VILNIUS TECH
Vilnius Gediminas Technical University

Business: Theory and Practice
ISSN 1648-0627 / eISSN 1822-4202
2022 Volume 23 Issue 2: 323–333
https://doi.org/10.3846/btp.2022.15366

INVESTIGATING THE NEXUS BETWEEN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TECHNOLOGIES IN THE CASE OF INDIAN SERVICES INDUSTRY

Mithun S. ULLAL[1], Pushparaj M. NAYAK[1], Ren Trevor DAIS[1], Cristi SPULBAR[2], Ramona BIRAU[3*]

[1]*Department of Commerce, Manipal Academy of Higher Education (MAHE), Manipal, India*
[2]*Faculty of Economics and Business Administration, University of Craiova, Craiova, Romania*
[3]*Doctoral School of Economic Sciences, University of Craiova, Craiova, Romania*

Received 29 July 2021; accepted 20 June 2022

Abstract. The future in the services industry belongs to Artificial Intelligence (AI) driven machines, which is a major source of worry for the job market in India. Over 50% of India's GDP constitutes services, and it is a major source of employment for the skilled manpower of India. The research measures the impact of AI on service jobs in India based on qualitative parameters such as logical, natural, physical, and compassion; and finds which aspect serves the jobs better between machines and humans. The jobs taken over by AI are primarily at the task level more than the job level and for the basic tasks predominantly. The replacement starts with the basic tasks involved in providing service and then it grows to perform all the tasks involved in services. The research finds out that the logical aspects of the service will slowly reduce in the coming 5–10 years as AI will perform all the logic-related tasks leaving more emotional tasks such as compassion for humans. Finally, even these emotional-related tasks will be taken over by the AI which provides us with a very interesting combination of man and machine in the Indian scenario still threatening human employment.

Keywords: Artificial Intelligence (AI), machine learning, human intelligence, big data, robots, automation, service sector, consumer.

JEL Classification: M15, M21, M31, P46.

Introduction

Artificial Intelligence is going to make a huge impact on the sales graph in India (Ullal et al., 2020). The human-like intelligence developed in machines is slowly taking over the service landscapes in the world which is the major source of innovation at present (Rust & Huang, 2014). Machines can be seen in the western countries working in hotels and healthcare sectors and machines converting the customer service into self-service are increasing at a rapid pace (Fluss, 2017). Portfolio managers' jobs are getting replaced by big data-backed AI (Javelosa, 2017). This technological revolution is minimizing the difference between man and machines (Schwab, 2017). This innovation could snatch away the jobs from the most vibrant sector in India. India has seen a shift from manufacturing to services unable to compete with the cheap Chinese imports which are also seen across the world (Buera & Kaboski, 2012). Ullal et al. (2021) argued that E-commerce portals in India rely on more than 380 million Internet potential users, with constantly growing Internet traffic, considering that the market is driven mainly by cost and quality, which are typical concerns of the urban middle class of a developing country such as India, product reviews grossly affect sales. Nethravathi et al. (2020) have conducted a complex research study based on business intelligence (BI) techniques to examine customer behaviour patterns by also using genetic algorithms.

Service jobs can be saved or not? Humans always had more power with over half of the humans following machines. The tasks performed in India by highly skilled professionals such as investment managers and doctors can be replaced by AI (Chui et al., 2015). Researchers have found this technological advancement with awe and gone deep into this topic of AI which can broadly be divided into service technology focusing on the good aspect of AI

*Corresponding author. E-mail: *ramona.f.birau@gmail.com*

and economic aspects which identify its impact on human jobs. The applications of AI can be found in service literature (Marinova et al., 2017), and technology-driven services. The research suggests that the development of AI will result in more self-service (Meuter et al., 2000), increase productivity (Rust & Huang, 2012), and make economies run more on service. The recent literature is more intended to analyze the impact of AI on jobs like the use of Chabot's for customer services (Leachman & Merlino, 2017), the increasing effects of AI on the skilled workforce (Davenport & Kirby, 2015), machines driving the services and offices jobs being redefined (Chui et al., 2015).

This research study proposes the following research questions:

1. How AI will change the Indian service sector after it is being a disruptive technology?

2. When will AI completely replace humans and to what extent?

3. How will the human-centric Indian service sector respond to it?

4. What will be the future workforce qualification?

To answer all these questions, we develop a theory to find the future of services. With the combination of human intelligence with AI, four types of tasks are defined which are logical, natural, physical, and compassion. The research also explores how the companies functioning in India should decide between humans and machines backed by AI. The current situation in India is that only certain tasks are completed by AI in providing service. The biggest achievement of using AI for a company is the cost advantage and also AI can do certain tasks better than humans (Ullal et al., 2020). Starting from certain menial tasks the AI is moving towards completely replacing humans in service tasks. The lower intelligence jobs are taken over first and then the AI moves towards higher tasks. Examples could be found in restaurants in Japan, where servers are being replaced by robots whereas chefs have retained their jobs.

AI is slowly moving towards performing the task that requires natural reactions and compassion in service delivery. This technology change is rapidly changing the service landscapes and is going to replace a whole lot of jobs in the service sector. The AI replacing jobs is imaginative as well as analytical giving understanding to the firm's strategies in the era of AI. The research tries to answer the question of whether intelligence will be needed more or less in the case of humans as AI gets ready to take over

Table 1. Intelligence and jobs replacement based on task and its effect on service

