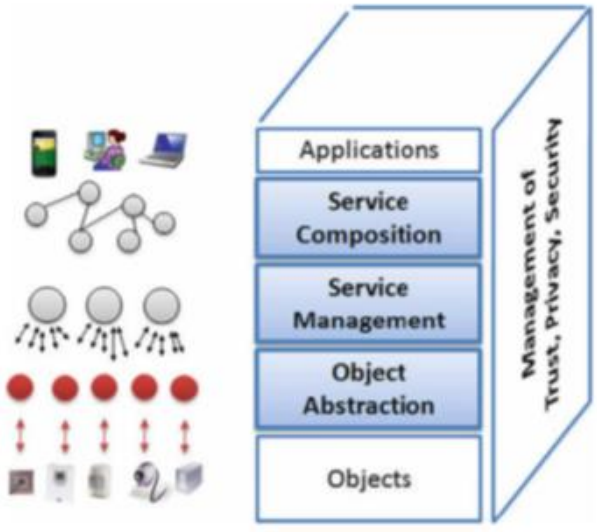

Figure 2. Apracadabra application platform architecture [3,5].

3. Application Vision

To understand how the application work let consider a customer driving his car on a road connecting two cities and suddenly got drive failure and perhaps by utilizing his simple experience he can determine the failure type. All what he needs to do is open mobile phone and insert the type of problem he got in his car on Apracadabra application platform interface. it immediately processes his order and guide him to the nearest car mechanic which he is specialist in this type of failure, as well as through the GPS it can determine the mechanic location, distance and provide all contact information about him. The mentioned example is one of the online services provided by the Apracadabra, in searching process this application depends on the distance between the service requester (client-customer) and the service provider(saller) to show the results as in Nearest First(NF) concept.

The service provider shop has RFID reader that connects the shop online via the internet to allow the client to search for tools or a particular service. when the client searching about this particular service, through the coming results the costumer can identify the service or item in details and he can buy them through his connected bank account and the Apracadabra uses semantic search as essential benefit as in Figure 2. to show the full relationship between both internet, semantic search and the IoT. Therefore, we conclude that our research is a good example of the desired integration between the three significant techniques and this is one of the most important Apracadabra application platform features.

One of the important aspect of Apracadabra application platform is how can a customer ask for service and how the service provider response and deliver service to him, on other word how/what is the transaction architecture between the two sides (customers- providers)? To answer this question, we find that the appropriate architecture for Apracadabra on the 3rd world countries is to use (customer- internet could-service provider) because the application developer's future plan to cover different types of services, and it can be extended day by day (whenever new service has been added thus new class will be added too).

The steps of requesting or searching for services as following: a) opening the mobile or any smart phone, which must be connected to internet, b) opening Abracadabra main interface and login in with the customers User name, c) typing the name of the service or products on the textbox then he can choose the class or department which the service belong to, or even without choosing it the application will automatically search on all services classes same as famous searching engines like google. d) after pressing search button the results will be listed directly, we mentioned above that Abracadabra application platform differ from other application in searching results which is sorted in Abracadabra on Nearest-First(NF) principle, also the results come according to rate feedback from previous

benefited customers. e) The customer can request one or more product or service (also he can view more detail about such services). f) If the customer wants to contact the service provider he can do that using any social media or even they can use video conferencing.

For easily publishing and spreading the application we plan to link it with some famous application like WhatsApp, WeChat according location user preferring application, we expecting the application will get high popularity in very short time because of its benefits and usability to everyone, in case of willing any user(store-market- engineer etc..) to advertise any new service he can do it in very easy way though Apracadabra application platform by writing all important information in detail about this service so the application can deliver it to all customers any different ways: a) a new notification bob up in users(who is in interest) in their main page of the application, when he click it he can open new page, in that page he can view all information or data about the promotions, or new services or products etc.. b) The also application had the ability to analyses the data in any (shop- services providers) from transaction record for example to know which customers is interesting to which services, thus the application automatically shows up any news about such service, this is one of data mining aspects, as we mentioned above that one of the most IoT advantages is connecting many technologies together to provide many services and to minimize the cost and efforts.

3.1. Communication types

As we mentioned above Abracadabra application for intelligent services is in the first version, we aim to deploy the fully IoT technology in the 3rd words countries which need such services very urgent, the application also as it have different working architectures with many communicating interfaces it can be also useful in 1st and 2nd word countries, so we can call it a real IoT technology, Apracadabra have communicating types:

1. Clients- Service Providers communicating: it means services requesters and providers, or human to human.
2. Clients- Services communicating: it means directly connecting a services requesters and products in case of attaching a RFID rag or sensors on the products.

