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Natural Language Processing and Artificial Intelligence for Enterprise Management in the Era of Industry 4.0

Pascal Muam Mah [1,*], Iwona Skalna [1] and John Muzam [2]

[1] AGH University of Science and Technology, 30-059 Krakow, Poland
[2] Silesian University of Technology, 44-100 Gliwice, Poland
* Correspondence: mah@agh.edu.pl

Abstract: Introduction: The advances in the digital era have necessitated the adoption of communication as the main channel for modern business. In the past, business negotiations, profiling, seminars, shopping, and agreements were in-person but today everything is almost digitalized. **Objectives:** The study aims to examine how the Internet of things (IoTs) connects text-object as part of NLP and AI responding to human needs. Also, how precipitated changes in the business environment and modern applications such as NLP and AI embedded with IoTs services have changed business settings. **Problem statement:** As communication takes lead in the business environment, companies have developed sophisticated applications of NLP that take human desires and fulfill them instantly with the help of text, phone calls, smart records, and chatbots. The ease of communication and interaction has shown a greater influence on customer choice, desires, and needs. Modern service providers now use email, text, phone calls, smart records, and virtual assistants as first contact points for almost all of their dealings, customer inquiries, and most preferred trading channels. **Method:** The study uses text content as part of NLP and AI to demonstrate how companies capture customers' insight and how they use IoTs to influence customers' reactions, responses, and engagement with enterprise management in Industry 4.0. The "*Behavior-oriented drive and influential function of IoTs on Customers in Industry 4.0*" concept was used in this study to determine the influence of Industry 4.0 on customers. **Results:** The result indicates the least score of 12 out of 15 grades for all the measurements on a behavior-oriented drive and influential function of IoTs on customers. **Conclusion:** The study concluded that NLP and AI are the preferred system for enterprise management in the era of Industry 4.0 to understand customers' demands and achieve customer satisfaction. Therefore, NLP and AI techniques are a necessity to attain business goals.

Keywords: natural language processing; artificial intelligence; Internet of Things; enterprise management; Industry 4.0

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1. Introduction

Natural language processing (NLP) is the systematic approach means of a computer that gathers knowledge on how humans use, applied, and understand language [1]. The developmental approach and techniques in which computers understand and manipulate text are in an advanced stage with the support of AI [2]. Industry 4.0 is taking advantage of the advanced use of NLP for industrial use. The statement fourth industry revolution refers to a new level of innovation, technology, and modern scientific concepts of economic growth and advanced standards of living. The term Industry 4.0 was first published by the German government in 2011 [3–7]. The word Industry 4.0 has been globally recognized as a descriptive word for an economy with advanced industrialization. The new technology era has radicalized the modern economy with advanced applications and systems software such as natural language processing (NLP) and artificial intelligence (AI) [8]. The level of connectivity of the Internet of Things (IoTs) with NLP and AI has brought humans very close to the concept of Industry 4.0 and it has given a new phase of affairs [9,10]. The IoTs have

given the global economic opportunity to engage and enjoy the benefits of Industry 4.0 by connecting objects and system applications to fulfill human needs [11]. Thanks to the advancements of NLP and AI that IoTs enable economies without the facilities of Industry 4.0 to still enjoy the services provided by Industry 4.0 [12]. To achieve a substantial classification, industries apply global optimization ability based on globalization [13].

Industry 4.0 has a strong connection with the supply chain management system from the production to customer. Following precipitated changes in the world, communication is a focal point for modern businesses [14,15]. Natural language processing applications have been broadly involved in the activities and services of Industry 4.0 as a main part of the interaction. Many industries now deal with slot of communication which gives rise to AI systems. The AI is now applied through the NLP application. The combination of AI and NLP is helping companies to understand their customers and provide products and services tailored to their needs. With prime concern in understanding customers' needs and wants with the help of AI and NLP, companies have resulted in influenced customer choice. The needs of customers are now based on what the company wants and not what the customers need. As the turtle continues with industrial wants and customers' needs, the study seems to find out how the company reaches this point of industrialization. Following the precipitated advancement of Industry 4.0, systems such as enterprise resource planning (ERP) are more industrial-oriented than customer-oriented [16]. The Industrial Revolution is now using AI and NLP application to impose their services and products on customers. The main aim of AI is to develop system software that thinks and acts similarly to humans. But this function has been broadly overridden by the competitiveness of the business world. Since there are no rules and regulations for applying AI and NLP for industrial use, key performance indicators (KPI) are industrial-oriented in this era of Industry 4.0 [17]. The primary objective of KPI is to evaluate how business success is reaching its target [18]. High-level KPI focuses on business performance and low-level KPI focuses on the process of departmental resource management (HRM), sales, and marketing [19]. The advanced development of technology has shifted the rule of low-KPI to the IoTs to achieve high sales, marketing, and HRM. The integration of KPI and ERP with modern program applications of AI and NLP has grossly and unintentionally ignored the needs of customers. This system software has basic human feeling and does not capture individual situation but rather concentrate on the group-based situation. This makes it difficult to fulfill the needs of every customer base on group assumptions [20]. The study introduces a concept that tries to advance a state of the arts and enhance the current process of understanding the use of AI and NLP applications with support from IoTs to influence customers' choices, needs, and desires. To achieve a substantial feature in text extraction, integrating principal component analysis and the local binary pattern is required [21].

One of the importance of the study is that it helps expose the tactics of industrial developments and advancements in technology that allows companies to access information in a variety of ways tailored to their needs [22]. This paper stands as a caution to the general public on their role play in advancing the growth of industrial enterprises. The study, however, identifies that most customers act in the favor of most industries but in return gain little or nothing. For this reason, the paper stands to expose the tactics of most industries and the method they used. This paper stands as a town crier and eye-opener to most customers who react, respond and run their day-day activities without knowing the impact on their lives. The time factor is very important in determining customer satisfaction. The time taken to deliver industrial products is very important in customer retention, especially for companies that deal with perishable goods [23]. The policies of Industry 4.0 are perfectly fine with industrial expectations of a 21st-century world but unjust in the level of customer demands [24]. For example, the services and products of IoTs have developed to a level that is irresistible. Based on services and products offered, customers' needs are tailored to this service and they use this service base on convenience and not desires. That is why the world keeps on getting into challenges that are far most dangerous to human existence than in the past without these services. For the world of enterprise management

to perform better, it is a priority to keep customers' needs and wants above industrial needs. There is a need for interoperability to mitigate possible conflict between standards and policies of Industry 4.0 [25]. The use of chatbots helps businesses seek customer care domain intending to complement and demonstrate a live agent experience with artificial intelligence able to help a customer fulfill a task [26–28].

1.1. Business Dimension Uses of Natural Language Processing

The following Figure 1 below presents the objectives of the study as a relation between text-object devices that convey information about the company's products to customers and allow customers to learn and interact with the company's products. The items in the figure below represent the Industry 4.0 options of tech that use NLP to fulfilled most business activities nowadays [29]. Following advances in the growth of technology and digitalization of business activities, the following applications have shown to be topping the game when it comes to modern business. The uses of NLP processing show how important NLP is to industrial enterprises. Virtual assistance is raising very important interaction between system software and humans [30].

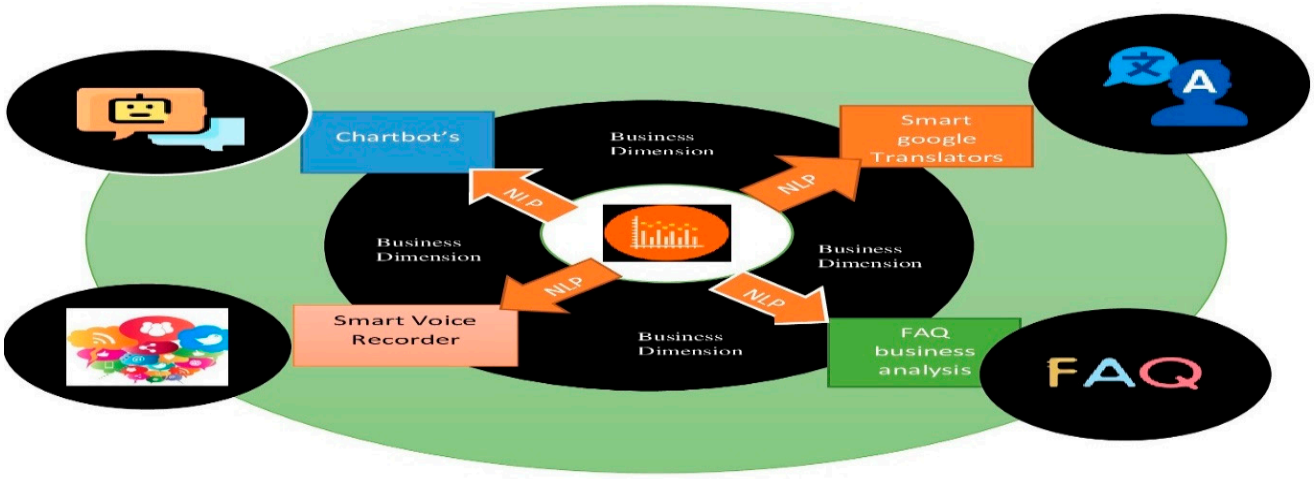

Figure 1. NLP business dimension.

Figure 1, explain the most used applications by companies to push forward their mission and how they are tailored to the company's products. Virtual assistance, google translation mostly for smart contracts, frequently asked questions, and smart communication tools such as video conferences and audios. These options help customers be it persons with disability or special needs interact with companies' products. Figure 1 represents the most used applications nowadays for business purposes. Due to advances in technology, modern business activities are looking for better options to satisfy customers. With the above system business activities are better tailored to customers' needs. The following points below detail the uses of NLP for business or enterprise management.

Text Summarization: The NLP is an application that simplifies and summarizes text of high volume in search engines into synopses on research databases and indexes. Text Summarization and classification use natural language generation (NLG) and semantics which are added into significant textual content and conclusions for documentaries.

Sentiment analysis: It is an NLP element used with the modern business application system that brings to the open source data the hidden meaning of customers' comments and communication about business products and services. Social media posts, reviews, and extracts are now an important tool where companies get first inside into their services and products thanks to NLP of sentiment analysis.