Intelligence		Job Replacement	
AI	Skill/Labor	Nature of Tasks	AI Applications
Physical			
– Low qualified and less learning – For example, Machines learning by repeating the same tasks as the alarm in hotels for individual customers	– Low skills like BPO workers, tele callers, receptionists	– Routine – Low skilled	– Restaurants allowing a customer to decide their taste online – Robots greeting hotel customers in Japan – Virtual bots turn customer service into self-service
Logical			
– Learning based on data – Methodical, learning – For example, Computer deciding the breakfast menu for customers – Sensible decisions	– Qualified workers with technical know-how. Example engineers	– Rule-based difficult tasks Logic and analysis needed – Data extensively used in service	– Payrolls and increments decided by AI rather than humans in the HR department
Natural			
– Learning is naturally based on a thought – Deep learning and machine learning – Example. Now Interact	– Intelligent technically qualified employees for their problem-solving skills. – CEO's and CFO's	– Difficult and multitasking. Skills needed are natural, holistic, empirical, and relative interaction and analysis. – Customized, characteristic, and knowledge	– Management by AI, Finance managers, and Doctors' jobs. – Automation – Machines are better than humans
Compassion			
– Compassion based understanding – Needs understanding the emotions of the customers – Computing and Communicating – Apples Siri	– Relationship managers who are trained in soft skills – Negotiators and doctors dealing with psychology	– High interactive, social skills – Understanding emotions and compassion needed – Complete involvement based service	– Sales based AI interact with customers and understand their needs – Machines providing service based on the psychological condition of the patient

services. Business schools in India are offering business analytics to their students but AI replacement will create jobs that require natural reactions of humans as jobs related to analytics need logic which will very well be performed by AI in the future and does not need humans to do the work. Soft skills seem to be the only field where humans can retain their jobs.

The research identifies all the types of intelligence that need to give service. From these, our theory is developed to design a proposal and explain to the concerning industries already employing AI in India. The theory we developed is explained in Table 1.

The goal of the research is to find how disruptive could AI be in a conservative country like India and to see if humans can be completely replaced in the process by AI. In addition, this throws light on how future employees can upgrade their skills to resist the change.

1. Types of intelligence – general framework

The services can be offered by machines backed by AI or humans and is a task where customers and employees meet which is explained in Figure 1. The type of service needs a different level of intelligence. The types of intelligence needed could be broadly classified into four categories viz, physical, logical, natural, and compassion. The natural response of humans and those services needing compassion such as that of doctors or nurses need complex software to try to emulate as its deeply human. These are a higher level of intelligence that exists only in humans. Intelligence is the ability to learn from experiences and develop according to the requirements (Gardner, 1983, 1999; Sternberg, 1984, 2005). The capacity of an individual to achieve his goal in his sociocultural context has also been defined as intelligence by Sternberg (2005). The capability to process information and solve problems is called intelligence (Gardner, 1999). The skills developed by human's time to adapt to their environment is also called intelligence (Schlinger, 2003). AI researchers in the past have focused on developing intelligence in machines similar to humans such as problem-solving, learning, and perceptions (Russell & Norvig, 2010). The research discusses the various types of intelligence along with their features and how they can be utilized to provide services.

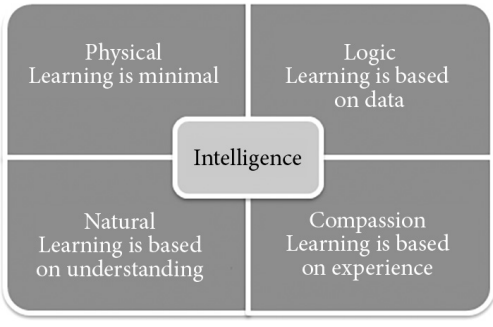

Figure 1. Different types of intelligence

1.1. Physical intelligence

Performing regular tasks and obvious reactions constitute physical intelligence shown in Figure 1. It does not require higher intelligence but is important for completing basic tasks. It is devoid of imagination as its routine activity and can be completed without much effort (Sternberg, 1997). These tasks can be effectively categorized into unskilled segments which are not performed by highly educated Indians. The majority of the young graduates working in Indian call centres and BPOs are such jobs performed.

This can be effectively performed by machines as it is easy to develop software for these unskilled jobs. Robots used in Maruti's plants in Gurgaon Plant near New Delhi are a typical example of this. Robots perform physical intelligence tasks without supervision and perform their tasks independently when backed by machines (Colby et al., 2016). These tasks are performed on set procedures and based on physical unpredictability while providing services. Adaption in these tasks is not a priority as updating their learning is needed as tasks are routine (Engelberger, 1989). The latest software's built with automatic updating (Kim, 2007) makes machine capable of performing the actions on their own (Engelberger, 1989). The companies today are backed by servers that use the state of the art algorithms to respond to the customers. The tasks could necessarily be called physical intelligence as the algorithms give them the most relevant solutions but do not understand the complexity of those solutions themselves (Del Prado, 2015). The consistency shown by machines is their advantage over humans as they do not get bored or tired like humans which makes them more suitable for tasks than humans. Machines here perform the same task repeatedly.

1.2. Logic-based intelligence

Logic-based intelligence is necessarily problem-solving abilities based on existing information and learning based on those outputs (Sternberg, 1984, 2005). This depends on information handling, logical reasoning, and many skills (Sternberg, 1999). Training and thinking are important for these tasks which are currently performed by qualified engineers and scientists in India. The primary tasks of AI are machine learning and analytics which have various forms and are powered by big data to search for a particular solution and offer it to the customers. The computers which have games that challenge human intelligence are based on rule-based learning. This logic related intelligence cannot develop natural responses. This is because human intelligence can be imitated but not the human mind (Azarian, 2016). The jobs that AI needs to perform are very difficult but expected to a routine. This makes them appropriate for customization based on big data collected from daily tasks. AI is now independently moving away from machines that develop intelligence. This is the biggest contribution of AI to services, machines being able to process and analyze data and develop responses from them.