In all cases we can successfully got an excellent results and best services finder based on IoT, whatever these services were buying a goods (online shopping) or an urgent service for customers like searching for care mechanics.

Apracadabra also can directly communicate with the services, products and tools through RFID technology or any collecting data interface, the service provider can set a RFID sticker in the tools or products that service provider need to sell and he can insert and attach all information about this tool inside the Card such as name, model, type, country, price and other concern information for client.

- App back bone: as it’s the first version of Apracadabra application its working based on the internet and it use any famous chatting application like Facebook messenger or WhatsApp for connecting the services provider with any client or customers through Apracadabra servers, thus they can communicate and try to get more clarify from services providers, thus our application use a social media just from communicating between two sides (service owner or provider and service requester or client).
- App work flow: Apracadabra application based on U2U architecture and NF (Nearest-First), so when the customer search for any service or products the results will be showed in his screen is based on NF.

3.2. Location detection

The application also has the ability to detect the location for both services and customers through the following:

- When adding new products or new services the person who enter the data can insert the location of his business or market (in case of having fixed location).
- In case of car mechanics or the services provider doesn't have an exact place the application can detect the location of customer or providers based on GPS, thus we can know the distance between them.

4. IoT phase (1)

At first glance, you may see that this application does not use the full methodology of IoT, you may see that this application does not use Internet of Things technology stuff full communicating methodology. However, it contributes and provides a quick and speedy service for those interested in the search for a goods or service and communicate with those who provide this service, thus Apracadabra provides better things or customers communicating all this contribute in fast easy immediate services.

Therefore, this application is very useful in emergency cases, it's based on the number of users i.e. the system working efficiently when it has a large number of users and service providers. Thus, both Apracadabra users works as a server and client at the same time i.e. if the service providers have products can be provided to clients. he need to enter all information about it if client wants the request this product he will search about it, he will get all that information and he can contact with the service provider, in Figure 3. there is chat button allow the two side to chat with each other.

The ASS allows us to also many ways of communication between the clients and service providers such as direct contact with the instant messaging, audio or video call. And through visual communication clarifies or review the type of service or car failure (as the previous example), or through SMS services.

The Apracadabra application is a Users2Units (U2U) with the opportunity to learn more details about services. This research seeks to utilize IoT system and enables users to find out the location and additional information about the emergency services which they are seeking.

One of the most important success factor on developing this technology and success in order working as real IoT is that the seller enter detailed, accurate information about the available various products, he can also enter additional information about available quantity and price, specifications and the more detailed. Whenever information is accurate the Apracadabra has opportunity to bring more customers, and also saves a lot of effort for those wishing to inquire about the commodity given the current possibilities, we see such an application was considered sufficient, we can call it the initial release phase (1) of the IoT.

Application service types: this application has unlimited service areas so can we call it Unlimited Things Communicating (UTC) thus the database developed to cover all services that we need or want to query or to display to customers so this application can be also help the Hyper Market in easily products advertisement's, but it focuses more on the style of the NFFS concept and its one of the most searching results. This application differs from normal searching sites, its more focused on providing services in the range within a city or smaller than a city (as in the previous example), this does not mean that the application not display the results located in other cities or countries, but as we mentioned earlier it focuses on the principle of Nearest First-Fastest Service (NFFS).

ASS users as mentioned can be a service provider represents many products or services such as (vehicles spare parts with many products and tools) and therefore every item needs to have a unique tag, in FRID case the service provider need it insert all concerned information or characteristics about the item inside the tag.

The other type is also the client (Mechanical Engineer) and thus will need a unique address or user name to represent him, so he can write in detail what kind of failure he has fluent experience to fix and repair it.

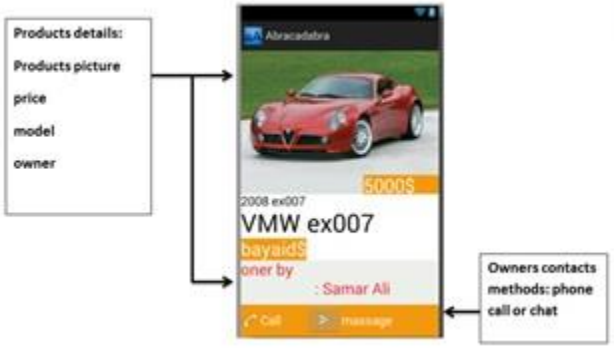

Figure 3. Products detail view and customer/ provider communicating.