Chatbots and virtual assistants: Chatbots and virtual agents are now very popular and becoming the first contact area of business with new customers. Amazon Alexa has

a system of speech recognition, command features, and NLG that provides appropriate and helpful comments to the company. The modern virtual assistants learn contextual clues recognition on human requests and used the contextual clues recognition request to provide even better results to requests from customers.

Machine Translation: One of the biggest NLP technology is Google translation. NLP with Machine translation is the ability to replace one language with another. There is one of the biggest NLP technology that has made the world more friendly. With the availability of internet usage, language barriers are shattered. The modern era uses NLP alongside semantic systems to capture tone and emotions. Also, AI is becoming very effective in applying feelings and emotions using various NLP objects. Nowadays tone, feelings, and thoughts are captured via systems. Barriers to one's touch before feel, see before imagine, and hear before react have been broadly overridden by NLP applications via different systems. Text to audio and audio to text have changed every thought and consideration.

Spam detection: The NLP application has advanced into a modern twist where threats to text and unhealthy contextual data are determined. Also, the validity of the text is determined by the sender. With Gmail, it is possible to determine the existence of email in the inbox of the receiver. Text that sends to spam nowadays lasts for at least a month and disappears.

Frequently Asked Questions (**FQAs**): The FAQs are one of the NLP applications for business insiders to potential customers. The FAQs pages help most companies nowadays determine traffic to their website using FAQs. These options contain questions and answers tailored to Company's products and services for future reference for potential and future customers.

1.2. Scope of Study

NLP, IoTs, and AI have been broadly applied in different sectors of the economy. The study, however, understands that with so many users-customer service, grammar checks, software development, and business marketing strategies, the study focused on industrial management.

Natural Language Processing is about interpreting the complexity of our natural spoken, and conversational language that helps the growth of humanity such as business growth. The study there made findings on how industrial enterprises uses the services of NLP and AI to gain insight into customers' desires, needs, and wants.

1.3. Three Achievable Applications Identify as Important Systems in Industry 4.0 Era

The three paragraphs detailed the technological application that has developed into a modern tool for Industry 4.0 uses to understand customer insight.

Natural language processing (NLP). NLP has built information network technologies that help businesses develop advanced financial stability by gathering, processing, analyzing, and supplying the right information about customers using to industrial policymakers.

Artificial Intelligence (AI). AI has leveraged information network technologies that improve operations, efficiency, security, and effectiveness of management services using ERP and KPIs processes with the help of mobile payment, automated investment advisor, biometrics, and predictable machine learning techniques.

Internet of Things (IoTs). IoTs have provided open access and data sourcing possibilities designed to further develop and built digital innovative services based on information technology. The ease with which customers interact with the company's products is thanks to the advances of embedded IoTs.

2. Literature Review

This section consists of a definition of terms, Implementation Aspects of Natural Language Processing in Modern Businesses, Industrial Enterprise Applications that work with Natural Langue Processing, Modern Applications and Enterprise Management in the

Era of Industry 4.0, Artificial Intelligence in an Industry 4.0, Natural Language Processing in an Industry 4.0, and Internet of Things in an Industry 4.0.

2.1. Definition of Key Teams

Natural language processing (NLP): The interaction between humans through speech and text [31]. A field of study that supports a variety of language technologies from predictive text to email filtering [32]. The study of mathematical and computational modeling of various aspects of language and the development in a wide range of systems [33]. The NLP is computers behave intelligently similar to humans [34]. NLP is a branch of computer science and artificial intelligence that is concerned with the interaction of computers and human languages [35]. NLP is a technique where a machine can become more human thereby reducing the distance between a human being and the machine [36].

Artificial Intelligence (AI): AI is a field of study that is attracting much interest in medicine [37]. Artificial intelligence is a general term for the use of computers to model intelligent behavior with little human intervention [38]. Artificial intelligence is a field of computer science that is attempting to build enhanced intelligence into computer systems [39]. Artificial intelligence is the study of how to build computer programs to enable them to do what minds can do [40]. Artificial intelligence is widely heralded new and revolutionary technology that will transform the world of work [41].

Industry 4.0: It is the part of an economy that produces material goods which are highly mechanized and automatized [42]. Industry 4.0 is a new industrial stage where vertical and horizontal manufacturing processes integrate with product connectivity to help companies [43]. Industry 4.0 is a broad domain that includes data management, manufacturing competitiveness, production processes, and efficiency [44]. Industry 4.0 is an initiative from Germany that has been globally adopted as a term in the past decade [45]. Industry 4.0 is technological innovations that interact between the real and virtual worlds [46].

Internet of things (IoTs): The Internet of Things is basically a system for connecting computer devices, mechanical and digital machines, objects, or individuals [47]. The IoT is an emerging technology that makes people's lives smart by conquering a plethora of diverse application and service areas [48]. The IoTs is a convincing stage of interface sensors around us via the Internet that is giving incredible chances for acknowledgment [49]. The IoTs an evolving paradigm that seeks to connect different smart physical components for multi-domain modernization [50].

2.2. Implementation Aspects of Natural Language Processing in Modern Businesses

The human language is full of duplicated words that are difficult to write down accurately as software [51,52]. To simplify man's spoken words for use by everyone, computer programs employ the services of NLP applications. NLP divides Human spoken texts and voice data into the following stages with the help of a computer, internet, electronic devices, and human affiliations.

Figure 2 below provides details on how the application of natural language processing work with most businesses. Figure 2 self-explains that companies collect their data from text, calls, audio records, and video conferences to understand customers' demands. Hyponymy helps present the clear relationship between living things. Helps draw a clear line between human aspects and animal attributes. The English language identifies nouns as living things but with no clear specifications between animals and humans. Homonymy is a word that has different meanings but is pronounced the same and spelled the same. Polysemy represents a word with a range of different meanings. Natural language processing uses polysemy to show relations with meanings of words that extend or shift to a single word and has two or more related meanings. Synonymy represents words or expressions of the same language having the same or nearly the same meaning in some or all senses. Merortomy represents the human body part named in languages of different structures. This makes it easy to identify situations based on simple text.

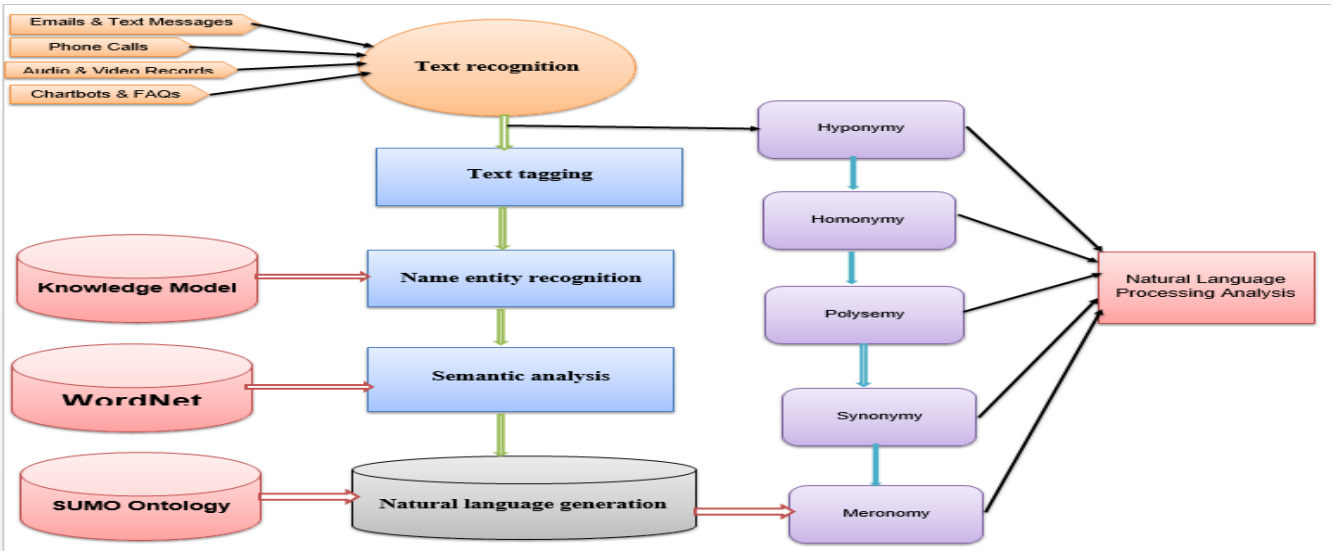

Figure 2. Aspects of NLP for modern business.

The following points below explain the steps required to complete an NLP application action and how relevant each tool is to the business world.

Text recognition: Spoken words such as speech, songs, and word documentaries can be easily converted from text to audio with the help of NLP. NLP can help users quickly capture meaning, keywords, and relevant data within a text message. The application of NLP helps readers to quickly identify stress words [53]. The conversation can easily be identified with the help of the NLP application.

Text tagging. This is the process of determining part of text or speech with the help of its use and context [54]. Part of speech identities "attend" as a verb in 'we will attend church service together next Sunday?' This phrase can be used as a noun 'which church do you attend?'. If the responder is a catholic, then his/she is tagged as a catholic.

Name entity recognition: In NLP, named-entity recognition is one of the subtasks of data extraction. The aim is to locate and classify named entities mentioned in an unstructured text into predefined categories [55]. The unstructured text mentioned in a text can be grouped into person names, organizations, locations, medical codes, quantities, monetary values, time expressions, and percentages, Extracting text helps sort unstructured data and detect important information, especially when dealing with large datasets.

Semantic analysis: It is an NLP application that allows computers to understand and interpret paragraphs, sentences, and whole or part of documents by analyzing their grammatical, format, and structure, and identifying the relationships between individual words in a particular context [56]. For example "Sunday is great". The person is giving remarks about the weekend or Sunday.

Natural language generation: There are six steps involved with Natural Language Generation.

- **Analyze content.** Information is filtered here to determine what should be included in the content produced at the end of the process. This process includes identifying the main subject in the source text or document and establishing the relationships between them.
- **Data digestion**. This stage involves information being interpreted, and patterns of identified and structured context. Machine learning is broadly used at this stage.
- **Document structure.** This stage involved a documented plan. This stage helps create a narrative structure based on the type of information being interpreted.
- **Sentence aggregation.** This section helps combine relevant sentences or parts of sentences in ways that accurately summarize information about the topic.