1.3. Natural intelligence

The ability to think and change to different situations differently is called natural intelligence. It is termed knowledge based on universal thinking (Sternberg, 1984, 1999, 2005). Natural intelligence stems from professional skills such as managers, consultants, etc. Understanding the problem is the main difference between natural and logical intelligence. This type of intelligence is considered more like human intelligence by researchers. The AI functions like humans but is much faster and more accurate as it is backed by machines. Machine intelligence in all other ways is similar to humans (Kurzweil, 2005). The search engines today give millions of responses instead can focus on one right answer to the customer's query if it were to use natural intelligence (Del Prado, 2015).

This natural intelligence makes machines alert and aware like humans (Azarian, 2016). This machine with natural intelligence will not repeat mistakes like humans do as it learns from experience. All the technology assistants like Amazon's Alexa and Googles Assistants can use strategic thinking with available information. The latest machines backed by AI can show reasoning and understanding as some well-experienced humans do (Ullal et al., 2020). The complex tasks require natural intelligence to successfully provide service to the customer. Personalized service provided by luxury hotels and recommendations from Netflix kind of company could be good examples of such intelligence.

1.4. Compassion

Machines can imitate human intelligence but can they respond emotionally like humans do (Goleman, 1996). This has social and interpersonal skills that allow humans to be social beings (Gardner, 1983; Johnson, 2014). Relationship managers, CEOs, and advocates are examples of compassion-based intelligence (Caprino, 2012). The jobs with negotiation and speaking skills need compassion. It could be a top-level job of a doctor or a hotel receptionist. The challenge is to make the machine feel compassion towards the customer receiving the service. Emotional computing works with emotion or should get affected by emotion. This takes the ability of the machines with AI to a new level in decision making. The challenge in building machines with compassion is how will a machine have practice with inherent characteristics which humans have. Emotion is necessarily a reaction that may be difficult to put into AI. How will machines experience the emotions of humans in a service encounter? Emotions are similar to awareness and AI can be programmed to be like humans in emotions. Awareness and emotions are computations of the mind (Minsky, 2006). So, AI can have emotions similar to humans in a computational manner. AI rationally imitating emotions is unlike human emotion. But the question is about AI having emotion and not how they learned emotion.

The latest version of AI is the one with human compassion-based intelligence like robots taking care of the old in Japan with some countries awarding citizenship to robots (Maza, 2017). The AI in these is much ahead of natural and physical intelligence which are limited to functional activities. Compassion based AI are tasks that have a social presence (Giebelhausen et al., 2014; Wünderlich et al., 2013). These tasks are having an emotional quotient in them. How humans manage emotions and expressions to complete a job is important. The emotions exhibited by the employees are very important in front of the customer (Yoo & Arnold, 2016). Our next objective is to find out how this AI with all four types is going to impact jobs in the service sector in India.

2. The artificial intelligence (AI) paradigm

The companies in India need to decide whether to use AI instead of humans and if so to what extent. The alternative to job retention by humans seems only superior skills that will let them hold on to their jobs. Based on the types of intelligence shown by AI, we develop a theory to suggest how the jobs in India will be affected by AI. Based on the level of replacement we differentiate between jobs, tasks, and labour. Then we explore the advantages of AI over humans and develop a model of AI which tells when and how jobs in the service sector will be replaced.

2.1. Jobs, tasks, and labour

A particular connection of tasks in order is called a job that needs the skill to be done. In India, the major service jobs are Engineers, Doctors, call centre employees, managers, etc. These jobs are made of back end tasks which India is a hub in International trade and front end jobs like receptionists. To complete these tasks one must employ numerous tasks which are actions in a profession (Chui

Table 2. Skills needed for different levels

Jobs	BPO workers	Managers	Doctors	Negotiators/CEO's
Physical	Monotonous services to customers	Perform basic duties	Perform routine checkups	Present the known facts
Logic	Analyze customers problems	Identify which service suits which customer	Analyze the clinical support system	Analyze the opposition's points
Natural	Understand customers problems	Understand which solution is better	Diagnose the disease	Understand the problem and provide a solution
Compassion	Show compassion and serve the customers	Serve customers with compassion	Treat patients with compassion	Be compassionate towards others needs

et al., 2015). The tasks involved in services that India provides to the world come in different levels of difficulty. Table 2 shows various jobs on the four types of intelligence required. Labours are the most important part of services. The employee-customer role in services is a very important aspect of services (Vargo & Lusch, 2004). Labour can be differentiated on skill levels from different jobs.

2.2. Analyzing the role of AI

The machine's ability to learn which we term machine learning and connectivity are the main elements of AI. Machine learning is the ability of the AI to improve with experience (Mitchell, 1997). This aspect of AI is managed by the algorithms that not only mine the data but can take decisions based on it (Soucy, 2016) by deep learning that functions on sensory data (Genmod Project, 2013) and can also learn from the experiences of other AI (Simonite, 2017). Self-improvement is a very important part of machines. The services can be adapted according to the customers' likes and recommendations can be done on youtube (Chung et al., 2016).

One of the biggest aspects of AI is its ability to connect to other AI-driven computers to improve its self-learning by the experience of the other AI equipment. This makes a machine part of a network giving it collective intelligence. Google's self-driving cars are an example of this as the experience of one car will be added to the repository of all cars thus making them a service provider of high quality with deep learning abilities.

3. Will artificial intelligence (AI) replace humans?

Based on a model built on the observed order of development of AI concerning the types of intelligence we develop a series of assumptions employing them to build propositions that can be tested. The results are surprisingly opposite to the existing understanding of AI with proofs shown at the end of the paper.

Assumptions

The first assumption of the research is that AI takes over physical intelligence jobs first and then logical tasks, then natural intelligence tasks followed by compassion. These need intelligence from machines or humans to be finished. The uses could be divided into different levels.

