Developing Chatbot Conversational Systems & the Future Generation Enterprise Systems

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Evan Asfoura[1(✉)], Gamal Kassem[2], Belal Alhuthaifi[1], Fozi Belhaj[1]
[1] Arab open university, Riyadh, Saudi Arabia
[2] German University in Cairo, Cairo, Egypt
e.asfoura@arabou.edu.sa

Abstract—Conversational technology has recently emerged effectively; it helps people in communicating with smart devices such as smartphones by using human language. When they emerged, they enabled and assisted users to perform various functions such as gathering information, conducting transactions, having general conversations, and easily navigating web services and entertainment. They not only have an impact on people in general by improving customer service as they can provide answers to any inquiries but also facilitated navigation by assisting people with disabilities by interacting with a system that deals with voices or any other human language. In addition, recently they started to play a significant role in enterprise systems by supporting employees as they are assisted in learning the newly implemented system. As virtual assistants, they contribute to better accessibility, and acceptance, and also reduce the costs associated with customer service. This paper provides a chatbot system that helps the employees to learn how to deal with the newly installed ERP system flexibly and easily, which helps in solving one of the common problems that occur when switching to the ERP system.

Keywords—conversational systems, enterprise systems, virtual assistant

1 Introduction

Business today is as competitive as ever as customer expectations have risen, markets have grown and competition has increased. Companies must therefore anticipate, understand and react quickly to the changing demands of the market, improve their skills and remain competitive; all this by having a business strategy that will help the company survive [1][2][3].

The emergence of many technologies has helped companies to start a new era in the business environment and in meeting their needs by benefiting from these technologies. Enterprise systems have significantly enhanced businesses by allowing them to integrate the dispersed business applications thus assisting in the decision making process, planning by providing the employees with timely and correct information leading to have better customer service and more efficient operations [4][5]. To implement the complex enterprise systems; it requires appropriate planning and continuous support. It

goes through different phases during its whole life they are called the lifecycle; it starts with making the decision to adopt the enterprise system and analyzing its benefits and returns whether they are tangible or intangible to the business reaching to the system maintenance, upgrading or even replacing it with a new enterprise systems with the latest functionalities. The several phases of the enterprise system may often be time-consuming, expensive or can cause the employee unsuccessful transition to the new implemented system. Many ways are there to handle the drawbacks or the downsides when implementing the system; one way is to use technology. Chatbots are one of the technologies that could be considered suitable, they have evolved significantly over the years. They are systems that supply users with information by using speech and other modalities, participate in a conversation and assist users in achievement of different tasks. They are used in many applications [6][7]. The chatbot can be used to support the business various needs when implementing the new enterprise system, it also can save a lot the enterprise a lot of money and that is by having various benefits such as being available at all time due to being virtual robots they can never get tried and is always accessible to follow commands, it also have the ability to reply to all employees instantly no matter how many people are contacting it, being a one-time investment for the business it saves it money by reducing labor and other costs. Additionally, it handles users inquiries and can be used to do specific, repetitive tasks therefore provides the user with almost 100% satisfaction. This study is focusing developing conversational systems which supports and affects the enterprise systems lifecycle by showing the usability and user experience and that is done by using a design science approach according to [8]. The design science approach consists of 6 steps. First, Problem identification and motivation. Second, Objectives of a solution. Third, Design and development. Fourth, Demonstration. Fifth, Evaluation. The final step is Communication. The previous steps will be handled through the following sections of this paper.

2 Related work

The related research to the subject of this work focused on deferent aspects of conversational systems which will be presented through the following subsections.

2.1 Benefits and uses of conversational systems

Conversational systems have a lot of uses as it engages the users in dialogues from which they can gain a lot of information with minimal effort and less complexity. These conversations are offered for a wide variety of applications that assist humans in a user friendly manner. They aid in finding solutions for people who have both hands or eyes occupied while driving or doing other tasks but still need to access a certain service such as contacting someone through call or e-mail, they can also assist people with disabilities as they would need minimal effort to do the desired tasks by only using their voice or simple gestures as there is no keyboards therefore providing convenience to them [9] [12]. Conversational systems are capable of answering questions through retrieving them from the web or from responses that were given as input earlier and they

also engage in a conversations. This can act as an educational assistant in an entertaining way to children as they will be learning through not only questions and answers but through toys, gadget and games that are played for educational purposes, in example of these gadgets is a story telling companion that assists in helping pre-school children [11][9][13]. Language learning and usage has become much easier ever since conversational systems were invented not only has it helped in practicing the language but it also eliminated the error of using spelling mistakes when writing an e-mail or a text message. It has solved the problem of the minority spoken language of the population so for example: if a client comes to the help desk and speak one of the minority languages the system will be able to help him out unlike the receptionist that may not understand the language thus this will increase customer satisfaction and enhance customer service. It also helps in educating the employees new languages in an easy way through a lot of practicing and chatting using simple keywords [9][13][14][12]. Moreover, the systems can be used to gather valuable information and data by asking the user specific and multiple questions and analyzing the gained information from the user to conclude a specific outcome. For example in the case of health care, the patient would be asked questions regarding his blood pressure and heart rate to keep as a record. If the patient suffers a severe increase/decrease in any of them an advice would be given to the patient and an alarm would be generated for the patients' doctor to inform them of such change [9]. When it comes to businesses, conversational systems are the answer. They are used in various ways all in the aim of increasing the company's profit and having a competitive advantage through simple tasks. They can be used as shopping assistants that have high abilities of convincing clients to purchase particular products by filling them in with extra information which helps simplify the decision making process. It was documented that an increase by 40% in sales at a company happened through using a chatbot [10][13][14][11].