- **Grammatical structuring.** This section helps program applications that produce the syntactical structure of the sentence. It provides general soundness or meaning of the text and then uses this information to rewrite the sentence in a grammatically correct manner.
- **Representation of language.** This section is the final results generated based on a structure template or format used by the programmer. Based on the need or require language structure and purpose of the text an author or editor can choose any format.
- **Policy Guidelines.** This section involved the structure of text based on the application system. Some systems required only British English and format. With other systems requesting a combination of both. This alone determines the output of the text. This is a coded structure put in place by an organization or company for a particular or single purpose.

2.3. Industrial Enterprise Applications That Work with Natural Langue Processing

The following applications are the most frequent use by companies to enhance better customer understanding of their products and services no matter their country of origin and language. Most of the applications use one or two aspects of NLP. Some of the text editors directly depend on the NLP system for easy access.

Unified communications as a service (**UCaaS**). This is an enterprise communication system where all communications are streamlined via cloud delivery to allow the industry to become more flexible with its human-financial resources and expenditure. Examples of (Uaas) are mobile systems apps (video, audios, SMS, and chat) and virtual apps (Ms Teams, Zoom, Skype, YouTube, WebEx).

Cloud Base Communication Systems. This is a communication system that allows organizations to host their infrastructure in the cloud or off-site. With this system, multiple locations host the industry server. With multiple server location systems, it is easier to back up, protect, free-up space, and run proper on-premises resource management. Three-dimensional printing is one example where documents are printed and shared remotely. Gmail also operates in the same manner.

Semantic text analytics applications for business. Semantic text analysis helps organizations with the interpretation of the text meaning and extraction of critical information from unstructured data. Semantic text analysis enhances machine learning tools that are very important for natural language processing components which in turn boost decision-making and improve the overall customer experience. Semantics text analysis techniques.

1. Semantic classification (Topic classification, Sentiment analysis, and Intent classification).
2. Semantic extraction. (Keyword extraction and Entity extraction).

Types of semantics broadly used nowadays.

- Google's semantic algorithm-Hummingbird
- Cdiscount's semantic analysis of customer reviews
- IBM's Watson conversation service
- Automated ticketing support

Smart translation applications for business. The following applications are the most frequent use by companies to enhance better customer understanding of their products are services no matter their country of origin and language. Most of the applications use one or two aspects of NLP.

- **Google Cloud Translation.** This type of translator lets you dynamically translate between languages using a pre-trained and custom Machine Learning model based on your content needs and requirements.
- **Microsoft Translator.** This is a smart translation application readily available for Windows, iOS, and Android. Microsoft Translator helps users translate text, images, screenshots, and voices. Microsoft Translator is available in more than 60 languages.
- **Linguee Translator.** This is a web-based application service launched in 2009 that helps users to translate singular words. Linguee shows users a diverse, bilingual

pair of words and sentences that are used in online publications. The application is available on Windows, iOS, and Android.

- **Babylon Translation application.** This application is one of the number one translation and dictionary software globally used. The application is supported by Windows, Android, Mac, and iOS. It also translates to more than 77 languages.
- **iTranslate Translation application**. This is an app built for all types of systems such as Windows, iOS, Mac, Google Play, and Kindle Fire. This app is a straightforward software that can translate anything by just typing words, text, and voice-to-voice speech.

Document converters applications for business. The following are iOS and Android apps that can help users convert any files into PDFs. From Word, Excel, PowerPoint, and JPEG.

- **iLovePDF**. This is a PDF editor and reader that is 100% free for use. iLovePDF works on both iOS and Android. iLovePDF supports 25 languages and with up to 10 free converters every day for single system software.
- **PDF Converter Ultimate.** This is another file converter. This type enables the converting of files from PDF to Word. Users can convert any PDF to Excel, JPG, PowerPoint, CAD, Word, and text files and can also convert any Excel, JPGs, PowerPoint, CAD, word, and text to PDF.
- **PDFelement Lite.** This is an all-in-one converting PDF editor that can be used to read, edit, annotate, and convert PDF files whenever and wherever. This application enables users to take a snap of documents and instantly convert them into a PDF.
- **Genius Scan.** This is a top-rated converting application available on both iOS and Android, The Genius Scan has 20 million users and is used by thousands of businesses in their daily activities. The following service types are handled with the application. Documents can be exported to users' email, DropBox, Evernote, Google Drive, OneDrive, or even FTP.

Smart healthcare devices for business. From the advanced digitalization, the healthcare industry has also adopted some changes to ease the process and execution of a task. The following points detail some of the recent tools are technological advanced linguistic tools for medical needs.

- **Robotic surgery**. It is a surgery performed with the help of IoT devices that reduces the size of incisions required to perform surgery, leading to a less invasive process, and faster healing for patients. Robotic surgeries have interpreters that handle complex conditions inside a patient's body. Robotic surgeries help make the right decisions about how to proceed during surgery.
- **Microcameras contact lenses**. This is a type of lens that allows wearers effectively to take pictures with their eyes. Micro Cameras contact lenses are smart lenses that promise to turn human eyes into a powerful tool for digital interactions. This lens helps quick sensor machines to identify items and locate them. These lenses are used by supermarkets to identify what customers focus most on.
- Ingestible sensors. This is a healthcare device that provides insights into stomach PH levels. They help pinpoint the source of internal bleeding.
- **Parkinson's disease monitoring.** This is a device that allows the healthcare sector to assess how the severity of the symptoms of patients fluctuates throughout the day. The IoT sensors continuously collect data about Parkinson's symptoms and give patients the freedom to go about their daily activities in their homes rather than only in the hospital.
- **Heart-rate monitoring.** This is an IoT sensor device that collects patient data and or wards the data to a software application where healthcare professionals and patients can view it. The sensor device has an algorithm that is used to analyze the data to recommend treatments or generate alerts. For instance, when an IoT sensor detects a patient's unusually low heart rate, it generates an alert so that healthcare professionals can intervene.

Industrial autonomous robots for business. The following applications are the most frequent use by companies to enhance better customer service. To enable the understanding of the company's products and services, the following points below are applied. With industrial robots, there are no language barriers. Most of the applications use one or two aspects of NLP.

- **Geomagic Design X**. This is a device developed by Oqton that uses 3D Scan Data to Reverse engineer Physical Parts.
- **Autonomous mobile robots (AMRs).** This is a device that works alongside people and automates repetitive, risky, and dangerous work, increasing productivity and reducing injuries.
- **Financial virtual spreadsheets for business**. There is no business activity be it for non-profit and profit organizations or companies that do not use money. The following points brief the various financial calculators.

Income statement spreadsheet. This is a document that declares how much a user earned, and how much spent. This type of spreadsheet is used in businesses and households to give a picture of financial health.

- **Vertex42 spreadsheet**. This is a spreadsheet that has been created professionally and designed for business, personal, home, and educational use. Vertex42 is a leading provider of templates for Google Sheets and OpenOffice.org. They also process and create many Spreadsheet Templates. Their collection of financial calculators includes some of the most powerful and user-friendly tools.

Virtual classroom. This is an online-based learning portal used remotely and that utilizes synchronous instruction. Virtual classrooms have an audio or video system or tool where instructors and participants engage with each other and with the learning material. The many tools used for virtual classrooms offer added set of features that are essential to a learning environment. Some examples of audio and video virtual classrooms are Ms Teams, Zoom, Skype, YouTube, and WebEx.

2.4. Modern Applications and Enterprise Management in the Era of Industry 4.0

The following figure below detail the role of NLP, AI, and IoTs in modern businesses. The figures also explain how relevant is the concepts advantageous and how they can boost a global friendly business environment.

2.4.1. Artificial Intelligence in an Industry 4.0

Figure 3 below explains how companies applied artificial intelligence to enterprise resource planning and key planning indicators in the era of Industry 4.0. As the world advances so too do the areas of technological applications to advance to achieve and enhance better customer satisfaction.

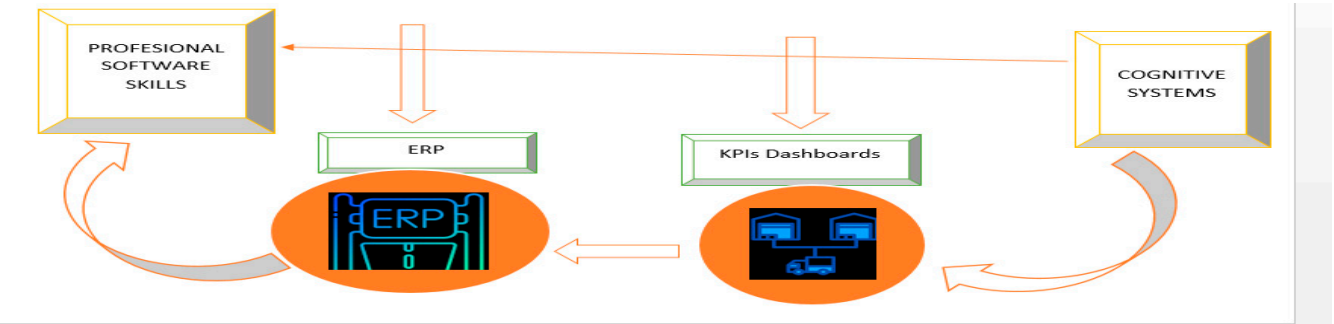

Figure 3. Artificial intelligence for industrial use.

Figure 3, explain how the digital era help companies use artificial intelligence applications to influence and easily understand customers through enterprise resource planning

(ERP) and key performance indicators (KPI). With the advances in technology, companies do not longer rely on human resources to measure their sales rate as AI embedded in systems such as key performance indicators helps companies plan better using enterprise resource planning. AI with the help of professional software skills such as ERP and cognitive systems such as KPI has changed the state of affairs within business [57]. Since ERP depends on AI software for business planning, it has also tremendously supported KPI. To understand key performance indicators within a business, there's a need for effective evaluation and monitoring. Due to large data acquisition within nowadays business activities AI is trying to assist. Nowadays, businesses use AI to predict sales and forecast the return on investments of their products. Since KPI is to evaluate how well or not a product is doing, AI has shown that it can effectively manage these services according to Figure 3 above. AI tools, with the support of the right data, have a far-reaching benefit on sales than average sales personnel. ERP systems or digital platforms are the best AI-built systems nowadays that help to manage a global supply chain, enabling understanding of customers' behaviours.AI tools have been largely incorporated in enterprise software [58]. An AI provides the following services to industrial enterprises through ERP software. To predict asset conditions and predict maintenance industries require AI technology [59]

- User assistance and augmentation
- Process improvement
- Planning and forecasting

In aid of more productive and profitable business, AI is being incorporated to make more critical business decisions and solve complex issues nowadays. AI tools have access to a larger amount of data and are capable of processing more than any person can determine. AI provides services and products for business needs and sales leads will generate the most business gains. With AI, decisions go beyond basic process automation. Examples of AI already used with ERP are Consumer digital assistants Siri, Alexa, and the Google digital assistant. AI assists businesses with customer insights by examining social media, customer service interactions, and product quality systems.