First is at time t¼ 0, where AI replaces physical tasks; Next level at time t T1 > 0, where AI replaces logical tasks; next level starting at time t¼ T2 > T1, where AI replaces natural tasks; then starting at time t T3 > T2 where AI replaces compassion-based tasks; lastly, t, in which AI completely replaces humans. For the first level, tasks at this level are monotonous jobs that can be handled by automation. These are frequent jobs that need less intelligence and these will be taken over first by machines (Chui et al., 2015). The jobs may consist of multiple tasks but if they are divided into similar tasks then AI can replace such jobs. A task that can be completed within a few seconds can be replaced by machines backed by AI (Ng & Jacobstein, 2017).

Second, the jobs replaced by AI for a level of intelligence are relative to AI replacing the tasks. If the AI replaces 10% of the tasks it means that 10% of the service providing professionals are no more needed. For example, ATMs in India perform the tasks of a teller as it does not need high intelligence levels. Task replaced by AI leads to humans being replaced by AI. The more the tasks performed by AI, the fewer the workers needed. Davenport and Kirby (2015) used augmentation to suggest a job completed by AI and humans. But the rate at which AI is growing is only making it take over human jobs one after another. The skilled jobs are also in line to be replaced by AI (Davenport & Kirby, 2015) with the marketing manager's jobs also replaced by AI (Javelosa, 2017). This implies that task replacement by AI is human replacement by AI.

Third, the AI replaces jobs in a certain level of intelligence based on the number of humans possessing that level of intelligence which points to a theory of replacement at a consistent rate. The replacement rate declines as the replacement of humans are near 100%. The Bass model of new product diffusion uses the same assumptions (Bass, 1969) which are shown using differential equations. When we apply our first two levels we obtain the following:

$$dP(t)/dt = -k\,P(t);\ \text{for } t > 0;$$

$$dL(t)/dt = -k\,L(t\text{-}T1);\ \text{for } t > T1;$$

$$dN(t)/dt = -k\,N(t\text{-}T2);\ \text{for } t > T2;$$

$$dC(t)/dt = -k\,C(t\text{-}T3);\ \text{for } t > T3,$$

where P(t), L(t), N(t), C(t) are parts of the humans doing the various level of intelligence tasks and k > 0 is the rate at which AI is taking over human jobs. Higher intelligence AI is will take time to build and thus our models will be unaffected.

The equations give us terms for P(t), L(t), N(t), C(t).

$$P(t) = \exp(-kt) \text{ for } t > 0$$

$$dL(t) = \exp(-k\,(t - T1) \text{ for } t > T1$$

$$dN(t) = \exp(-k\,(t - T2) \text{ for } t > T2$$

$$dC(t) = \exp(-k\,(t - T3) \text{ for } t > T3.$$

The importance of intelligence relative to others for humans has to be identified as this will define the skills needed for the jobs along with their qualifications. Relative importance at t as a percentage of the number of jobs of a particular intelligence normalized by the total of all intelligence.

To understand the relative importance of physical intelligence P(t) is shown as:

$$P^*(t) = P(t)/SUM(t).$$

The SUM(t) here represents the sum of physical, logical, natural and compassionate intelligence.

Next, we derive propositions on how the job environment will alter with proofs at the end of the paper.

Level 1: Replacing physical jobs

The relative importance of physical intelligence reduces and all other intelligence increases.

This is the recent trend in AI unskilled people in India working in BPOs have been suffering job loss due to automation (Lerman & Schmidt, 1999). Restaurants in developed countries have created touch screen chefs where customers decide the taste-making the chefs obsolete (Johnson, 2016). The importance given to other levels of intelligence is more (Miller & Chandra, 2015).

The repetitive tasks are done by physical intelligence AI which is cost-effective for companies working from India as they don't have to hire Indian engineers for these tasks. Huge job losses are expected at this level of intelligence. Indian call centres are a good example of this as the machines do all the tasks replacing the tele callers. Softbank has already started employing machines that can recognize human faces and complete the frontline tasks in the service sector (Halzack, 2017).

Humans now need a higher level of intelligence than the one at physical levels. But Sawhney (2016) has argued that humans having high skills in their jobs keep their jobs which points to the fact that workers can keep their jobs if they constantly improve their skills to higher levels of intelligence. This shift was experienced by the western world when their jobs were outsourced to China and India and this current trend of AI is a similar one. The semi-skilled engineers flooding the job markets were accommodated by the service sectors in India.

Level 2: AI taking up Logical Intelligence related jobs

The physical intelligence declines and logical intelligence jobs are also reduced while the rest two intelligence levels scale up. Logic related AI has just entered the Indian market and thus started taking away tasks from humans. But natural and compassion-based levels are considered too important to be left to machines and need human intervention as much as possible. Level showed the importance of logic-based skills for humans. The marketing analytics courses offered by Indian B-schools have gone up (PricewaterhouseCoopers [PwC], 2017; Wedel & Kannan, 2016). All the existing researchers have argued that skilled humans don't have to fear AI (Davenport & Kirby, 2015). But as our findings suggest logic skills have already become an advantage of AI taking away logic related tasks and giving them to machines. The solution seems to be humans relying on their natural intelligence which can be used in both unskilled and skilled jobs.

The tasks of relationship managers in large numbers in the Indian private banks require natural intelligence. These jobs based on big data are through other customers and not from central customers. The information can be used to give customized service to the customers. These jobs strongly need natural intelligence. Based on this information obtained from the software is termed smart services (Wünderlich et al., 2013). Huang and Rust (2018) argue that the first levels of intelligence can be left to machines and natural intelligence-based analysis jobs be done by humans which is AI used for logical support for humans to give service better a stage at which India is at present in the AI replacement stage. They also argue that big data is useless without human analysis. However, Sawhney (2016) states that AI can free managers from the current lower intelligence jobs helping them to perform more complex tasks. Portfolio managers have well been replaced by AI (Javelosa, 2017) based on data and analysis replacing the jobs of managers in the jobs of analysis.