2.2 Usage of conversational systems in the ERP life cycle

Taking the lifecycle of Sommers & Nelson which was agreed with Zmud & Apple. The six stages of the ERP life cycle that was discussed in the previous section will be assisted by the conversational systems. In the initiation phase the conversational system could be used by asking several questions to the executives and decision makers, as well as analyzing their answers and extracting keywords that may be used by search engines for better interpretation of the manager's needs [9][11]. This shows that it has the ability in decision making. In the adoption phase the system is used to save money as it eliminates several factors which used to affect return on investment negatively and it cuts of extra money needed for the same quality. In addition to that it helps reduce the budget needed training the employees and their labor costs, in case forced in cutting the budget and the employees [11]; [12][13]. In the adaption and the acceptance phases, the system acts as a personal assistant to the employees which helps them in handling the new system by responding to the questions asked by the employees regarding the system, it simplifies searching through confusing library website by directing the navigation towards specific information by taking them directly to the resource that they need or even helping them reach the right contacts [12][11]. In the routinization phase,

the routinization is accomplished by the conversational systems as it allows the employees with a 24/7 instant support and by simplifying their navigation processes in the new implemented systems when needing specific information, also by allowing employees to use their natural language and the conversation system will interpret them into actions on the system [11]. In the infusion phase, the system can help by the assistance of the chatbot developer by checking the log to recall the questions frequently asked and the keywords and phrases used, therefore assisting managers in finding problems or functionalities that needs upgrading [15].

2.3 Overcoming ERP risks by using Conversational systems

A few risks could be solved and tackled using the conversational systems. For instance the first problem which is the performance decline risk could be tackled by enabling employees to ask the conversational systems questions regarding the enterprise system understanding and providing them with the needed information to tackle all the skills needed to master the new system implemented [11] [9] [13]. The second problem is integration; it could be solved by using chatbots. As it will help in exploring the enterprise system while interacting with suppliers, customers, recruiters and other employees; this will extend the disperse of chatbot within the enterprise to keep everyone in contact through easily interacting [16]. The third problem is change in management/adaptation problem. The conversational systems can solve this problem in two ways: the instant access of the system which is available 24/7 helps the employees collect all the information needed to improve themselves. This led to an increase by 50% in the productivity [11]. The fourth and the fifth problems where are the operational factors and the implementation problems regarding money and employees using the system. Money problems could be solved by using the conversational systems as it can help in reducing the money needed for employee training and their costs. Also it can be used to tackle the operational factors and the problems regarding the employees by assisting them in understanding and navigating in the new system also it can use the given data to analyze the provided information and produce advice that can assist managers. [11][12][13].

After exploring the previous literature reviews. A huge gap has been found in investigating conversational systems in the ERP lifecycle phases. Hence, the research question that this study attempts to answer is: “How conversational systems can support in the enterprise resource planning lifecycle phases?” In order to answer the research question stated in the research gap. A design science would be established.

3 Methodology

According to [8] the model consists of 6 steps. First, Problem identification and motivation which is defining the specific research problem and showing its importance. Second, Objectives of a solution. Which is showing the benefits of the specific solution of the problem. Third, Design and development. Which is creating the artifactual solution. Fourth, Demonstration. Which is demonstrating the efficiency of the artifact to

solve the problem by using the above mentioned lab experiment. Fifth, Evaluation. Which is observing and measuring how well the artifact supports a solution to the problem. This activity involves comparing between the conventional way of doing the phase and the specified phase using conversational systems. The final step is Communication. Communicate the problem and its importance, the artifact utility and novelty and that is done by writing the thesis.

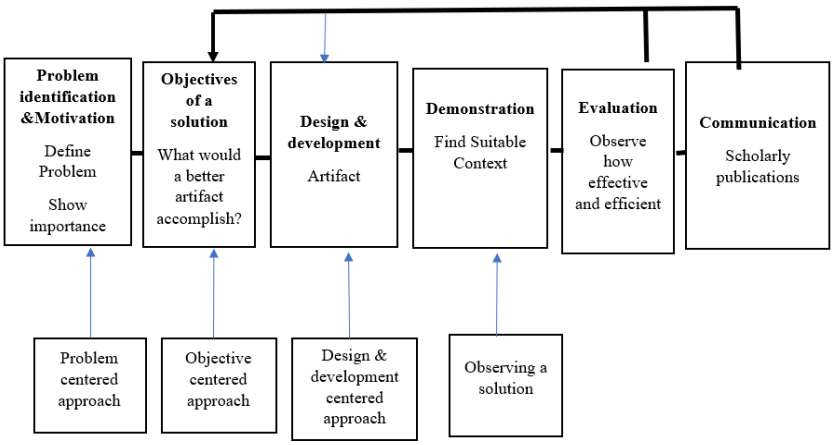

Fig. 1. Design Science process

Enterprise systems help organizations in dealing with the huge competition in the market by having a competitive advantage and by also allowing organization's to have better information flow that can assists managers in better decision making and increase customer satisfaction. It provide enterprises with major benefits by implementing it, it has changed the way businesses do work at all levels of the company starting with communicating to making informed decisions using data insights. Existence of enterprise systems can support employees in reaching higher demands and goals more efficiently. On the other hand when employees aren't provided with the necessary education and training to the new implemented system, staff members can feel frustrated and stressed out leading to have a negative effect on their efficiency and motivation. Enhancing the performance of staff members and decreasing the stress accompanied with the new installation; training is essential. An effective training program can count as a competitive advantage but even though it's such an important phase in the enterprise systems lifecycle. A lot of challenges are faced when implementing the system; starting with employees, not all employees can master the new system from the beginning and a lot of questions and additional repetitive questions are asked that needs to be supported at all times. Moreover, trainers may not provide end users with information in an interactive and engaging manner and providing it with detailed and technical way rather than simplifying it causing problems in understanding the new system. One of the highest budgets prepared for the system is related to the training of end-users thus consuming a lot of money that could be benefit and be utilized in other ways. According to that, tools such as conversational systems could be used in assistance to the training