2.4.2. Natural Language Processing in an Industry 4.0

Figure 4 below explains how natural language processing is applied to the connected device that enables communication in business to help advance business decision-making. As days go by communication is much more promoted to expand beyond human-human. With the advancements in technology, NLP can link the business management system with a modern system. The linguistic nature of things enabling understanding of customer behavior with the help of internet services and NLP is very important to modern business. Today, emotional intelligence is capable to uses linguistic attributes to provide insight into how customers react and think about a company's products.

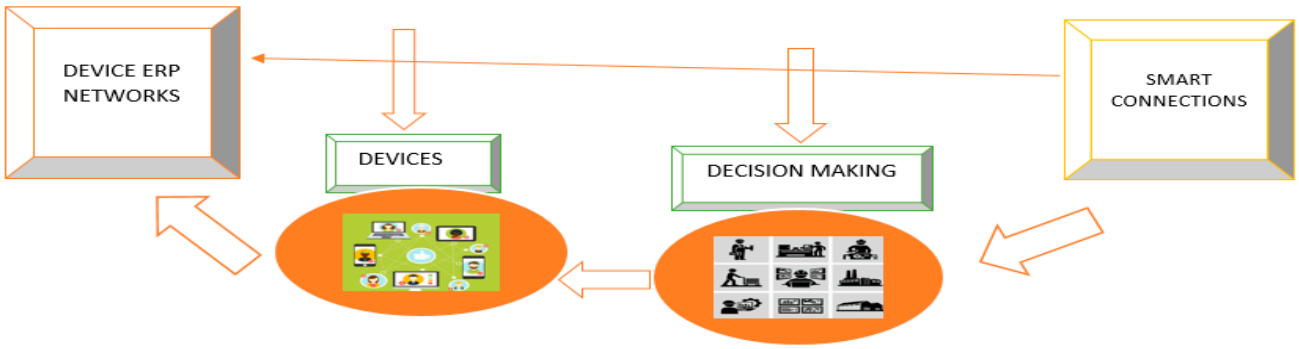

Figure 4. Natural language processing for industrial use.

NLP organizes unstructured data for businesses by analyzing its relevance, correlation, and semantic meaning. NLP helps connect devices that allow and reorganize proper

decision-making with the help of text, emails, SMS, audio, and video conferences using ERP network systems tailored to businesses.

Subject extraction as a tool of NLP helps provide insights for effective content creation of products and services of a company to customers. The option of subject extraction helps provide exact content to potential customers and in return boost sales. NLP provides sentiment analysis determinant tools for businesses. The sentiment analysis determinant helps businesses to understand if one communication method receives different feedback than another. The sentiment analysis determinant in business is part of the KPI that helps to evaluate how well a product is doing [60]. Audience identification for targeted messaging is an NLP tool used as part of ERP in nowadays business [61,62]. Companies use glean themes and keyword categories phrases to learn more about what clients are talking about their products, where the gaps in their products are, and how they can address and fix them. NLP replaces the manual processes of financial institutions by employing unstructured data in a more usable format [63]. For instance, NLP is automation that helps capture earnings calls, management presentations, and acquisition announcements.

Four ways NLP applications advance business.

The following points are some of the steps used by companies to enhance their activities.

- **Lead capturing**. The use of chatbots to capture customers' insight with the help of auto-responder.
- **Sentiment Analysis**. NLP applications of listening skills and records help businesses to track what the audience perceives about business content.
- **SEO ranking**. AI text generators designed for optimization of keywords best support search engine crawls and indexes.
- **Audience reach**. The use of voice search help users targets the right content faster. The use of voice search gives access to everyone no matter their situation. Thanks to voice search people with disability can now perform search queries with no problem.

2.4.3. Internet of Things (IoTs) in an Industry 4.0

Figure 5 below provide some of the tools that enable a close relationship between objects and humans. The close relationship is not only understood in utilizing solutions but also in predicting the outcome of an activity. Today, orders and supplies are almost remote thanks to the application of advanced NLP. The tool of RFID is broadly used nowadays to enable transparency and end-use of products.

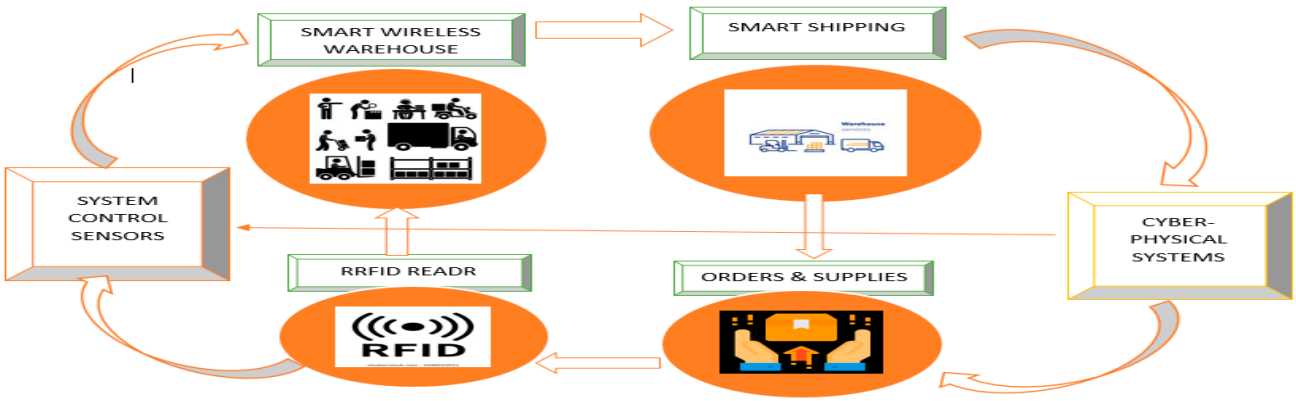

Figure 5. Internet of things (IoTs) for industrial use.

The use of IoTs has helped the supply chain become faster and more reliable in delivery services. Tools such as RFID had embedded systems that communicate with warehouse and management systems. The use of IoTs has helped register most tools used for business activities in the cyber-physical space. The use of its modernized shipping of

goods with advanced trackers. Thanks to the IoTs, the warehouse is now digitized with advanced functions.

The advancement of technology is helping businesses to extend functionality and product capabilities to many areas in one setting. The Internet of Things is helping businesses to understand where their solution fit within the corporate value [64]. The IoTs help businesses engage with the corporate digital, transformation, and Innovation offices faster [65]. The IoTs have helped a lot of business processes with solutions that engage sensors, devices, gateways, and platforms to gain insight into the business world and boost productivity. For example Near field communication (NFC).

Four ways IoTs promote business.

- **Advance business insights and customer skills**. The IoTs help businesses understand what customers want thereby helping customer service officials to provide the exact needs of customers at an appropriate time.
- **Reduce cost and quarry downline.** Inquiry into business goals, mission, vision, products, and services is faster with the help of IoTs. It is faster and more convenient with industrial workplace tools handled by employees with the help of an embedded sensor.
- **Boost productivity efficiency**. Thanks to the IoTs the business world is becoming more of a customer's demand with prompt response to changes in consumer attitude. Production systems can balance supply with demand. With IoTs there's much equilibrium in the business world today.
- **Birth of new business models**. The IoTs have necessitated the growth of new knowledge and skills amongst personnel in most businesses. Human resource management can match employees' expected fulfillment requirements with the target audience's wants. There is a free medium where employees can share their ideas in and out of the business environment such as simulators.

2.5. Challenges of NLP, AI, and IoTs in Industry 4.0 Technology for Enterprise Management

The following paragraphs present some of the difficulties faced by NLP, Ai, and IoTs technology in the era of Industry 4.0.

- **Identifying market gaps**. The process of developing an industrial app is probably the most challenging. There have been a lot of difficulties to obtain a great and unique idea of how customers will respond after consuming the company's products.
- **Shaky ideas**. There exist a lot of shaky ideas that can single-handedly slow down business growth. This is very common in areas with limited resources, internet access, and lack of market need in a startup. The existing upside measures of finding a customer's idea with strong market demand is lacking.
- **Planning proximity**. Focusing on a few key performance indicators is a big problem that is much more effective than tackling 50 percent of issues at once. This limits the company's capacity even though with great insight into spendthrift customers. There is a need for more time and effort in polishing the app's core features. There are a lot of features that make the planning more complex, negatively impacting and providing an ill-user experience.
- **Evaluation timing**. The process of evaluating each problem depends on its urgency. It is foremost concerned with individual schedules and market needs but most customers and users rely on the general soundness of the market that does not suit their needs. The problems encountered should be solved based on an individual approach and not generally as the companies in Industry 4.0 do.
- **Designing good users versus industrial experience.** The most challenging issue with Industry 4.0 is that they need to simplify complex financial processes and terms based on experience and learning models but the influence of IoTs does not allow customers to employ this. The key user flow is lacking as new users find it difficult to meet up and usually turn to think naive about the services due to IoTs influence.
- **Inadequate engineering know-how**. The shortage of professionals system to help customers is one of the real dangers faced by technological industries. The companies

turn to focus on the company's needs than customers which is dangerous for the company's future.

- **Data leakages**. The leakage of sensitive information has significantly eroded the trust of users. There is a need for engineers to encrypt users' data so that hackers cannot capitalize on any data they manage to steal.

3. Results of Findings

This section provides details on how Companies use IoTs to influence the way customers think, act and run their day-to-day business activities based on data obtained via NLP means. In this section, we explain with the help of statistical data and a bar chart the role of IoTs on customers' responses to the company's products and services.