Level 3: Physical, Logical and Natural jobs replaced by AI

The physical and logical intelligence keeps reducing along with that natural intelligence also sees a decline at this level but compassion intelligence increases here. Natural intelligence-based jobs are taken over at this stage. AI has started performing better than dermatologists in skincare (Esteva et al., 2017). In related exchanges, AI can analyze where the customer stands in a particular case and use its set of exchanges with the customer to handle the case. The entertainment industry in India is implementing AI at this level where through their app they ask the customer for their choices, make recommendations and based on the choices made they filter and make their recommendations accurate where AI suggests to the user what are their likes and dislikes.

Level 4: All intelligence replaced by AI

All jobs are replaced with the compassion aspect of intelligence taking the highest priority. Compassion in AI is built for all types of services. AI can assist receptionists in luxury hotels and reduce consumer waiting time (Poggi, 2017). AI in hotels and villas across India can personalize the customer experience (Huet, 2016). The advantage this AI has over the previous software is that it can detect the emotion of the customer thus designing services accordingly. Emotional analytics for customer experience and management can also be done by AI segmenting it into different emotions and learning the customer's feelings behind their words. This approach is model-based to identify the feelings based on the perceptions of AI collected by the customers (Xiao & Ding, 2014). Service providers are using AI to send emails to customers based on the emotions shown by the customers in previous emails to convince them to use their service over their competitors (Roberts et al., 2015). All the intelligence-based jobs are taken over by AI but the compassion-based jobs are the ones humans can retain. Natural skills can be developed compassion-based to retain jobs because physical and local intelligence is managed by a different aspect of the mind (Huang & Rust, 2018). Both sides of the brain need to be equally balanced out by AI if it has to manage both numbers and interact with people.

Level 5: Partnering AI with humans or AI replacing humans

The final aspect of AI is a complete replacement or complete integration. This level sees AI become intelligent like humans. The ability of the AI to imitate humans makes them capable to take over all human jobs. The solution seems to be a mix of humans and AI, which has many facets. The first is to let the customer decide if they want to deal with a human or a machine. The latest example in India is food delivery chains reducing the number of people going to restaurants but still, a considerable number of people prefer to go to restaurants. Humans and AI give the same service but to a different set of customers. This points to the outcome that humans can have jobs but only for the people who prefer to interact with humans.

Second humans and machines have separate tasks. This outcome makes both humans and AI work as one to provide service. It gives rise to great service as experts say humans perceive compassion better than AI. Winkler (2017) says that humans' compassion can never be imitated by AI. The author argues that humans are superior to AI at this level of intelligence. AI is a tool to increase human intelligence and moves human civilizations ahead (Russell & Norvig, 2010). The third stage could essentially be AI assisting humans. The humans can decide what to do and leave the rest of the complex tasks to the AI. This is what the majority of the economies across the world are trying to achieve despite the superiority of machines over people. But this will allow AI to take over all the tasks in the future which the economies of these countries may not allow to happen. Fourth, AI increases human capabilities by working together with AI becoming a tool in the hands of humans. Hospitals in India have been already using this with patients connected to machines helping doctors monitor them (Winkler, 2017). Indian startups have started working on integrating humans with AI. Which will help in improving customer service.

Human brains can be partnered with the Internet (Andrews, 2017). This brings AI imitating connectivity for collective intelligence which is a combination of the Internet and brains. This will increase learning and developing capabilities of service. But the challenge could be a complete takeover by AI and dominance completely over humans (Kurzweil, 2005). The jobs may not be lost to a single machine but the connections of machines connected by AI (Vinge, 1993). The biggest advantage of AI is it does not make mistakes like humans do. AI developed to reject commands by humans when wrong which may push humans out of the job. AI can develop the same as humans do but at a pace much greater. This will make AI very complex that is beyond programming.

4. Empirical findings

The research opens up several options for researchers and policymakers. It guides the companies in taking decisions concerning AI implementation along with its advantages and costs. But the question is should the jobs be replaced by AI. The research finds that replacement can happen at the task level and managers need to make a decision based on this and divide the job accordingly between humans and AI. The managers can take the type of tasks into account as jobs that need physical intelligence can be replaced initially. For example, jobs like call centres can be handled by machines which give answers to repetitive questions on transport systems timings across Europe. The jobs like handling the problems when installing software that requires a combination of various intelligence levels can use humans and AI partnerships. Type of service is also another thing managers need to focus on as jobs that do not require relationships with customers are better suited for replacement but jobs such as banks and finance firms that build relationships with customers need humans over AI which is similar to the earlier findings. The jobs that require human interaction are very difficult to be replaced by AI agrees with the findings of Giebelhausen et al. (2014). The strategy adopted by firms is also of importance as the cost is the biggest challenge for the service industry. Companies looking at cost reduction will opt for replacement but firms that need strategic thinkers in management will opt for humans. But in 10 years, AI will develop capabilities better than humans which will take over these jobs as well.

Replacement of humans by AI as company's new approach

AI services can be developed in many ways by companies. First, we propose they can have a category for either completely AI or completely humans based on the preferences of the customers. The advantages of both have to be analyzed by the companies based on preferences shown by the customer. Another strategy could be a partnership between AI and humans with both assisting each other in the process. But the decision of who should assist whom and to what extent is the decision to be taken by the company. Another option is service completely provided by machines which will reduce the cost for the company as well as improve the quality. Apple in selected stores in the US is already implementing this. Also, a possibility is AI improving the customer or the employee experience. Collective intelligence could be another area that can connect all employees into one, which will benefit the customer.

5. Contributions

5.1. Future of jobs

When the industrial revolution happened machines took away jobs and humans turned to service as it needs humans to serve with the consistency needed less. But with the AI revolution staring at humans now what will be the future of service jobs. The research finds out that people with natural and compassion-based intelligence jobs like doctors and nurses will keep their jobs if they continuously improve on them. Compassion in the future will

remain with natural intelligence also replaced. Collaborating with humans and AI can be a solution. For example, doctors give some robots that conduct surgeries but the instructions. However, the cost is a challenge. The paper finds a strong evidence that emotion will always stay with humans and jobs that need emotion cannot and will not be replaced. However, all the jobs that are monotonous and needs basic intelligence driven by AI will be taken over by the machines.