of end users. Chatbots especially could be considered one of the technologies that is considered accessible at all times and not costly as traditional training. used The chatbot could be beneficial for many reasons; its all-time resource availability can be when employees have various inquiries or when not wanting to pester a fellow worker with recurring questions. By also having it integrated with the ERP system it also can respond to the workers questions and requests in real time in cases where it can either be simple or complex. Moreover it can search the web for responses for a specific question to gather more valuable information. It assists in navigating the user towards the resource they need making it easier dealing with the puzzling library, it can help the employees by only using their native language and the conversational system will interpret it into actions. By using a chatbot it will make the learning and training process for the user a more enjoyable and stress free experience. It can help managers and decision makers to improve the system by checking the history of the bot to see the frequently asked questions and problems that occur to the employees when dealing with the system therefore helping in upgrading finding solutions for these issues. Chat bots can also decrease expenses regarding employers and trainers that assist employees in their training for the new implemented system.

4 Design and development

The first phase was analyzing the available SAP modules. SAP stands for Systems, Applications and Products in data processing; they're one of the leading companies in providing software's. SAP ERP has different functional modules, such as: Human Resource Management, Production Planning, Financial Supply Chain Management, Sales and Distribution, Financial Accounting and Controlling, Quality management, Warehouse management and last but definitely not least is Material Management. Material management module for example ensures that the materials and the supply chain process of the company is free from any shortage or gaps. It manages the materials of the company with a goal of enhancing productivity, lowering costs, being able to adapt to changes in the everyday life and enables the business to work more efficiency by affecting time and cost factors. Sales and distribution module do various functions such as setting up customer records, sales document types, billing types and tax related components. Also they set up Organization Structure by creating of new company, company codes, sales organization, distribution channels, divisions, business area, plants, sales area, maintaining sales offices and storage location. Finance and Controlling is a module which is liable for integrating all the information and following up the flow of the financial data across the organization to enhance strategic decision making, it also helps in monitoring and optimizing the different processes in the organization and also controls the business flow. The human resource module carries out functionalities such as employee-related data for administrative, time-recording, and payroll purposes; it also have other uses for example: recruitment, organizational management, time management, benefits and compensation management. The production planning deals with different planning processes such as: capacity planning, material planning, execution of

production order, bill of material and goods movement. It manages the master data required for Bill of Materials activity, work center and routing, and keeps it in a separate component. There are also a few steps to execute a production order some of which is converting planned order to production order, issuing of the production order, product order confirmation and issuing goods for production order. Quality management is also a module within the ERP system that supports and have different uses throughout the enterprise such as: Quality planning which includes Creating and Managing the Master data that is required to plan and execute quality inspections, it's also used in quality inspection which is responsible for determining whether the units inspected fulfill the predefined quality requirements. Moreover, quality control which implement different activities like corrective, preventive and monitoring actions. Another module is Warehouse management; it deals with tasks like: warehouse management inbound which does inspection and receipt of inventory, warehouse management outbound which process outbound shipments of goods, it also uses strategies first; for stock placement thus optimizing the use of inventory storage space usage, second; for enhancing physical flow of inventory. Moreover, it improves resource usage in warehousing operation and enhances operational uptime options. By having this system and various modules. The systems return benefits by performing various functions; it assists the integrated business processes inside the company, it provides long term profitability, by analyzing the right data it enhances the process of the decision making, it allows the organization to adapt to the changes of their processes and also it can help organizations against security threats. The second phase was chatbot matching where chatbot features and functionalities were determined. Using a chatbot is an innovative way in enhancing the training of employees in exploring the systems newly implemented in the organization. The use of this technology improves processes and the overall experience for employees. A Chatbot implemented for employees who are training to work on the new implemented SAP ERP system could be a helpful tool for fast learning and to decrease the pressure regarding asking for help when not recalling the small details or forgetting the process of a specific function or even when dealing with unexpected errors. The thirst phase was the implementation phase. A chatbot domain can be designed and implemented in one of two ways either open or closed. An open chatbot have natural language processing capabilities that enables the chatbot to understand sentences and questions that are given by the user even when not properly structured or off-topic. The closed chat bot on the other hand can only understand a limited amount of questions. Moving onto the chatbot response generation two approaches could be taken; the first approach is not being able to generate new string and that is by using a retrieval based chatbot uses a repository with predefined responses that are used when the user inserts some kind of input that is used as a parameter therefore choosing a reply from a static set. The second approach is having a generative chatbot that generate new replies when needed and don't use predefined responses that are used in the first approach. For developing and launching the chatbot two approaches could be taken. The first approach is using a DIY bot platform; they are web-applications that have different capabilities such as interacting with other platforms for example: Chatfuel, Converse.ai and Kore.ai. They are user friendly and don't need coding for development in case of beginners and non-technical users. The functionalities could be a little bit limited when

comparing it with coding but functions are always being added but on the other hand they have a high level of customization, not expensive to launch and integrate it to the ERP system and easy to learn due to the tutorials being offered. The second approach is using a bot development framework. It is framework that is used for quick chatbot development by using a predefined set of classes and functions. This approach is more complex and challenging than the first one because it's harder for beginners to learn chatbot development and technical more expertise users are needed to develop it therefore being more costly, it also takes more time and needs a host for the server infrastructure. On the other hand it is more flexible and precisely tailored for companies. Bot frameworks have different examples such as: Microsoft Bot Framework and Wit.ai . A few guidelines are taken when developing the chatbot on the system: cues should be given to the user in order to assist them in reaching their end goal, the users should also be able to exit the conversation when needed therefore allowing flexibility, the usage of AI is a must in order to understand the various and different human expressions, giving the chatbot diverse response to predefined questions to make the conversation more human-like, last but not least the expectations of the users should be managed and the purpose and the functionalities of the chatbot should be clearly stated and known to the user.