The result presents results of the outcome applied by most companies. The method explains how companies use various options identified in (Figure 1) as the business dimension uses natural language processing to extract information about customers' desires. To understand how customers' viewpoints and what they think about a company's products in Industry 4.0, companies use natural language processing to understand customers as a detailed classification of the text in methodology (Figures 10–12). After each classification, they use the deep learning method (Figure 13) to predict future action. The companies in Industry 4.0 also use text classification of fewer customers to predict a larger proportion of their markets. The results section of the study presents the level of influence based on the information categorization as detailed in the methodology.

All the data used in this section is obtained from a recent paper "influence of the Internet of Things on human psychology" [66]. The published paper provided detailed results on how IoTs influence human psychology and this study uses the result of the paper to explain the role of NLP and AI in the era of Industry 4.0.

3.1. Behavior-Oriented Drive and Influential Function of IoTs on Customers in Industry 4.0

There are selected keywords determined by the authors as very important influential factors of IoTs that have necessitated the push for customer's reactions and bond to the Company's products regardless of intricate value. We called these push as (behavior-oriented driven and influential functions). Based on some selective ratings, we offer each a score of one up to five ratings. The rating is based on the author's choice. The Key Benefits of IoTs on customers' reactions are based on the Metrics Score range and key benefits score rate classified into poor, fair, good, very good, and excellent. The behavior score defined the gradient of the key benefits of IoTs below.

Push factors IoTs are products and services of the Internet of Things that provide good services to customers' daily activities referred to in this study as dependent parameters. In the study, dependent parameters are (Enabling business activities more efficient, enabling social reasoning more effectively, and enabling education in a most reliable, informed, and accessibility). The metrics range is made up of numbers from (1, 2, 3, 4, 5) that help measure the level of influence of IoTs. The Behavior Score is a unique level determined in the Metrics Range of one up to five. Only a single value is allowed for each Metrics Range. The Benefits score rate is a grade allocated for each defined behavior score.

Formulae

The influence is symbolized as BIF = F(D) which is said "f of d" equal to $\int (D)^{\sum_{MR}^{MR}} \times BS$. *MR are related such that for every MR, there is a unique value of MR. That is, F(D) cannot have more than one value for the same d in MR. The said theory used function related in an element d as defined by MR to an influence F(D) to determine the influence behavior score.*

BIF = Behavior-oriented drive and influential function of IoTs on customers in Industry 4.0

F = push factors IoTs

D = Dependent parameters

MR = Metrics Range

BS = Behavior Score

KBS = key benefits score

$$\text{Eq} = \int (\text{D})^{\sum \text{MR}}_{\text{MR}} \times \text{BS} \quad (1)$$

The metrics range score and key benefits score of IoTs help users to rate how influential a particular service provided by IoTs influences customers' reaction to Company's products. Based on the need and value of the service, a rate is determined based on the author's view Table 1.

Table 1. Metric range and key benefits score rate of IoTs.

Metric Score Range	**1**	**2**	**3**	**4**	**5**
key benefits score rate of IoTs	Poor	Fair	Good	Very good	Excellent

The benefits of IoTs are determined based on behavior scores (Table 2). The Score Rate ranges from poor, fair, good, very good, and excellent. The behavior score defined the gradient of the key benefits of IoTs on customers. The higher the value of the metric score range, the more vulnerable and loyal the customer is to the company. Higher grades play to the favor of the company and very or no favor to the customer. This table determines the success value of the application of the Internet of Things to the industry. When calculating the benefit score, whatever value obtain stands as a success gain for the company. If the result indicates a grade of 4, it means the influence is very good and if a grade is 1, it means poor.

Table 2. Behavior-oriented drive and influential function of IoTs on Customers.

Push Factors IoTs	**Dependent Parameter**	**Metrics Range**					***Behavior* Score**
Faster data collection.	Enabling business activities more efficient	1	2	3	4	5	4
	Enabling social reasoning more effective	1	2	3	4	5	4
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5
Faster data sharing	Enabling business activities more efficient	1	2	3	4	5	5
	Enabling social reasoning more effective	1	2	3	4	5	5
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5
Faster data verification	Enabling business activities more efficient	1	2	3	4	5	4
	Enabling social reasoning more effective	1	2	3	4	5	5
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5
Faster data analysis	Enabling business activities more efficient	1	2	3	4	5	4
	Enabling social reasoning more effective	1	2	3	4	5	3
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	4
Faster data integration	Enabling business activities more efficient	1	2	3	4	5	5
	Enabling social reasoning more effective	1	2	3	4	5	4
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5
Faster data acquisition	Enabling business activities more efficient	1	2	3	4	5	4
	Enabling social reasoning more effective	1	2	3	4	5	3
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5

Table 2 presents push factors that companies use to measure success. The push factor of fast data collection is a tool that indicates to companies how quicker and easier to gain insight into customers' needs and wants. The higher the Key benefit score, the higher the success value to the company. Push factor data collection enables a boost in the company's activities with more efficiency. We all know that efficiency is an important factor in determining KPI and ERP. Fast data collection enables companies quickly understand the social reasoning of customers in the most effective way. This alone helps companies

tackle customers ethically and culturally. Fast data collection enables education to be most reliable, informed, and accessible. With quicker insight into what customers' needs and desires are, most companies have resulted in higher sales for very low-quality goods. From Table 2, all the push factors play a vital role in the Industry 4.0 era.

Other factors such as fast data sharing, fast data verifications, fast data analysis, integration, and acquisition help companies a lot.

Determination of *Behavior* score Influence of IoTs base on faster data collection.

To determine the influence function for enabling business activities more efficiently through fast data collection. The following statistics apply.

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (4), **KBS** = key benefits score

$$\text{Eq} = \int (\text{D})^{\sum_{\text{MR}}^{\text{MR}}} \times \text{BS} \tag{2}$$

$$\sum \text{MR}(1+2+3+4+5) = 15$$

$$\text{MR} = (5)$$

$$\text{BS} = (4)$$

$$\sum_{\text{MR}}^{\text{MR}} \times \text{BS} = \tfrac{15}{5} \times 4 = 12$$

To determine the influence of function for enabling social reasoning more effectively through fast data collection, the following statistics apply.

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (4), **KBS** = key benefits score

$$\text{Eq} = \int (\text{D})^{\sum_{\text{MR}}^{\text{MR}}} \times \text{BS}$$

$$\sum \text{MR}(1+2+3+4+5) = 15$$

$$\text{MR} = (5)$$

$$\text{BS} = (4)$$

$$\sum_{\text{MR}}^{\text{MR}} \times \text{BS} = \tfrac{15}{5} \times 4 = 12$$

To determine the influence function for enabling education in a most reliable, inform and accessibility through fast data collection, the following statistics apply.

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (5), **KBS** = key benefits score

$$\text{Eq} = \int (\text{D})^{\sum_{\text{MR}}^{\text{MR}}} \times \text{BS}$$

$$\sum \text{MR}(1+2+3+4+5) = 15$$

$$\text{MR} = (5)$$

$$\text{BS} = (5)$$

$$\sum_{\text{MR}}^{\text{MR}} \times \text{BS} = \tfrac{15}{5} \times 5 = 15$$

Remarks: From Figure 6 below, behavior influences factors of IoTs based on fast data collection. We can say that the Internet of Things has a very high influence on customers on a company's products and services. The results show a key benefits score of very good, very good, and excellent remarks of a metrics score of (4, 4, 5).

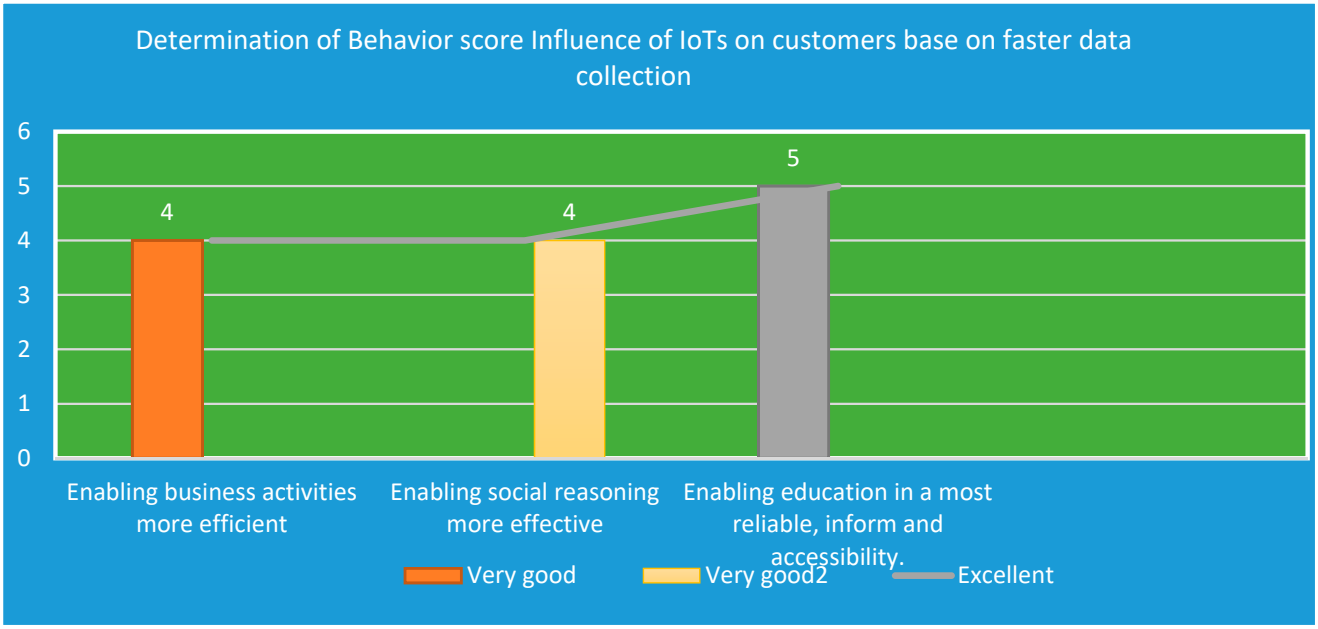

Figure 6. Behavior score influence graph of fast data collection.