5.2. Skills

AI developers and companies must develop the above findings to help the firms identify what type of intelligence and what type of skills should humans have to resist AI replacing them. The research identifies that the analytics thought by the premier B-schools across India will be the jobs done by machines and not humans so the degree of skill is of no use. The education programs designed to interpret data and aid in decision-making should be the focus. The findings agree with Miller (2017) that employees with a lower level of intelligence like call centres and BPO employees only will be replaced by AI. The main challenge for human workers will be to develop compassion-based intelligence to stop the complete replacement of their in-service jobs by AI and which should be developed by them. Workers have to provide value-added services based on the relationship with the customers tailored to their needs which may not be possible with machines. In areas were doctors perform, a combination of AI and humans can be the best form of service.

Conclusions

We see the findings on service jobs and their replacement by AI. These findings guide how the replacement happened on intelligence levels and how they must be used to provide services and how education can help the worker develop the skills that will ultimately help the workers keep their jobs by partnering with AI. Finally, we conclude that AI can give rise to new human and AI partnerships in the future in providing services but will replace human jobs on the first three intelligence levels.

References

Andrews, R. (2017, September 15). Scientists connect a human brain to the Internet for the first time. *IFLSCIENCE*. http://www.iflscience.com/brain/scientists-connect-human-brain-internet-first-time/

Azarian, B. (2016). A neuroscientist explains why artificially intelligent robots will never have consciousness like humans. *RawStory*.

Bass, F. M. (1969). A new product growth for model consumer durables. *Management Science*, *15*(5), 215–227. https://doi.org/10.1287/mnsc.15.5.215

Buera, F. J., & Kaboski, J. (2012). The rise of the service economy. *American Economic Review*, *102*(6), 2540–2569. https://doi.org/10.1257/aer.102.6.2540

Caprino, K. (2012, April 27). What you don't know will hurt you: The top 8 skills professionals need to master. *Forbes*.

Chui, M., Manyika, J., & Miremadi, M. (2015, November). Four fundamentals of workplace automation. *McKinsey Quarterly*.

Chung, T. S., Wedel, M., & Rust, R. T. (2016). Adaptive personalization using social networks. *Journal of the Academy of Marketing Science*, *44*(1), 66–87. https://doi.org/10.1007/s11747-015-0441-x

Colby, C. L., Mithas, S., & Parasuraman, A. (2016, June 24). Service robots: How ready are consumers to adopt and what drives acceptance? In *the 25th Annual Frontiers in Services Conference*. Bergen, Norway.

Del Prado, G. M. (2015, August 5). Intelligent robots don't need to be conscious to turn against us. *Business Insider*.

Davenport, T. H., & Kirby, J. (2015). Beyond automation. *Harvard Business Review, 93*, 58–65.

Engelberger, J. F. (1989). *Robotics in service*. Springer. https://doi.org/10.1007/978-94-009-1099-7

Esteva, A., Kuprel, B., Novoa, R. A., Ko, J., Swetter, S. M., Blau, H. M., & Thrun, S. (2017). Dermatologist-level classification of skin cancer with deep neural networks. *Nature*, *542*, 115–118. https://doi.org/10.1038/nature21056

Fluss, D. (2017, January). The AI revolution in customer service. *Customer Relationship Management*, *38*.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligence*. Basic Books.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligence for the 21st century*. Basic Books.

Genmod Project. (2013). *Self-learning AI Emulates the human brain*. Sponsored by European Union. http://ec.europa.eu/research/infocentre/article_en.cfm?artid=40376

Giebelhausen, M. D., Robinson, S. G., Sirianni, N. J., & Brady, M. K. (2014). Touchversus Tech: When technology functions as a barrier or a benefit to service encounters. *Journal of Marketing*, *78*(4), 113–124. https://doi.org/10.1509/jm.13.0056

Goleman, D. (1996). *Emotional intelligence: Why it can matter more than IQ*. Bloomsbury Publishing.

Halzack, S. (2017, January 18). Robots and artificial intelligence set to up end the art of making a sale. *The Washington Post*. https://www.washingtonpost.com/news/business/wp/2017/01/18/robots-and-artificial-intelligence-set-to-upend-the-art-of-making-a-sale/?utm_term¼.155afad65ebd

Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research*, *21*(2), 155–172. https://doi.org/10.1177/1094670517752459

Huet, E. (2016, October 20). Pushing the boundaries of AI to talk to the dead. *Bloomberg*.

Javelosa, J. (2017, March 30). Major firm announces it's replacing its employees with A.I. *Futurism*.

Johnson, H. (2014, October 17). 6 soft skills every professional needs. *Business 2 Community*. https://www.business2community.com/human-resources/6-soft-skills-every-professional-needs-0788441

Johnson, H. (2016, May 16). Fast food workers are becoming obsolete. *Business Insider*. http://www.businessinsider.com/self-service-kiosks-are-replacing-workers-2016-5

Kim, M. (2007, August). Challenges on the development of robotic intelligence. In *16th IEEE International Conference on Robot & Human Interactive Communication*. Jeju, Korea. IEEE. https://doi.org/10.1109/ROMAN.2007.4415106

Kurzweil, R. (2005). *The singularity is near*. Viking Books.

Leachman, S. A., & Merlino, G. (2017). Medicine: The final frontier in cancer diagnosis. *Nature*, *542*, 36–38. https://doi.org/10.1038/nature21492

Lerman, R. I., & Schmidt, S. R. (1999). *An overview of economic, social, and demographic trends affecting the US labor market* (Final Report). The Urban Institute for US Department of Labor, Washington, DC.