In the last phase was the testing phase, a usability testing will occur allowing the employees to try the new implemented chatbot that is integrated to the ERP system. The employees that are selected for the testing phase are existing employees in the company where they will learn how to deal with the new implemented ERP system by the help and usage of the integrated chatbot. The results of the test will be gathered in two ways:

First, chat logs between the user and the chatbot will be seen by managers and bot developers. Therefore gathering information about the inquiries of the user and finding more about the problems that faced the user when interacting with the chatbot therefore enhancing and bettering the experience and performance of the chatbot, also to check if the information provided to the employee is perceived as reliable. Second, a module for user feedback will be used allowing the user to submit their issues, ideas and suggestions. This module will have many returns as the feedback is the basis for improvements and performance enhancements; the user feedback is a guarantee to ensure that the chatbot developed fulfils and serves the needs of the employee, it also measures the level of satisfaction the user have and whether the users expectations have been met or surpassed when dealing with the chatbot, it also provides insight on how to enhance the bot to better the user experience by being provided with tangible data and to check if there were any difficulties in accepting the chatbot as a method of training and communication. After the results are gathered a change management process occurs to improve the chatbot to allow the employee to have a better experience and that is by adding required features that was known after testing, adding AI responses to the questions that were asked during the first usability testing and enhance the conversation flow to be more convenient for the employee and also debug and fix the errors that occurred. Afterwards another user feasibility test is done to make sure that all points were covered. The testing phase is one of the most important phases as it serves multiple pur-

poses and ensures the achievement of various factors; first, quality by having the employees evaluating their whole overall experience when dealing with the integrated chatbot and by making sure that all functionalities are working well. Second, usability by finding the best way to improve the chatbot based on the preferences of the majority. Third, bug detection and fixing them. Lastly, performance and that is by analyzing it and the speed of the chatbot therefore enhancing it.

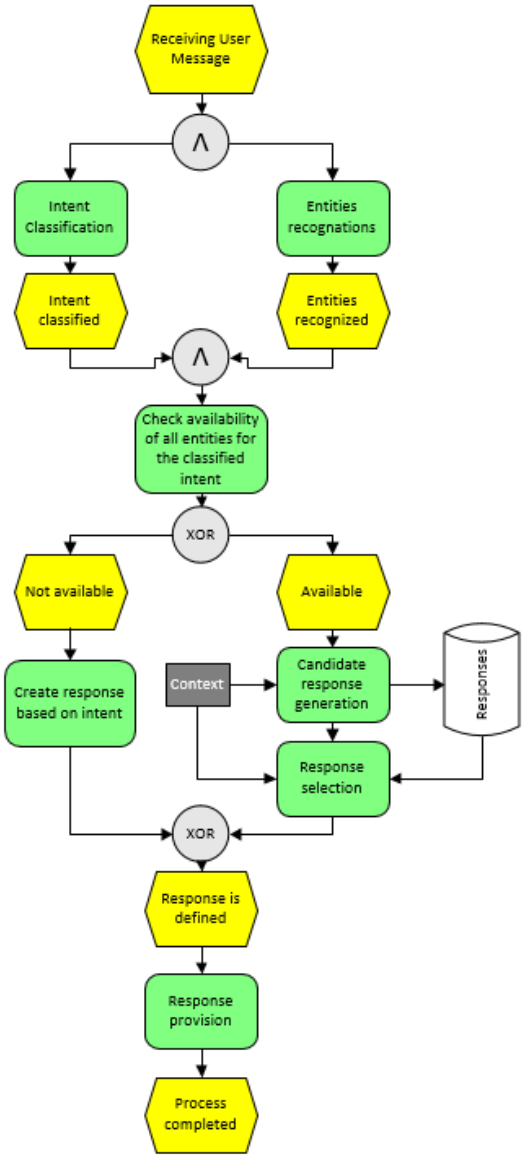

Fig. 2. developing process followed for improving the appropriateness of Chat bot responses

Accordingly, the module that is of interest is the material management module. It's a part of the logistics area; which joins between different modules such as Sales and Distribution, Production Planning, Plant Maintenance, Project Systems and Warehouse Management, these different areas are used to monitor the flow of materials to consumer from the manufacturer. Material management has various sub components; they are as follows:

Table 1. Material management sub-components

Sub-component	Description
Purchasing	Activities that are related to material procurement
Inventory management	Activities that manage the inventory in the storage area
Logistic invoice verification	Activities related to invoicing process
Physical inventory	Activities related to carry out physical inventory in storage area
Master data in Material Management	Material master, Vendor master and purchasing master
Material valuation	Activities related to material valuation
Service management	Activities related to Service management
Foreign trade and customs	Activities related to the import process
Product Catalog	Activities related to catalog management

Organizations purchases materials to fulfil their business needs. That is when the purchasing sub-component is used. It's used to deal with different functionalities such as handling the external purchases of materials and services, finding different source alternatives for a requisite, monitoring the deliveries and the payments for vendors. It also communicates with different modules for example: Controlling and financial accounting to make sure of efficient flow of information.

