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Application of Artificial Intelligence in Improving Operational Efficiency in Telecom Industry

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ABSTRACT: Artificial intelligence is the most popular word used by the tech experts now-a-days. Its accuracy and reliability make the best choice for the technology driven companies. The major portion of the investment in AI is happening in the telecom sector with the top companies across the globe. The telecom industry is growing significantly due to its potential of making the global economies by getting closer and simpler. With this, the demand for AI has increased exponentially to demonstrate their position in the global competitive scenario. Companies are largely investing and mobilizing their resources to automate their repetitive tasks with AI. Even the companies are also spending a lot of investment in AI research to explore the future technologies which can lead to disruptive innovations. In this context, it is discussed the potential possibilities of automation through AI in telecom service management and its benefits through a self-healing platform with preventive & corrective solutions management. Few product design challenges encountered during the research, which are managed subsequently with the risk management tools.

Keywords: Artificial intelligence, Operations management, Telecom, Service management, Automation, IT, Machine learning

Abbreviations: AI, Artificial intelligence; AGI, Artificial general intelligence; API, Application program interface; ML, Machine learning; IT, Information technology; IoT, Internet of things.

I. INTRODUCTION

Artificial intelligence (AI) is being used to reduce the human interventions in the critical activities of health and business predictions. Now-a-days processes operated by AI can execute lot of tasks like recognition of complicated models, integrating critical material, drawing to inferences/decisions, and forecasting accurately, which requires the human intelligence and intuitive decision-making abilities [1].

AI term was first coined in 1955, which was discussed in the first academic conference on the subject, at Dartmouth College. That same year, researchers at the Carnegie Mellon University created the first AI program, Logic Theorist [2]. The tremendous emphasis and technology developments around the world has provided the path for engineers, technologists, scientists, and entrepreneurs to stride for greater heights in developing and innovating artificial intelligence through precise algorithms for data aggregation, analysis and presentation [3].

Now-a-days improving the operational efficiency of the organizations is important factor for their sustainability. It is very crucial in terms of increasing the profitability and faster deliveries. On the other hand, it is also very essential to maintain the quality of the deliverables. AI can help to improve the operational efficiency through exhibiting the human like intelligence.AI solves the high complex problems with minimum resources, accurately and quickly by reviewing different types of data such as images, voice / speech, texts etc. [3].

The efficacy of AI is another crucial aspect in attracting the investors and entrepreneurs. With the availability of high computing abilities, the efficiency of AI has improved tremendously over a period. Majorly, AI efficiency depends of the computing speed and quality/volume of processed information. Now, the critical task for the technologists is to feed the quality information to AI systems for most reliable results. The companies are developing multiple AI systems for data segregation and further processing for accurate required results.

Telecom sector was an essential service used across the globe. The demand for mobile data & IoT services to watch videos, browse the internet and use various apps had accelerated rapidly, and, in from data, compared to 22% five years previously. The number of smartphone users also continued to grow rapidly. The smartphones ratio with mobile handsets is 11% in 2012 and it is 45% in 2017. The growth of 34% in just five years was primarily being driven by growing living standards and population growth, secondarily with lower airtime / data prices and device costs [4].

Information is one of the most valuable& crucial as sets of AI, when it is utilized correctly it can help in making decisions intelligently that can improve the business operations substantially [5]. When using information for AI, it is crucial to check for integrity of the data / information to take perfect decisions by the AI. AI has advanced into the new era of self-checking abilities to verify the data suitability.

On the other side of the coin, inadequate IT infrastructure in most parts of the world is leading to underutilization of the available AI developments for the good cause of the economies and humankind. Most

parts of Africa and Asia are lagging in AI deployment and talent development. Inadequate knowledge in the use of computers/software's/technologies and language hurdles are the vital causes of not tapping them on a huge scale leading to decreased pace of AI evolvement [8].

There are five key focus areas for successful AI transformation& value creation in the business operations as depicted in the Fig. 1 [1].