Determination of *Behavior* score of Influence of IoTs based on faster data acquisition.

To determine the influence function for enabling business activities more efficient through enabling fast data acquisition. The following statistics apply

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (4), **KBS** = key benefits score

$$Eq = \int (D)^{\sum MR}_{MR} \times BS$$

$$\sum MR(1+2+3+4+5) = 15$$

$$MR = (5)$$

$$BS = (4)$$

$$^{\sum MR}_{MR} \times BS = ^{15}_{5} \times 4 = 12$$

To determine the influence function for enabling social reasoning more effective through enabling fast data acquisition, the following statistics apply

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (3), **KBS** = key benefits score

$$Eq = ^{\sum MR}_{MR} \times BS$$

$$\sum MR(1+2+3+4+5) = 15$$

$$MR = (5)$$

$$BS = (3)$$

$$^{\sum MR}_{MR} \times BS = ^{15}_{5} \times 3 = 9$$

To determine the influence function for enabling education in a most reliable, inform and accessibility through enabling fast data acquisition, the following statistics apply

F = push factors IoTs, **D** = Dependent parameters, **MR** = Metrics Range (1, 2, 3, 4, 5), **BS** = Behavior Score (5), **KBS** = key benefits score

$$\mathrm{Eq} = \int (\mathrm{D})^{\sum_{\mathrm{MR}}^{\mathrm{MR}}} \times \mathrm{BS} \tag{3}$$

$$\sum \mathrm{MR}(1+2+3+4+5) = 15 \tag{4}$$

$$\mathrm{MR} = (5) \tag{5}$$

$$\mathrm{BS} = (5) \tag{6}$$

$$\sum_{\mathrm{MR}}^{\mathrm{MR}} \times \mathrm{BS} = \frac{15}{5} \times 5 = 15 \tag{7}$$

Remarks: From Figure 7 below, behavior influence factors IoTs base on fast data acquisition. We can say that the Internet of Things has a higher influence on customers' acquisition of a company's products and services. The results show key benefits score rate of very good, good, and excellent remarks of a metrics score of (4, 3, 5).

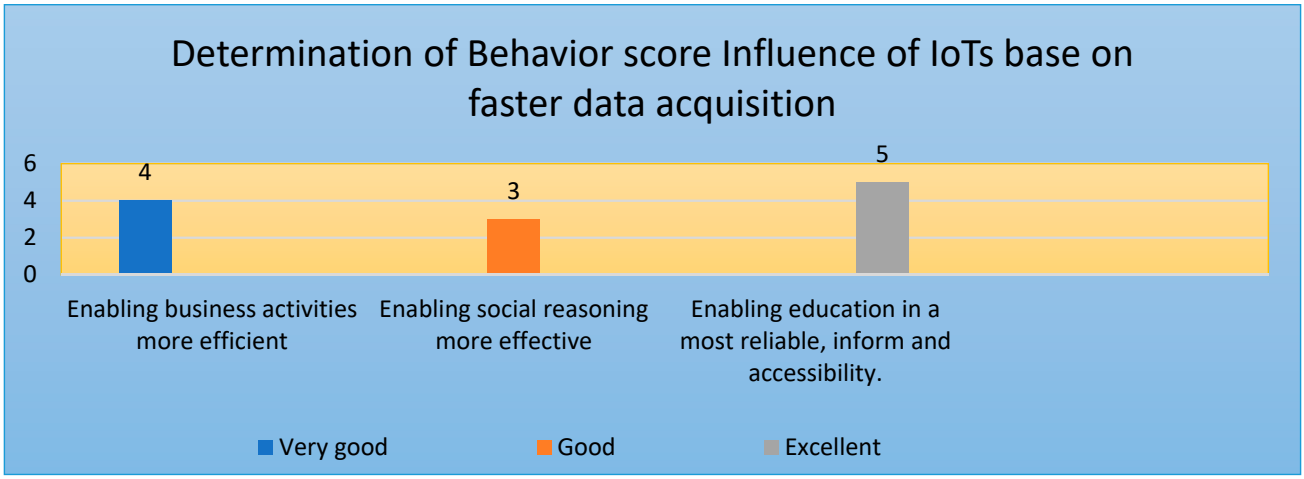

Figure 7. Behavior score influence graph of fast data collection.

Figures 6 and 7 above indicate the high influence of IoTs. IoTs are a company's product for helping connect customers with companies on one hand and on the other hand, companies have decided to develop their Internet services tailored to their product. The level of influence is higher than the findings of this study in real terms.

In the above Tables 3 and 4, we can see the first element objective of push factors IoTs dependent upon three objective features that are related to our day-day activities. These dependent parameters are measure base on a range of figures from one up to five. Each number represents a grade. The remarks for each grade is called behavior score. To determine the level of influence, we used the key benefit score rat.

To determine the influence of IoTs on customers' reactions, data collection was used here. Measuring how IoTs influence our way of reaction, behavior, and thinking is based on how we can access data. Information is now key activity in today's world for most businesses. With the capability of IoTs to connect with humans and objects, it has radicalized the way we think and act.

Table 3. The determination of Behavior scores of the Influence of IoTs based on faster data collection.

Push Factors IoTs	Dependent Parameter	Metrics Range					*Behavior* Score	Key Benefits Score Rate of IoTs
Faster data collection.	Enabling business activities more efficient	1	2	3	4	5	4	Very good
	Enabling social reasoning more effective	1	2	3	4	5	4	Very good
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5	Excellent

Table 4. The determination of Behavior score of Influence of IoTs based on faster data acquisition.

Push Factors IoTs	Dependent Parameter	Metrics Range					*Behavior* Score	Key Benefits Score Rate of IoTs
Faster data acquisition	Enabling business activities more efficient	1	2	3	4	5	4	Very good
	Enabling social reasoning more effective	1	2	3	4	5	3	Good
	Enabling education in a most reliable, informed, and accessible manner.	1	2	3	4	5	5	Excellent

3.2. Key Benefits Score Rate of IoTs on Customer's Base on Metrics Score and Behavior Score

The benefits of IoTs are determined based on behavior scores (Table 1). The score rate range from poor, fair, good, very good, and excellent. The behavior score defined the gradient of the key benefits of IoTs below.

- They enable users of IoTs to ensure smooth data security with tried and trusted solutions for education, healthcare, and businesses.
- They enable users of IoTs to enhance efficient centralized management systems that uphold higher standards and procedures needed for IoTs services.
- They enable users of IoTs to ensure cost-effective solutions with maximum support and help from existing challenges and services
- They enable effective use of available and predictable data with the help and support of edge computing, NLP, and AI.

4. Applied Method and Discussion

This section explains how companies are succeeding in integrating NLP and AI with IoTs to achieve high sales. The world has advanced in technology and it is changing business formulas.

The method explains how companies use various options identified in (Figure 1) as business dimension uses of natural language processing to extract information about customer's desires. To understand how customers view and think about a company's products in Industry 4.0, companies use natural language processing to understand customers as a detailed classification of the text in methodology (Figures 10–12). After each classification, they use the deep learning method (Figure 13) to predict future action. The companies in Industry 4.0 also use text classification of fewer customers to predict a larger proportion of their markets. The results section of the study presents the level of influence based on the information categorization as detailed in the methodology.

4.1. Correlation of NLP, AI, and IoTs in Industry 4.0 for Enterprise Management

Today, companies determine their sales and decide on ways to manipulate consumers via digital systems with the help of IoTs. The integrated system levied by Industry 4.0 with NLP and AI is very important to industrial growth. With a well-structured NLP, companies run expensive advertisements nowadays. The cost and time that were supposed to spend by companies to run ads is a shift to customers via social media applications. Nowadays consumers spend time following social media entertainment shows, events, and activities that are oriented to understanding how consumers think. With help of NLP and AI with support from IoTs, companies target their customers before initiating the product test phase.

Based on comments, pup-up items, and shot videos that appear before long videos and online newspapers, companies use these ads to predetermine their product's needs

Figure 8 below presents a picture of how co-related Industry 4.0 interconnect with NLP and with AI with the support of IoTs to extract information from targeted potential customers. The advancement in technology in Industry 4.0 has necessitated the interwoven of different systems for industrial benefit.

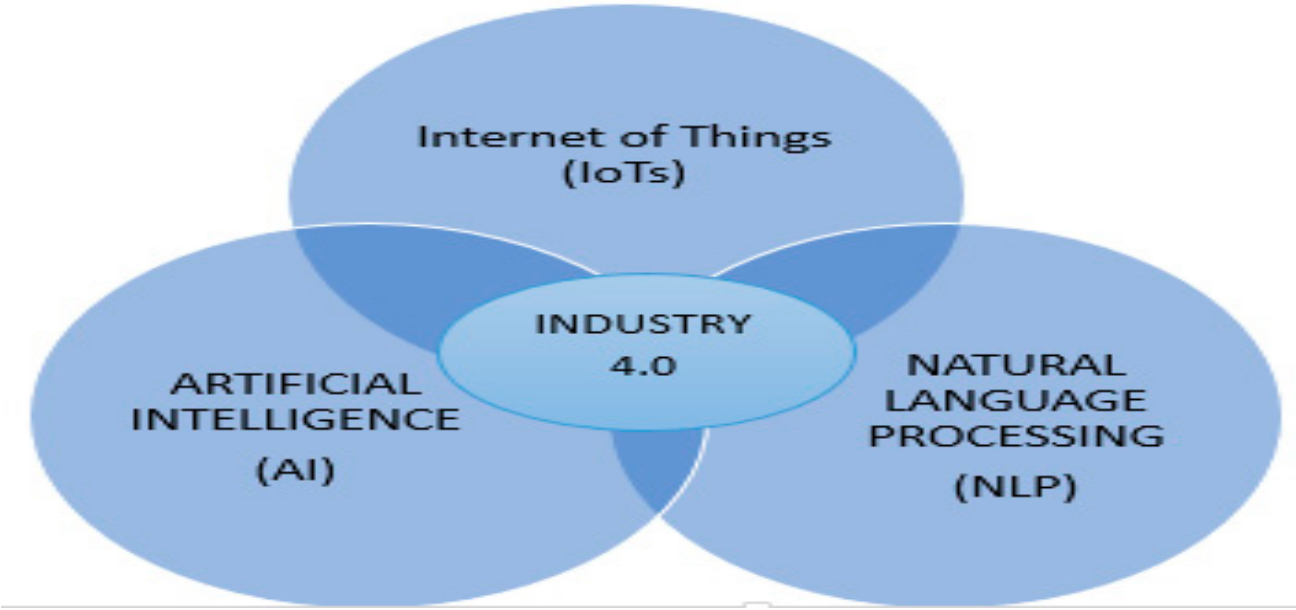

Figure 8. Correlation of NLP, AI, and IoTs.