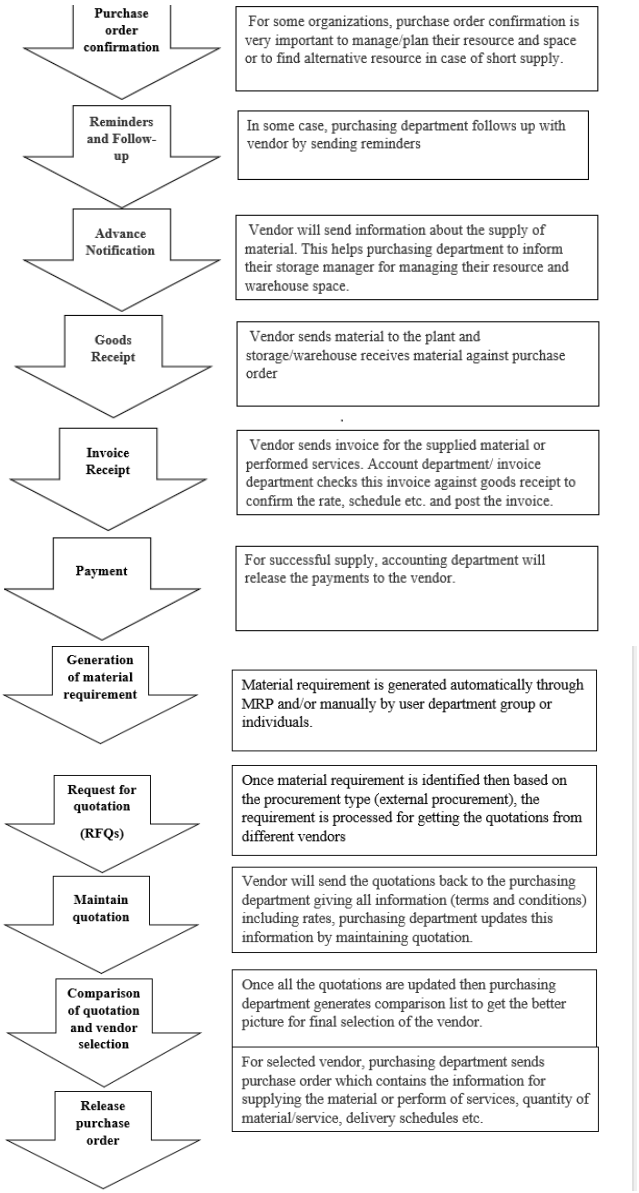

Fig. 3. Purchasing lifecycle

Rules-Based chatbot is the approach that's used for the scope of this research and that is achieved by using a DIY chatbot platform as it's the most appropriate and suitable one in this case and kore.ai was the one selected from the various platforms after having selection criteria to decide upon. The selection criteria was as follows: the possibility of implementing AI, a user friendly interface that doesn't need coding capabil-

ities, the simplicity and easiness of deployment and development of the chatbot. Additionally the services that are being provided are for free or minimal amount of money. Kore.ai bot platforms are used by enterprises to host, design, build and test their chatbot whether for business processes, employees or customers. They have two options for businesses to run the platform whether on premise or on cloud. Available tools are used by developers to construct chatbot either by choosing from already existing bot templates or by starting to build a custom bot from scratch; by choosing either they still can meet the business standards and reduce any complications and complexity in the development phase. Also by having strong capabilities not like other platforms; developers can build the bots not in months but only a couple of hours and not needing expensive resources such as hosting or hardware. It's also rich with other capabilities like enabling natural language processing in chatbot and that's by having standard responses and customizable intent recognition, it also has a flexible dialog builder by being able to create difficult interactions between the user and the bot by using reusable and modular components, it can use an already developed chatbot and select a starting point or modify previously used components. When starting to build the chatbot using kore.ai; various tasks are presented to choose from based on the functionalities and the purpose of the bot. Five primary tasks are available; Dialog tasks, Knowledge collection, Alert tasks, information Tasks and Action tasks. Each task has different uses for instance the alert task provide users and employees with timely and personalized information directly from their enterprise systems. It sends the user notifications based on their request whether they are scheduled alerts which are based on the user specifications on the days, time and frequencies they are triggered or Filtered alerts that are triggered when the user defined criteria has been met. Action tasks on the other hand gather, alter and post information in system of records by doing that it eliminate and reduce repetitive and time consuming steps that employees usually perform. Information tasks are tasks that return to the user easy to consume results that are appropriate and right for employees and customers and that is by gathering, extracting data and pulling reports. Also the user have the capability to filter the information that is delivered therefore making it more convenient for users to process and scan. Knowledge collection is a task where when users ask questions and have inquiries; right answers are being searched for in a pre-defined set of information and by using ontology mapping the bot queries the database to increase answers accuracy and provide the user with the right match and instant replies. The last task is the dialog task. The dialog task are used to handle the various user intents in a single conversation as the task is being designed based on pre-established business workflows and logic driven business processes. The bot can handle different user requests by allowing the user to interrupt the current request with another request and complete it first then return to the original one.