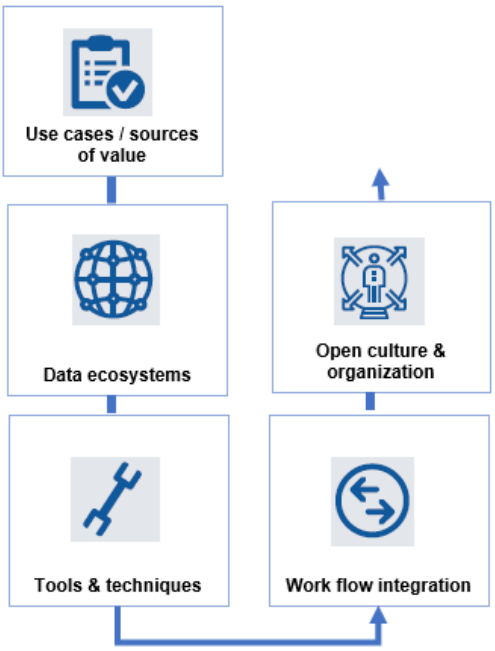

Fig. 1. Elements for successful AI transformations.

The goal of AI is to develop human like intelligence in machines. However, such a dream can be only accomplished through learning algorithms which try to simulate how the human brain learns& adapts [6]. AI can be applied to several areas in our day to day life activities of visual, taste, speech, smell and touch analysis and solutions.

The research on AI is paced from 2007, around 2823 published papers are identified during 2007 to 2019 period. And most of the research is carried out in the disciplines of computer science and STEM (Science, technology, engineering, math) [10]. From this data, it is evident that there is a research gap on applications of AI in operations management area. Hence our study creates an impact in development of AI application products/strategies across the operational excellence activities.

The self-healing platform concept is the revolutionized solution with the advantages of predictive & corrective management, resource optimization, quicker resolutions and cost effectiveness ultimately leading to customer delight.

II. ANALYSIS AND DEVELOPMENT

Before developing any AI platform, it is crucial to analyze the strengths and weaknesses to mitigate adequately.

The major cause of many delusions about AI are the potential harms it can create by overriding human intervention. The basic elements are weak AI and strong AI in terms of its execution. The strong AI do not have the potential risks with various controls. But in case of Weak AI, it is skilled at performing certain types of tasks like a data search, voice recognition etc. For example, the AI that makes any voice recognition system is good in voice commands interpretation in terms of language and meaning recognition but does not recognizes the intensity of the voice in order to capture the persons behavior situations like panic, calm etc. which is more crucial in some scenarios [7].

On the other hand, strong AI, often referred to as artificial general intelligence (AGI), is a hypothetical type of AI that can meet or exceed human-level intelligence and apply this problem-solving ability to any kind of problem, just like the human brain learning capability & adaptability in drive an airplane, cooking food, and developing software. The major fear perceptions about AI are the job losses, misuse by miscreants, exceeds the capability of human overriding and improper applications [7]. It is eminent that AGI can be developed eventually, as the computers have grown exponentially more powerful and AI has progressed dramatically to an extent that human-level AI is not seemed to be far off as it was present a decade ago. The advanced capabilities of AI – monitoring, discovering, predicting, interpreting, and interacting with various sources has made the possibility of near perfect AI is not a distant dream.

Obviously, the market drives the AI advancement and implementation, but the governments around the world must play a major role in creating a conducive atmosphere for learning and application in turn deliver benefits across the industry. There are three major priorities to set as part of global deployment: (a) establishing a global policy framework to support AI development and adoption, developing laws & regulations governing AI usage in the industries and society; (b) developing AI talent across the globe and encouraging usage at all levels of society, developing educational policies to introduce AI in the curriculum at high school/college education; and (c) focusing public debate on confirming that AI contributes to the overall growth of the economy and provides positive social outcomes without having the negative impacts [3].

Operational efficiency is a major challenge in ever growing technology spin for telecom sector, as the system failures in network and service tools is a natural phenomenon. But thanks to AI and ML –where the technology-oriented processes control data and information to educate themselves, analyze and resolve the challenges quickly and accurately.

To fix the operational issues automatically, a Self-healing platform build on AI will enhance productivity through reduction of manual efforts. Traditionally IT systems in telecom usually monitor the service calls and reports to assigned employee (L1), if not resolved by L1 it is assigned to another employee and so on. Due to multiple touch points and escalations the resolution of issue might take more time which leads more downtime.

With AI it is possible to build a Self-Healing Platform where it can monitor systems for the functional parameters and signals the observed deviations from the defined set of definitions as potential risks. If the

self-healing platform identifies any potential risks/problems, it automatically adjusts with the defined parameters to restore routine operations.

While normal network administrator manual intervention can take up to 30-40 minutes for a problem resolution, a self-healing design can bring that time down to almost 2-3 minutes. It is a massive improvement of more than 6 times in the time saved and results in billions/millions of cash saving to the companies and improves the customer experience.