Marinova, D., de Ruyter, K., Huang, M.-H., Meuter, M., & Challagalla, G. (2017). Getting smart: Learning from technology empowered frontline interactions. *Journal of Service Research*, *20*(1), 29–42. https://doi.org/10.1177/1094670516679273

Maza, C. (2017, October 26). Saudi Arabia gives citizenship to a non-Muslim, English-speaking robot. *Newsweek*. http://www.newsweek.com/saudi-arabia-robot-sophia-muslim-694152

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-service technologies: Understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*, *64*(3), 50–64. https://doi.org/10.1509/jmkg.64.3.50.18024

Miller, C. C. (2017, March 28). Evidence that robots are winning the race for American jobs. *The New York Times*. https://www.nytimes.com/2017/03/28/upshot/evidence-that-robots-are-winning-the-race-for-american-jobs.html

Miller, R., & Chandra, S. (2015, July 28). A world where man beats machine. *Bloomberg*.

Minsky, M. (2006). *The emotion machine*. Simon & Schuster.

Mitchell, T. (1997). *Machine learning*. McGraw Hill.

Nethravathi, P. S. R., Bai, G. V., Spulbar, C., Suhan, M., Birau, R., Calugaru, T., Hawaldar, I. T., & Ejaz, A. (2020). Business intelligence appraisal based on customer behaviour profile by using hobby based opinion mining in India: A case study. *Economic Research – Ekonomska Istraživanja*, *33*(1), 1889–1908. https://doi.org/10.1080/1331677X.2020.1763822

Ng, A., & Jacobstein, N. (2017, March 6). How artificial intelligence will change everything. *The Wall Street Journal*. https://www.wsj.com/articles/how-artificial-intelligence-will-change-everything-1488856320

Poggi, J. (2017, January 3). CMO's Guide to Chat bots. *Advertising Age*. http://adage.com/article/media/cmosguidechatbots/307199/

PricewaterhouseCoopers. (2017). What's next for the 2017 data science and analytics job market? *PwC*. http://www.pwc.com/us/en/publications/data-science-and-analytics.html

Roberts, K., Roberts, J. H., Danaher, P. J., & Raghavan, R. (2015). Incorporating emotions in to evaluation and choice models: Application to Kmart Australia. *Marketing Science*, *34*(6), 815–824. https://doi.org/10.1287/mksc.2015.0954

Russell, S. J., & Norvig, P. (2010). *Artificial intelligence: A modern approach* (3rd ed.). Pearson.

Rust, R. T., & Huang, M.-H. (2012). Optimizing service productivity. *Journal of Marketing*, *76*(2), 47–66. https://doi.org/10.1509/jm.10.0441

Rust, R. T., & Huang, M.-H. (2014). The service revolution and the transformation of marketing science. *Marketing Science*, *33*(2), 206–221. https://doi.org/10.1287/mksc.2013.0836

Sawhney, M. (2016, September). Putting products into services. *Harvard Business Review*, 82–89.

Schlinger, H. D. (2003). The myth of intelligence. *The Psychological Record*, *53*(1), 15–32.

Schwab, K. (2017). The fourth industrial revolution. *World Economic Forum*.

Simonite, T. (2017, January 18). AI software learns to make AI software. *MIT Technology Review*.

Soucy, P. (2016, July 7). Self-learning intelligent search, explained. *KM World*, S34.

Sternberg, R. J. (1984). Toward a triarchic theory of human intelligence. *Behavior and Brain Sciences*, *7*(2), 269–287. https://doi.org/10.1017/S0140525X00044629

Sternberg, R. J. (1997). A triarchic view of giftedness: Theory and practice. In N. Coleangelo & G. A. Davis (Eds.), *Handbook of gifted education* (2nd ed., pp. 43–53). Allyn and Bacon.

Sternberg, R. J. (1999). The theory of successful intelligence. *Review of General Psychology*, *3*(4), 292–316. https://doi.org/10.1037/1089-2680.3.4.292

Sternberg, R. J. (2005). The theory of successful intelligence. *Interamerican Journal of Psychology*, *39*(2), 189–202.

Ullal, M. S., Hawaldar, I. T., Mendon, S., & Joseph, N. R. (2020). The effect of artificial intelligence on the sales graph in Indian market. *Entrepreneurship and Sustainability Issues*, *7*(4), 2940–2954. https://doi.org/10.9770/jesi.2020.7.4(24)

Ullal, M. S., Spulbar, C., Hawaldar, I. T., Popescu, V., & Birau, R. (2021). The impact of online reviews on e-commerce sales in India: A case study. *Economic Research – Ekonomska Istraživanja*, *34*(1), 2408–2422. https://doi.org/10.1080/1331677X.2020.1865179

Vargo, S. L., & Lusch, R. F. (2004). Evolving to a new dominant logic for marketing. *Journal of Marketing*, *68*(1), 1–17. https://doi.org/10.1509/jmkg.68.1.1.24036

Vinge, V. (1993, March 30–31). Technological singularity. In *VISION-21 Symposium*. NASA Lewis Research Center and the Ohio Aerospace Institute. https://www.frc.ri.cmu.edu/~hpm/book98/com.ch1/vinge.singularity.html

Wedel, M., & Kannan, P. K. (2016). Marketing analytics for data-rich environments. *Journal of Marketing*, *80*(6), 97–121. https://doi.org/10.1509/jm.15.0413

Winkler, R. (2017, March 27). Elon Musk launches Neuralink to connect brains with computers. *The Wall Street Journal*.