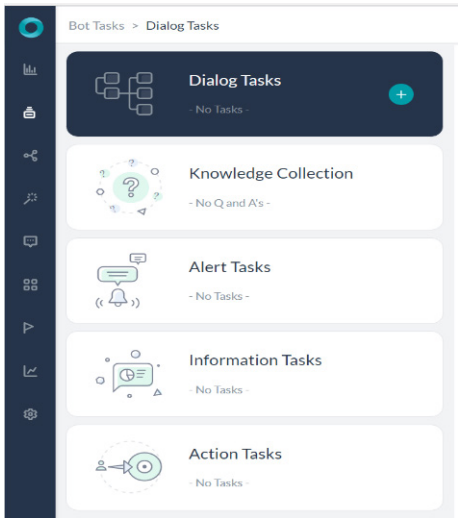

Fig. 4. Bot tasks

Choosing one of the previously mentioned tasks it's time to build a dialog using the dialog builder. The dialog builder turns decision trees and difficult interactions into conversations, it also helps in the development process by having the ability to provide flexibility to manipulate the entire dialogue process and also execute the simple tasks easily. Also when building the dialog other features exist such as: reusing previously developed nodes in current or future dialogs, request chaining and intent and sub intent recognition. Then the next step was configuring and training the bot to deal with users in natural language. Kore.ai was the best option when it came to this step due to its rich capabilities and features therefore providing a satisfying user experience. Kore.ai NLP engine capabilities include that it analyzes user input to identify intent and extract the important entities or data. In intent recognition the NLP engine analyzes the structure and words in the users command leading to understanding the synonyms and matching it with its proposed task. In the entity extraction; the chatbot only extracts the needed details and the necessary information to complete a specific task whether it's provided by the user all at once or throughout the conversation with the chatbot.

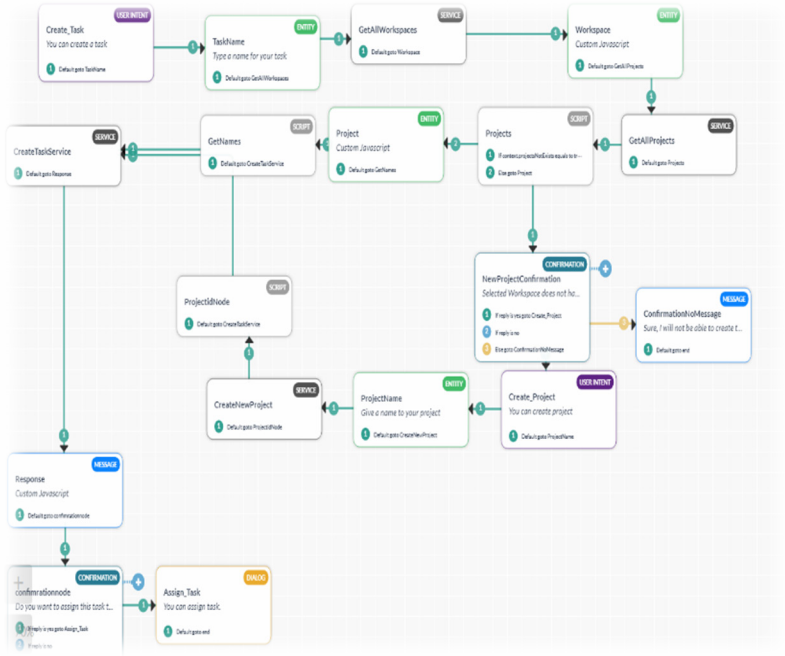

Fig. 5. Build dialog

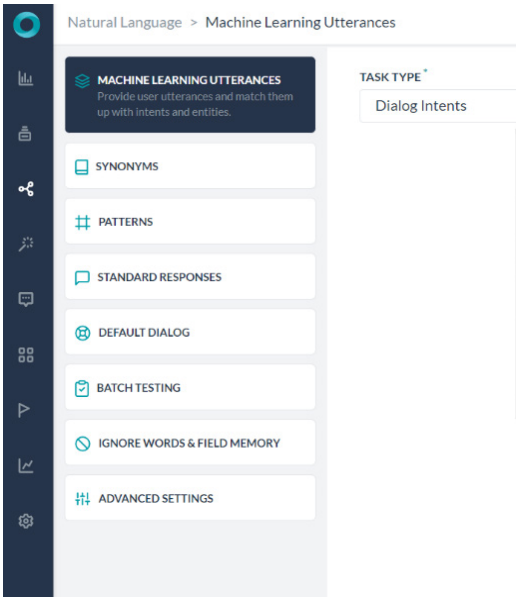

Fig. 6. Natural language

The fourth step was adjusting settings. The stored authentication and authentication profiles that the bot will be using within its service calls, language management and adding variables that was used when defining tasks and configurations. The fifth and the last step was testing. Kore.ai has the capabilities of allowing testing during the development phase thus assisting in developing a better bot for users. Also it's also capable of Test request chaining, intent recognition, conversation flow, and use the Kore.ai Dialog Builder debugger to expose chat logs and outputs in real-time. After the testing phase, the chatbot is published on one of the available messaging platforms and communication channels allowing the employees to start the training phase with the assistant of the chatbot. Due to some technical difficulties integration with SAP ERP was inapplicable so other solutions were found. After the chatbot being published the employees were able to test the implemented chatbot and providing feedback using the user survey feedback and by checking the chat logs allowing to make changes to enhance the usage, better the performance and perform more needed tasks that were suggested by the user. In the upcoming figures; it shows conversations between the employees who has inquiries regarding the purchasing module and the chatbot.