5. Apracadabra interfaces

Adding new products or new services can be done in two main ways:

1. Connecting the products directly through RFID tag or sensor node: this type almost IoT technology, the service provider can just place the RFID tag on all products in his markets and insert all information about the product into the tags.
2. Connecting all products which the service providers want offer it to the customers by provider User name or his Account, then under his account he can list all service he offers with correct name and detailed information to allow the customer easily found it when they search. Here we would like to mention the market owner or service providers usually have not enough skills to insert the products information
3. thus he can ask for help from one of application developers or any experts.

This application also provides an immediate advertisement services for all users and customers as fallowing: immediate publicity and advertising process for all interested (if the service provider need to make an announcement about a particular services or any hyper markets make a discount for some products), the application provides notice to all interested in that service and certainly their location, so all clients can see a pop up in his home screen about new products as illustrated in the Figure 4.

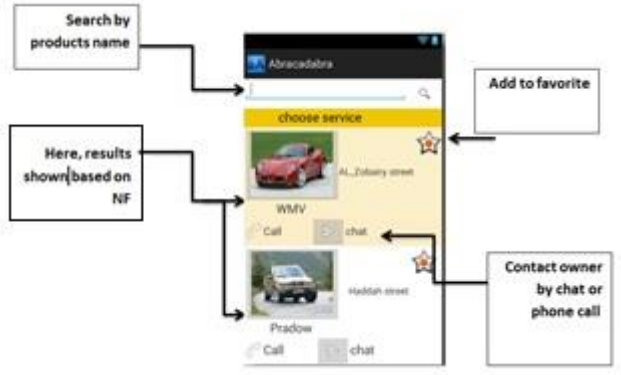

Figure 4. Searching result and Apracadabra options.

It's important for any user or client to mention his interests(whatever its products or services), from users interest, thus the application performance will be improved, so when any Hyper Market have new products, promotion or any service provider have new services want to advertise it to the customers(users) they can easily inserts it as new (services or products) as illustrated in Figure 5, when any client open the application in his mobile he can see every new adds as bob up in to top of the screen, this option it's very important especially for small business, it can help them to get more and more customers so their business will grow up faster with cost lower than any other advertising media.

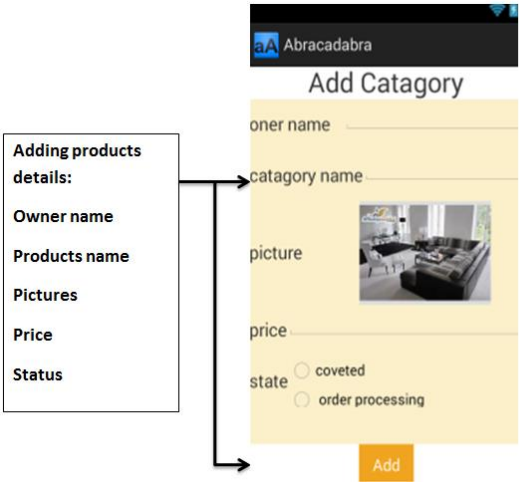

Figure 5. Adding new service or products.

6. Presentation and evaluation

Any user (customer- service providers) have unique account, through this account he can show all services he can offer it to other customers, also he can add new service or new products, thus all this services will be allowed for any customer to view it, also all users have their own page contain all transaction record they already done!

All customer or service benefiter can evaluate this service after they buy it or use it by two ways:

1. Through direct evaluation from customers who utilize this service, but we all know most of customers didn't come back to make evaluation for the goods or service they buy thus we can go to second way,
2. The application has the ability of limitation all customer who buy or use this service thus from knowledge base the application can evaluate this service. The service which has most positive evaluation rates will get high rank thus it will be in the top of searching results for customers.

This article focus on smart services containing (smart marketing, smart advertisement, easier and smooth communicating in emergency cases etc.), on another word how this application can help us to find anything we are looking for immediately.

7. Conclusions

Apracadabra application visions are to connect multi types of technologies: RFID, sensors, actuators, person's users etc.., the opportunity of bring out the IoT technology into reality became possible at the

present through the integration of many available technologies, especially in the developing countries, because it doesn't need high infrastructure.

The ASS contributes on enabling users to find out stuff that they are looking for, and provides sufficient and accurate information about products, tools and services they immediate needed with detailed information about it such as location, contact information, and direct contact with providers or even with these stuffs. From the previous section we view the main interface and the application vision, we evaluate the service provided by app and how it can directly link the customers to services which its urgent to him.

In the future we plan to cover different types of services, and it can be extended day by day whenever new service has been added. Thus, new classes will be added too, also we plan to develop the 2nd phase to Apracadabra.

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