4.2. Architect Detailed Integration of NLP and AI with IoTs in Industry 4.0 Era for Enterprise Management

Figure 9 below detail how companies interact with different applications in various ways. The system integration represents information flow from NLP to AI system interface and industrial ERP and KPI department via IoTs. How Industry 4.0 uses the data collected from its customers. Understanding which system helps them to analyze and predict the future of the company's sales.

Figure 9 above of the vivid integration of NLP and AI with IoTs via Industry 4.0 details the steps taken to gain insight into customers' desires needs and preferences. Most companies use NLP with the help of text and speech. The NLP has two systems incorporated to help companies understand potential customers. The two systems are natural language generation (NLG) made up of speech synthesis while natural language understanding (NLU) consists of speech recognition, text Summarization, text classification, information extraction, machine translation, and text proofreading. Systematic NLP has features of AI. Most companies use the integral characteristics of AI found within NLP such as image classification, object detection, target tracking, and image segmentation to determine how attachments are between the company's products and potential customers. To achieve these attachments between the company's products and potential customers, emotional intelligence is examined via industrial vision. Industrial vision is a targeted application of NLP and AI with the help of NLU and NLG.

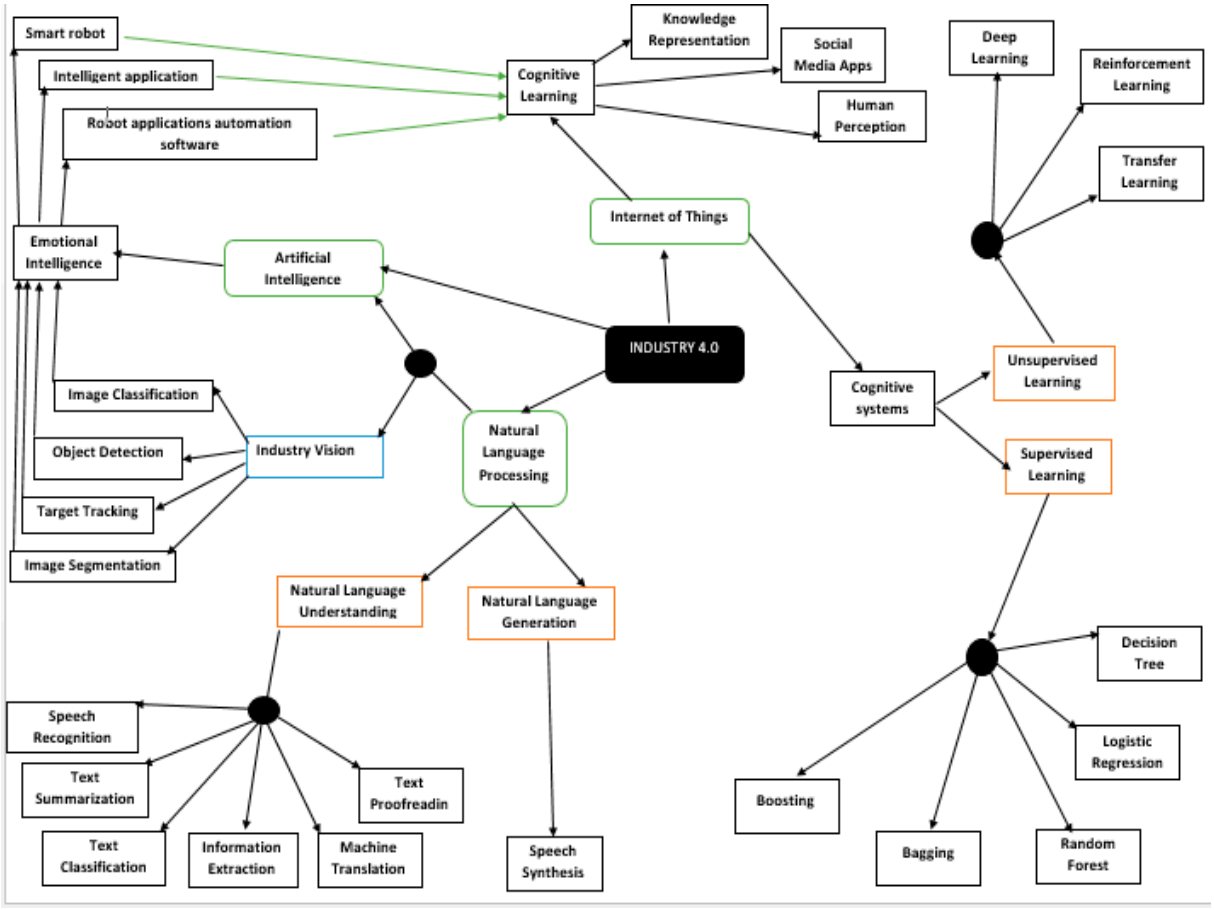

Figure 9. Vivid integration of NLP and AI with IoTs.

Emotional intelligence is extracted inside potential customers with the help of smart robots, intelligent applications, and robot application automation. Emotional intelligence transfers inside information obtained via NLP and AI to cognitive learning systems. Cognitive learning systems are free web pages and social media apps. The IoTs of help ease the relationship between the application and real data needed by companies. The bulk of information obtained with the help of NLP and AI is transferred to cognitive systems incorporated with unsupervised learning and supervised learning for analysis determinants by companies. The machine learning techniques are proprietary and used here to determine and predict the future of the company's products.

4.3. Stages of Data Classification and Analysis

Figures 10–12 represent steps and methods of understanding customers' interest desires, likes, and dislikes about the company's products. The study uses a sample text and explains different steps a company uses to understand how, what, and which company's products customers value, like, and love most. With the modern developments in technology, NLP with AI can analyze customers' text or speech. The steps below show how and what means companies obtain users' and customers' information. The steps below show how customers are so loyal to particular companies than others. The stages show how important IoTs help companies make more sales and how customers are vulnerable to companies.

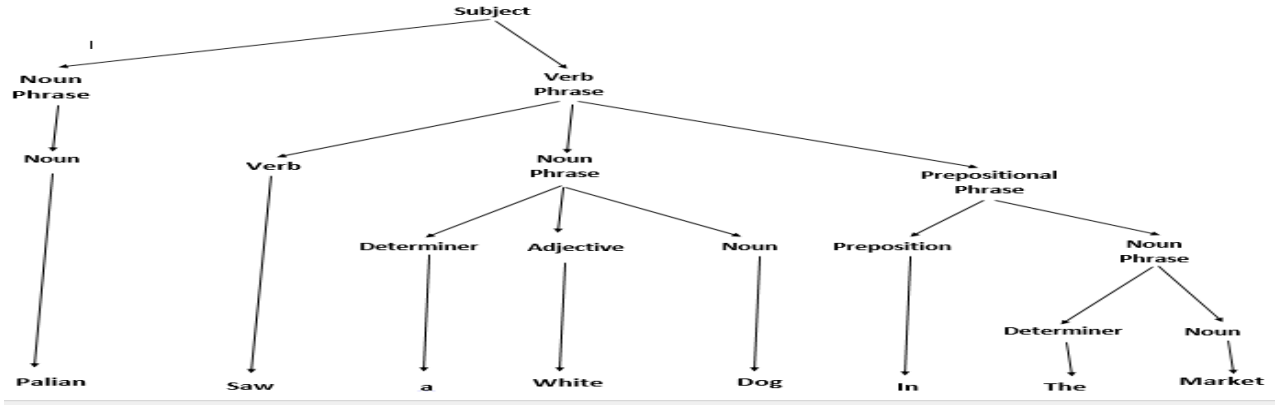

Figure 10. Semantic analysis.

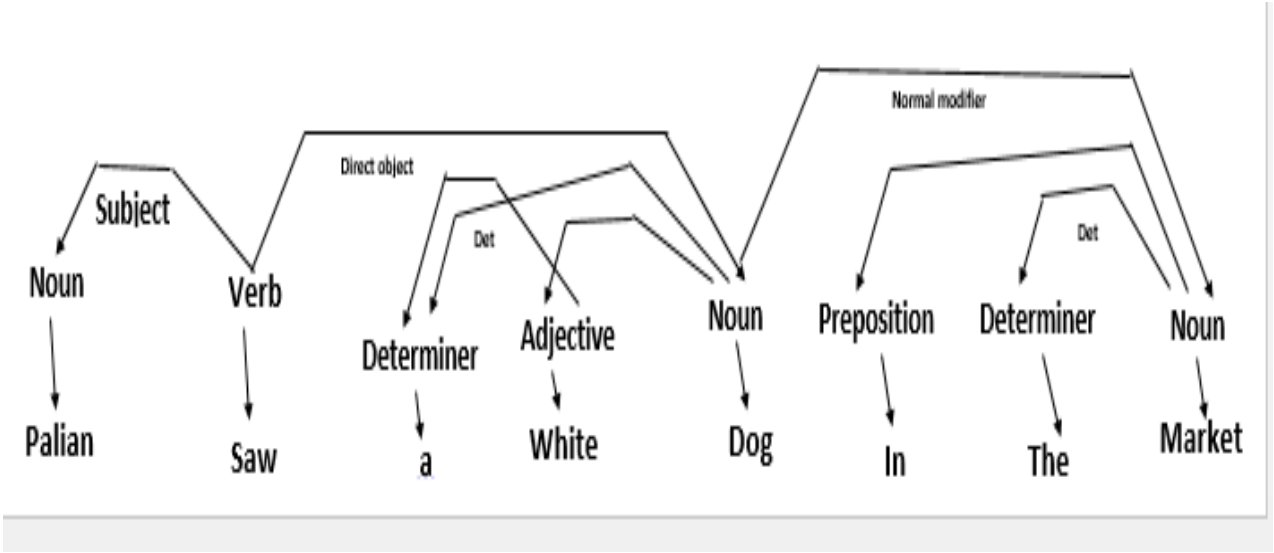

Figure 11. Text extraction and target customer base on word choice.