The critical factors examined in development of the self-healing platform are:

– **Affordability:** The key for business proposition is the affordability of the AI platforms. The research projects and the startup companies can make a credible impact in AI development with its cost-effective roll outs.

– **Robust design/architecture:** The coding framework and system design is especially important in terms of anti-hacking and anti-redundancy characteristics. Even the documentation control and change management of the product manual is crucial for future resolutions and product updates.

– **Ease in deployment:** The AI product should be adaptable with the existing market technologies and infrastructure for easy deployment. It should take minimum or no changes to the existing infrastructure and resources of the company.

– **Flexible structure:** Careful thought must be applied during the product development for accommodation of any future updates to the system structure. It helps in automating more process parameters in future as per the dynamic business /process requirements.

The typical Self-healing AI platform process flow of telecom customer service is presented in the Fig. 2.

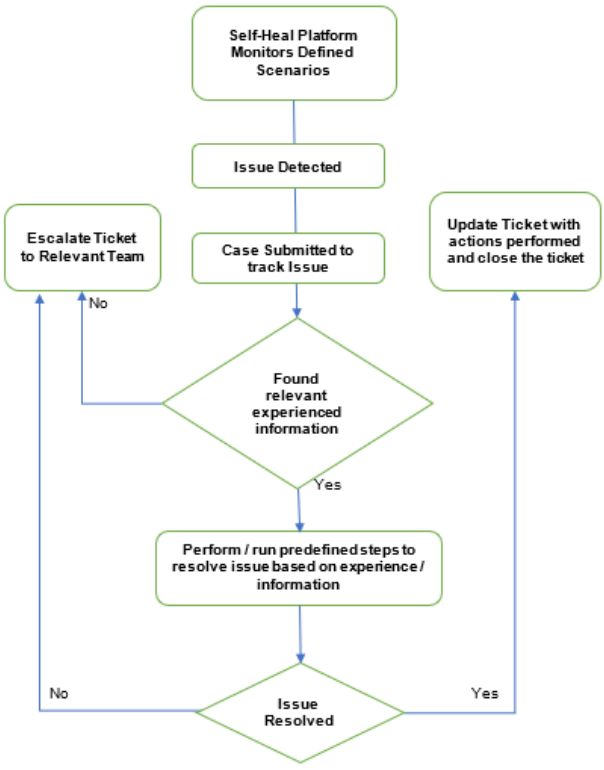

Fig. 2. Self-healing AI platform Process flow of telecom customer service.

So far, some organizations have already implemented some sort of automation where upon user submission the ticket automation triggers to validate and try to resolve. In this case still user knows about system unavailability and user is taking time to talk with customer support /submitting ticket via app/portal. With AI build Self-Healing platform capabilities, we can go step ahead to monitor systems and resolve issues upon failure even before users knows about system availability, to have better user experience.

Risk analysis is a great tool to list and analyze the risks associated with the process and product design areas. The mitigation plan is the output of the risk analysis which is very crucial for greater return on investment and successful AI product delivery. A systematic risk analysis is carried out at different tiers, assessed the potential risks of the self-healing platform product, and developed the mitigation plan with relevant actions. Some of the important risks identified are retaining the trained resources, noncompliance's in confidentiality and integrity ethics, high infrastructure costs with requirement of advanced computing machines and system security threats. It is also imperial to define the clear actions with assigned responsibilities and completion timeline for effective risk management.

The following workflow issues can be automated using the AI self-healing platform:

– **Availability of the Network endpoints:** A network endpoint is a remote computing device used to communicate with a network in bi-directional way to which it is connected. In today's Complex Networks every end point availability is extremely critical to avail maximum productivity. The typical endpoints are servers, network switches, routers etc.

The AI self-healing platform will continuously monitor all Endpoints in Network, whenever it identifies any unusual behavior from predefined conditions, it will invoke self-healing process with predefined steps like Rebooting device & Changing network route/link to reach that device. If endpoint is still down after multiple tries, then it will escalate to relevant team by submitting ticket on respective team.

– **Storage space availability:** Data is invaluable asset to any organization. To storage the data we need enough high available, scalable & reliable storage capacity which is costly. It is always necessary to have enough storage capacity to storage data for any server / application at the same time we cannot keep adding new storage capacity all the time, sobetter to have data classification along with retention policies.

Based on Data retention policies, AI self-healing platform will monitor the age of the data (Days/Weeks/Months/Years) as soon as any data meet's the retention policy based on age that data will be deleted to save storage space.