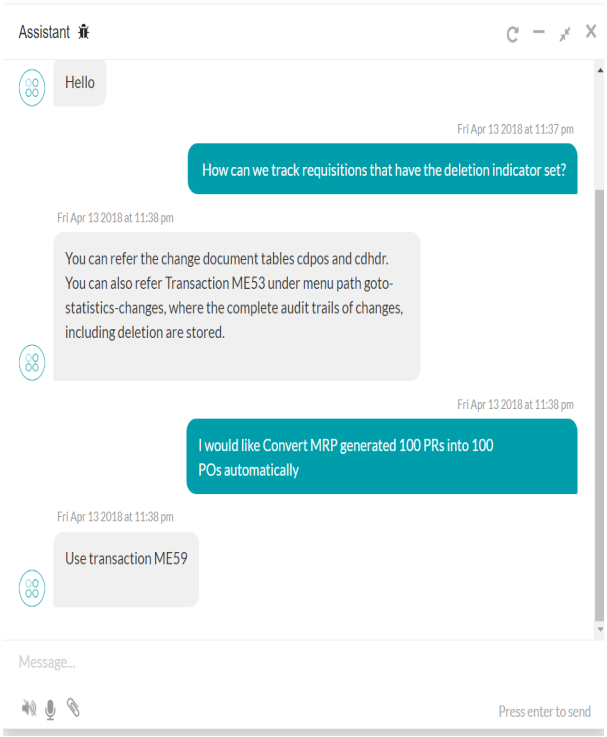

Fig. 7. Employee and chatbot conversation

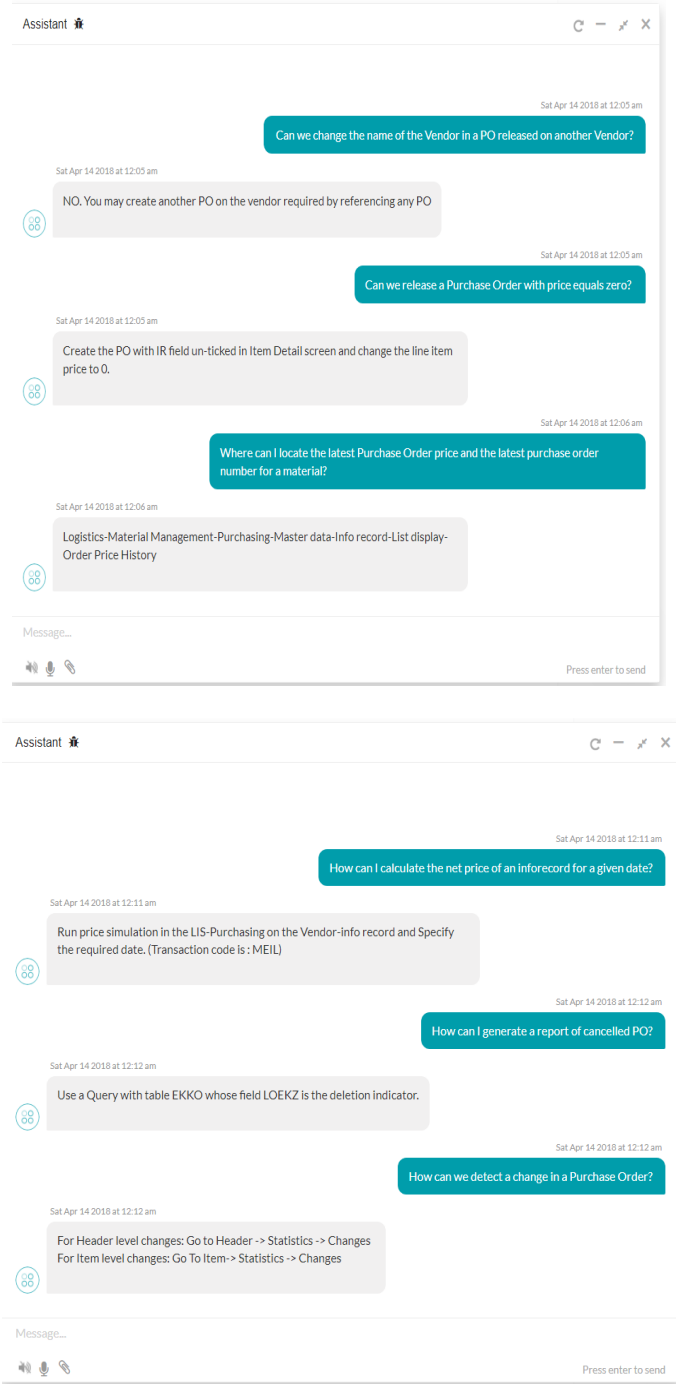

Fig. 8. Employee inquiries

The chatbot as shown in the figure doesn't include any graphic experience to the user, all the interactions between the employee and the chatbot are textbased. As human interaction is non linear and unexpected designing a chatbot that has the capabilities of natural flow in a conversation is one of the most challenging things when designing and developing the chatbot. So the chatbot was designed to meet the employees requirements which is to be able to handle the new implemented ERP system by having inquiries about the different functionalities in the purchasing module and asking for assistance incase of any errors that come up in the process therefore decreasing the user's fear, stress and anxiousness about dealing with the new implemented system by addressing the errors and providing instant replies to the questions.

5 Evaluation

Some limitations have been encountered during the development of the chatbot, even though chatbots have promising features. When developing the chatbot using kore.ai, it was the first experience of overall lack of guidelines, assurance of the chatbot landscape. In addition, difficulties were encountered in integrating the chatbot with the SAP ERP system, as the lack of connectivity may have affected the perception of employees using the chatbot. By not being integrated and made available on messaging platforms, resulting in the need for network connections as they connected to the Internet and can be accessed purely online; This can cause problems when there are network connection issues that affect the latency and availability of the chatbot. Additionally, using only chat as a medium limits interactivity and may not be universally applicable as chat is not the best approach in some scenarios. On the other hand, the bot developer consisted of various functionalities such as the ability to execute simple or complex tasks whether they are structured or unstructured, it also was constantly trained to have better and more efficient communications by using machine learning and NLP, it also dealt with declarative approach to recognize entity and intent, the capability of deciding what the bot remembers in short and long term memory. Furthermore, the ability to test the bot throughout developing phase before publishing it to ensure that it meets the users and the company's specific needs.

6 Conclusion and future work

With the advances in human-computer interfaces and its connections with many human technologies that help and enable users to conversation with computers, it has significantly changed the way humans communicate with machines and computers, from the coding to communication. By facilitating and enhancing the way user communicates with computers it had major benefits and more convenience and satisfaction for normal users, even for companies it affected them by assisting them in their customer service by allowing them to use conversation systems to help users in their inquiries and also in gathering valuable information and analyzing it. Moreover, as conversational systems have been emerging they also had a huge impact on enterprise systems

which are used to assist in integrating business functionalities into a single system that helps in enhancing information flow.