Wünderlich, N. V., Wangenheim, F. V., & Bitner, M. J. (2013). High Tech and High Touch: A framework for understanding user attitudes and behaviors related to smart interactive services. *Journal of Service Research*, *16*(1), 3–20. https://doi.org/10.1177/1094670512448413

Xiao, L., & Ding, M. (2014). Just the faces: Exploring the effects of facial features in print advertising. *Marketing Science*, *33*(3), 338–352. https://doi.org/10.1287/mksc.2013.0837

Yoo, J., & Arnold, T. J. (2016). Frontline employee customer-oriented attitude in the presence of job demands and resources: The influence upon deep and surface acting. *Journal of Service Research*, *19*(1), 102–117. https://doi.org/10.1177/1094670515589956

APPENDIX

In level 1 the relative importance of physical intelligence increases and all the other increases.

Explanation:

$$dP^*(t)/dt = SUM(t)(dP(t)/dt) - P(t)\ (dSUM(t)/dt), \quad (1)$$

when dSUM (t)/dt = dP(t)/dt.

Then, the equation becomes

$$dP^*(t)/dt = (SUM(t) - P(t))\ (dP(t)/dt). \quad (2)$$

Thus $dP^*(t)/dt < 0$

$$dL^*(t)/dt = SUM(t)\ (dL(t)/dt) - L(t)(dSUM(t)/dt) \quad (3)$$

$dP(t)/dt = 0$

we thus get

$$dP^*(t)/dt > 0. \quad (4)$$

The equations for natural and compassion intelligence similarly are

$dN^*(t)/dt > 0$

$dC^*(t)/dt > 0.$

Level 2: The importance of physical and logical intelligence reduces but the next two increases.

Explanation:

To get $dP^*(t)/dt$,

$dSUM\ (t)/dt = d(P(t)/dt + dL(t)/dt.$

Thus we get,

$$dP^*(t)/dt = (SUM(t) - P(t))(d(P(t)/dt) - P(t)(dL(t)/dt). \quad (5)$$

As, N(t) = 1, C(t) = 1.

Hence,

$$dP^*(t)/dt = -2k \exp(-kt) < 0. \quad (6)$$

So,

$$dL^*(t)/dt = SUM(t) - L(t)\ (dL(t)/dt) - L(t)\ (dP(t)/dt) = -2k \exp(-k(t-T1)) < 0 \quad (7)$$

$$dN^*(t)/dt = (SUM(t))dN(t)/dt) - N(t)(dSUM(t)/dt) \quad (8)$$

$dN(t)/dt = 0,$

$dN^*(t)/dt > 0.$

Level 3: Physical, logical, natural intelligence decline but compassion intelligence increase

Proof:

Since C(t) = 1,

$$dSUM(t)/dt = dP(t)/dt + dL(t)dt + dN(t)/dt. \quad (9)$$

Using Equation L1, we get:

$$dP^*(t)/dt = (SUM(t) - P(t)\ (d(P(t)/dt - P(t)\ (d(L(t)/dt + dN(t)/dt) = (L(t) + N(t) + 1)\ (d(P(t)/dt) - P(t)\ (d(L(t)/dt) + dN(t)/dt) \quad (10)$$

$$dL^*(t)/dt = (SUM(t) - L(t)\ (d(L(t)/dt) - L(t)\ (d(P(t)/dt + dN(t)/dt) = (P(t) + N(t) + 1)\ (d(L(t)/dt) - L(t)\ (d(P(t)/dt + dN(t)/dt). \quad (11)$$

The first term is higher than the third because of which the expression is positive, and that dL t = dt < 0. dN t = dt is similar, so $dN^*(t) < 0$.

P(t), L(t) and N(t) is reducing and C(t) is increasing.

Level 4: All intelligence-based jobs are replaced with compassion being the only level with importance. The solutions of equations 5 through 8 are negative which shows all jobs at various levels of intelligence will get replaced.

$$t - T3 < t - T2 < t - T1 < t,$$

that P(t) > L(t) > N(t) > C(t), which ensures that compassion-based jobs are retained over others.

Level 5: Level of complete replacement of human jobs by AI

$$P(t) = \exp(-kt), \text{ for } t > 0; \quad (12)$$

$$L(t) = \exp(-k(t - T1)) \text{ for } t > T1; \quad (13)$$

$$N(t) = \exp(-k(t - T2)) \text{ for } t > T2; \quad (14)$$

$$C(t) = \exp(-k(t - T3)) \text{ for } t > T3. \quad (15)$$

The expression limit is 0 as t goes to infinity proving that in the long run all the jobs will be replaced by humans.

Assuming the same rate of replacement across all levels of intelligence.

Let k1, k2, k3, and k4 be the rates at which jobs are taken over by AI of physical, logical, natural, and compassion respectively.

Level 2a: The relative importance of physical and logical intelligence decreases, natural and compassion level of intelligence increases.

$$d(P(t)/dt < 0, N(t) = 0, C(t) = 0,$$

$$d(P^*(t)/N^*(t) + C(t))/dt = d((P(t)/SUM(t))/((N(t) + C(t))/SUM(t))/dt = dP(t)/2 < 0. \quad (16)$$

For $L^*(t)$,

$$dN^*(t)/dt = d(N(t)/SUM(t))/dt = -dsum(t)/dt > 0. \quad (17)$$

This is same as $dC^*(t)/dt$.

Level 3a: Relative intelligence of compassion intelligence increases

$$dP(t)/dt < 0, C(t) = 1$$

$$d(P^*(t)/N^*(t))/dt = d((P(t)/SUM(t))/(C(t)/SUM(t))/dt = dP(t) < 0. \quad (18)$$

Similar to $L^*(t)$ and $N^*(t)$

$$d(N^*(t)/dt = d(N(t)/SUM(t))/dt = -dSUM(t)/dt > 0. \quad (19)$$

Symbol definitions:

P(t), L(t), N(t), and C(t) arephysical, logic, natural, and compassion tasks and $k > 0$ is the rate of AI job replacement

T_1, T_2, T_3 are stages of each level.