– Resource consumption monitoring, alerting & decommissioning: Over the decade most of the datacenter became SDN (Software Defined Datacenters) which allowed us for rapid provisioning/deployment of resources whenever we need. But over the time managing these resources become burden for operation team because of lack of visibility on consumption of resources. With ever growing new resource needs and trimming on total IT expenditure year by year we are in an urge of to keep

an eye on existing resource consumption and decommission underutilized resources to keep intact with declining IT budget.

Define rules for resources like production/nonproduction and set resource consumption thresholds respectively in self-healing platform. If any resources are underutilized for consecutive couple of months, then commence a communication to respective resource owner and initiate decommissioning process.

– **API availability:** With every changing IT needs with its agile in nature, API (Application Program Interface) has become a key component in Application Architecture. Fundamentally, an API specifies how software components to be interacted. As most of the organizations are started adopting Micro Services architecture as part of cloud transformations, API availability become even more critical.

In self-healing platform we need to define API dependencies for each application micro services and monitor their availability by making some synthetic transactions with frequent interval. If we find any in stability for API availability, then restart relevant services. After multiple retries if still service is unavailable then escalate to respective team by submitting a ticket.

The key elements for AI model deployments in the companies are:

– Talented employees who are proficient at using AI tools and platforms competently

Robust data environments

– High end IT infrastructure

– Traceable and value-added sources of data & information

– Perfect workflow integrations with the core processes

– Open work culture that welcomes experimentation

– Long term vision on life cycle development process

– Process orientation and flexible systems.

The important aspect required in AI application across the industries is the preventive process approach, which enables the technology with the self-assessing capabilities for the defined process parameters and mitigation of potential problems identified without occurring at all. The key result areas of the AI are the preventive & corrective solution development technologies which provides the good return on investment. Although innovative & advanced research areas also provide the good scope for AI deployment like in space exploration, climate change control etc.

III. RESULTS AND DISCUSSION

Digital companies mostly from the developed countries has made the most substantial and earliest investment in AI, presenting the test cases for possible ROI confidence in AI. In a case, online e-commerce firm Amazon invested $775 million & has attained remarkable results from an acquisition of Kiva, a robotics automation company that automates picking and packing. The Order receipt to distribution cycle time, which ranged around 60 to 75min. with manpower, reduced to 15 min. with Kiva robotics, while inventory capability increased by 50 percent. Operational costs reduced to an estimated 20 percent, giving a return on investment of close to40 percent. Similarly, Netflix has also attained impressive results from the AI algorithm it uses to personalize recommendations to its 0.1 billion subscribers worldwide. This tool helps the customers quickly find their desirable video content, as per their research any customer will tend to give up if the search takes longer than one & half min. With this better search results tool, Netflix estimates that it is avoiding can celled subscriptions that would reduce its revenue by$1 billion annually [1].Even the medical field had demonstrated significant developments in the clinical & diagnostic systems through Artificial neural network (ANN) tools [9].

The same pattern of positive results is obtained with the developed model. The resulted benefits by implementation of AI self-healing platform in telecom sector as per the discussed study are presented in the Table 1.

Table 1: Benefits with AI self-healing platform.

S.No.	Workflow issue	Benefits with AI automation
1.	Network endpoints availability	It will reduce the total downtime of endpoint in network and it will avoid any unplanned outages to make sure end point is always available.
2.	Storage space availability	Through this data life cycle policies, we can reduce total capital & maintenance of storage cost.
3.	Resource consumption monitoring, alerting & decommissioning	By decommission underutilized resources, it is possible to save lot of resources in terms of space & money until it is really required.
4.	API availability	With auto recovery of services, it will increase API availability for services to run healthily.

IV. CONCLUSION

This article presented the importance and necessity of AI in the present market. It is also discussed the value prepositions of AI in the organizations for better throughputs across the processes. An AI self-healing platform is developed for telecom service management in automation of the critical activities which resulted in the direct and indirect benefits to the industry. The model is developed with simple steps for use in telecom industry can also be utilized for other sectors.

From the discussions, it is evident that AI is the absolute necessity for future generations better and safer livelihood.

V. FUTURE SCOPE

There is a potential scope for including some more process areas in the telecom sector like backup availability, application deployment/rollback, database availability monitoring etc. in the self-healing AI platform. It can also be extended to other sectors like agriculture, medicine, and allied sectors in the future research.

Conflict of Interest. The authors declare that there is no conflict of interests with this research work.

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