The thesis aimed to show the capabilities of the chatbot and its ability to assist the employee in the lifecycle phases of the ERP system especially in the training and support phase. The paper was comprehensive starting with the enterprise systems, chatbot capabilities and summary about it, state of the art, conceptual module and module analysis.

Throughout the paper, it was verified that chatbots such as kore.ai are great assistants for users andemployees due to its ability to provide fast access to needed and important information. It also enhances business processes by having the ability to collect, modify data and posting information in systems thus reducing time consumed on iterative steps. Moreover, increasing employee satisfaction by transforming traditional processes into a digitalized one. A chatbot developed for the training process can have many returns to employees like the ones mentioned earlier by decreasing the gap between the new implemented system and the employee being trained by having an all-time access to crucial information that can help in dealing with the ERP system without the discomfort of asking other employees or the employer iterative questions.

In result a chatbot was developed using kore.ai bot developer to test and evaluate the performance and assistance of the chatbot when used by employees in the training phase of the ERP system; leading to answering the research question throughout the different phases of testing with the usability testing by checking the chat logs and the user survey feedback.

The outcome was as follows: after ten users where reached, the sample included 6 females and 4 males between the ages of 20-35. They were ready to test the chatbot and how it supports the training phase regarding the material management module. The users were requested to try the new chatbot made for the assistance of the enterprise systems by asking the bot questions and when having any inquiries regarding the new system; afterwards each user was asked to fill an anonymous survey providing feedback about the usage and convenience of the chatbot.

The survey has provided insights on the user's interaction with the chatbot which showed the following: first, seven users out of ten were their first encounter with a chatbot thus having possible difficulties on accepting the chatbot as the method of communication in the training phase as its relatively new type of interaction for them and different than the traditional training way; second, even though most of them were their first timedealing with a chatbot they were open to the idea of it and stated that they might recommend it for other users; third, users expressed their convenience when dealing with the chatbot and stated that their experience when dealing with the chatbot was pleasant; fourth, the target users inquiries were answered and the users were provided with reliable information causing the chatbot to be perceived as efficient. Moreover, most users were inconvenient with the fact that the chatbot wasn't integrated with the ERP system stating that it would be more user-friendly than having it on a messaging platform.

The research endures limitations in some areas; they are as follow: first, the test sample size was small only using ten individuals that were approached to try the chatbot and didn't volunteer, this can make a chance of them feeling obligated to do such a job

and perceived that the task was an obligation rather than an optional request. Also due to the small size of participants it can have an effect on the accuracy of the results. Second, there was a lack in available data and resources when developing the chatbot such as user requirements and full needs in the training process therefore causing to limit the scope of the analysis and having restraints when testing the chatbot. Also, there was a lack of prior research studies on this topic. Third, lack of access to organizations constraint the testing on individual users not on organizations therefore having less sample size and also affecting the accuracy of the results on how much chatbots can support in the lifecycle of enterprise systems. Fourth, due to time constraints a more extended study might have provided more insights about the usage of chatbots to support the ERP lifecycle by having a longer period to measure the effect over time.

Some points need to be improved in the future, such as: Integration of the chatbot with the ERP system as it was implemented using a messaging platform. This could lead to network connectivity, latency and availability issues. The chatbot's ability to answer user questions by having website and database knowledge based on expert systems by taking user feedback to improve it, and/or cognitive analysis by using content and semantic analysis built on predefined websites can search for answers to questions from employees or databases, including through document-based knowledge, where it can search for answers to questions asked in documents, whether they are in Word, PDF or other formats. Adding other features to chatbots to make them user-friendly by adding buttons and suggestions for users to support the conversation flow.

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9 Authors

Dr Evan Asfoura is an assistant professor at college of business, studies in Open Arsab University. He received a B.S. degree in business administration from Tshreen Uni in Syria and M.S. and PHD degrees in business information system engineering, from the faculty of informatic / Uni Magdeburg in Germany. His research interests include federated Enterprise planning systems, e business models and Internet of things. He Has many publication in international conferences and journals.

Dr Gamal Kassem received his master and PHD in business informatics from OTTO-VON-Guireke-University in Magdeburf, Germany. He is now associate professor by German university in Cairo. His research focus on Business process management, Data Mining nd process Mining. He Has many publication in international conferences and journals.

Dr. Belal Alhuthaifi received hisn Bachelor of Computer Application, University of Bharti, India and his Master of Information Technology Management, Oakland University, USA. Mr. Al huthaifi has finished his PhD in Technology Management, Eastern Michigan University, USA.

Dr. Fozi Ali Belhaj is assistant professor in management at Business Studies Department, Faculty of Business Studies, Arab Open University, KSA. He has extensive

experiences in academic and leadership. He joined academic filed since 1999 in Hadhramout University, Dar Aluloom University in KSA. He appointed in several managerial positions including the Vice dean of Student Affairs, Vice Dean of Community Services in Hadhramout University, Head of Human Resources Department, and Head of Quality Assurance and Accreditation Unit in Dar Aluloom University, Quality Assurance Coordinator, Courses coordinator in Arab Open University, KSA. He was a member of university council and he is a head and member in many committees, present training courses and consulting services in management. Dr. Fozi research focuses on management, technological applications in management, leadership and human recourses management aspects and has good communication, interpersonal skills, and ability to work within a team efficiently. He is very keen for knowledge and interested in conducting academic research and has publications in his interested area to improve skills and adapt updates.

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