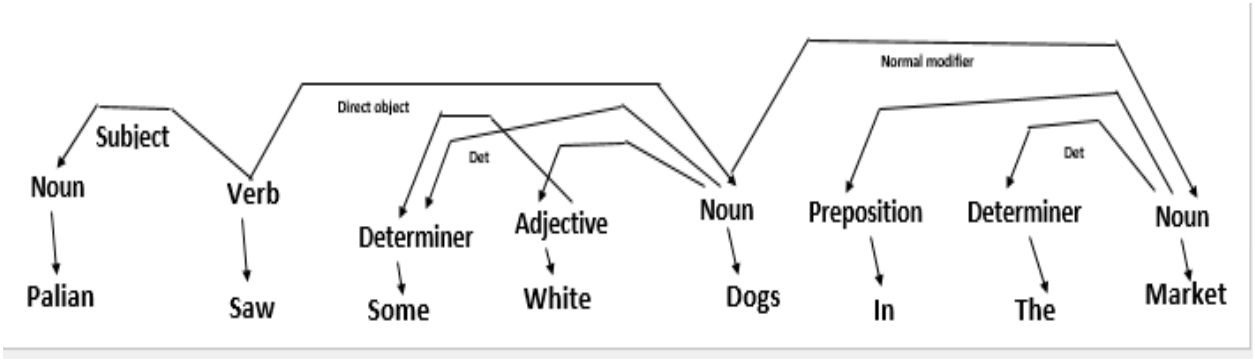

Figure 12. Text extraction and target adverts based on the audience's choice of words.

From Figure 10 above, the statement has been synthesized into different language structures. In the above statement, it is easier for a company to target potential customers. The statement details how NLP and AI structure text or speech to gain inside of customers' needs and desires. These statements can be used to pinpoint areas where companies focus and pay attention based on product needs.

Figure 11 below is based on the statement "Palian Saw a White Dog in The Market". From the statement, a potential company will focus on nouns and adjectives to capture

customers' preferences. The potential company can then use prepositions and phrase determiners to determine if there's a need for advertisement or not. The statement above shows the speaker is in the market. The statement also indicates that the speaker's favorite color is white. From the statement a potential company that deals in pets can seize the opportunity to make good business. From the statement, a potential company can also deduce a market where customers do not rely much on the advertisement. The potential customers indicated his or her choice and preference thereby helping the potential company understand the type of customer beforehand.

From Figure 12 below, the synthesized statement has been modified into different language structures. In the statement; it is no longer easier for a company to target potential customers based on choice because the speaker only identifies dogs but without a choice. The details of how NLP and AI structure text or speech to gain inside of customers' needs and desires required further analysis. The previous statement was used to pinpoint areas where companies focus and pay attention based on product needs and has changed with a plural form.

Based on the new format of the statement "Palian Saw some White Dogs in The Market". From the statement, a potential company will require to add another step and focus on the plural nature of the statement, then nouns and adjectives to capture the customer's preference. The potential company can then use prepositions and phrase determiners to determine the type of advertisement. The statement above shows the speaker is in the market and is unable to make a choice. The statement also indicates that the speaker has a color choice of white but can make a preference amongst alternatives. From the statement a potential company that deals in pets can seize the opportunity to mark well-targeted business advertisements based on segmentation and specialized method.

From the statement, a potential company can also deduce a market where customers rely much on advertisement for their choice. The potential company can deduce that the potential customers are made up of those who go to the market without a choice and preference. The potential customers identified so many dogs without a preference thereby helping the potential company understand the type of customer beforehand.

4.4. Loyalty Predictable Determiner with the Use of NLP, AI, and IoTs in the Industry 4.0 Era

Figure 13 below represents a deep learning model that this study uses to present how customer data is trained to predict future outcomes and company sales. Companies use simple text or speech of customers to determine their loyalty to the company's products. A loyalist of Company A will always speech positive about that company while a non-loyal customer B will speak against the company's products. Most companies use the data of customers to tailor products to their needs and desires. Based on the text below, the company can understand which of the company's products a customer likes. The study breakdown the method of analyzing simple text using parts of speech. A market-oriented company that deals in pets can use the statement made below to understand the customer's desires and put forward an irresistible product at a particular time, hour, and place most convenient for the customer.

Figure 13 is an analysis of text structure based on proportion. The relevance of text is determined by the number of words or sentences tailored to product needs. The greater positive text within a sentence that can be used to examine the need and desire of potential customers towards a company's product the more relevant the text or speech and vice versa. The words are adjusted in a way that decreases the differences between the actual response and the target output of the text. NLP is used to extract basic user data, and hobbies and to capture their interests by building a rich user profile [67]. To achieve this companies separate the text or speech of users into target words and non-target words. The target words are text or part of speech that fulfilled the company's choice and is tailored to their product's needs. Text removal and classification of the required dataset for the quick specification is a very important rule in NLP, especially for health-related services [68]. Positive vibes toward company products determine future sales and negative

statements about a company's products signal future low sales. Artificial neural networks help businesses to predict future returns on a company's products based on the comments of a potential customer.

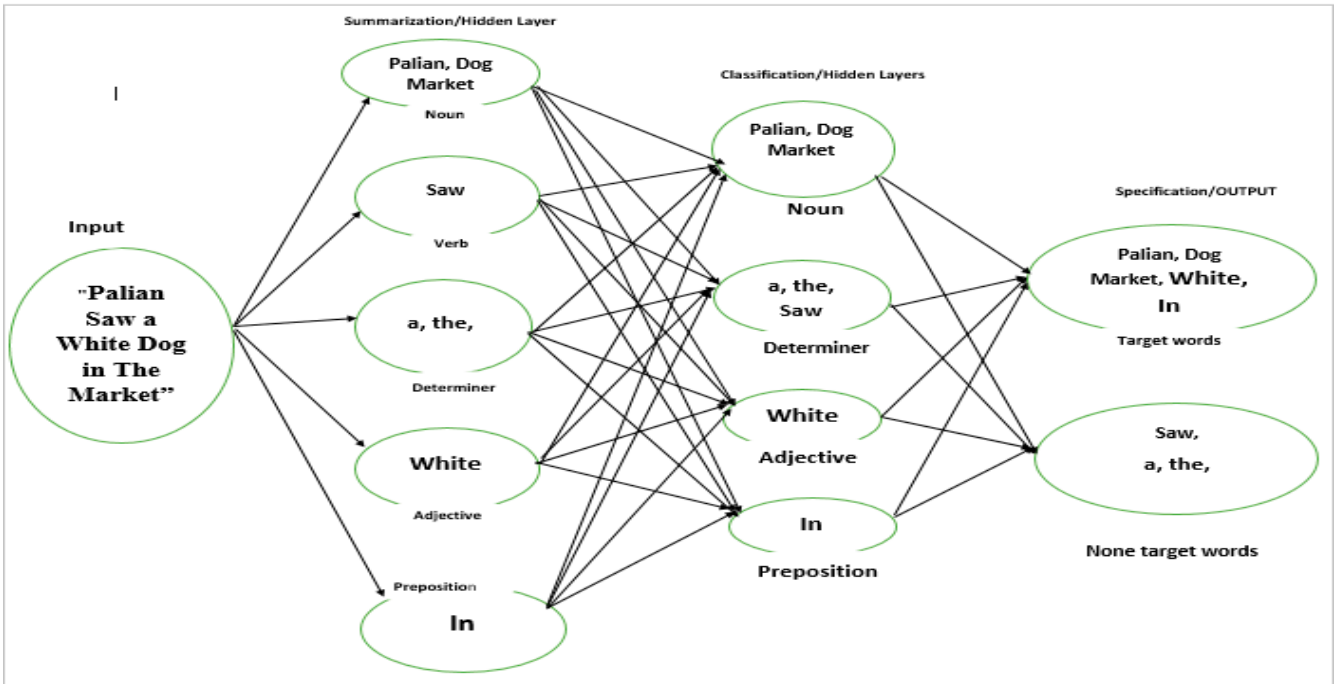

Figure 13. Artificial neural network classification of NLP text.

5. Conclusions

The study concluded that NLP and AI is the preferred system for enterprise management in the era of Industry 4.0 to understand customers' demands and achieve customer satisfaction. The study uses text content as part of NLP and AI demonstrated by way of example in the methodology section to let us understand how companies capture customers' insight and how they use IoTs to influence the way we react, respond, and engage with their products. The result from analyses indicates the least score of 12 out of 15 grades for all the measurements on a behavior-oriented drive and influential function of IoTs on customers. The study findings are based on text content as part of NLP and AI that IoTs use to influence human reactions, responses, and engagement with enterprise management in Industry 4.0. The "Behavior-oriented drive and influential function of IoTs on Customers in Industry 4.0" concept are critically examined. Statistics show that the influence of Industry 4.0 evolution on customers is real and is helping a lot of businesses sky rock on their rate of returns on investments. The results of the "Behavior-oriented drive and influential function of IoTs on Customers in Industry 4.0" study concluded that NLP and AI is the preferred system for enterprise management in the era of Industry 4.0. This is because the system of NLP and AI integrated with IoTs enables Companies quickly understand customers' demands and achieve customer satisfaction, NLP and AI techniques are a necessity to attain business goals.

The integrated system levied by Industry 4.0 with NLP and AI embedded IoTs is very important to industrial growth as represented and analyzed in Section 4 method applied in the study. Companies use simple text or speech of customers to determine their loyalty to the company's products. A loyalist of Company 'A" will always speech positive about that company while non-loyal customers "B" will speak against the company products. With all the data collected, companies use this data to tailor products to their needs and desires. Based on the text below, the company can understand which of the company's products a customer likes. With a well-structured NLP, companies do not run

expensive advertisements nowadays. The cost and time that were supposed to be spent by companies to run ads is now shifted to text analysis of customers via social media applications. Nowadays consumers spend time following social media entertainment shows, events, and activities that are oriented to understanding how consumers think. With the help of NLP and AI with support from IoTs, companies target their customers before initiating the product test phase. Based on comments, pop-up items, and shot videos that appear before long videos and online newspapers, companies use these ads to predetermine their product's needs.

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