



# Changing Landscape of Recruitment Industry: A Study on the Impact of Artificial Intelligence on Eliminating Hiring Bias from Recruitment and Selection Process

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An emerging trend of implementing Artificial Intelligence (AI) technologies can be seen in such domains that were solely dominated by humans. Today, AI is utilized extensively in HR department to assist and accelerate recruitment and selection process (F.R.M., 2019. Employers Are Now Using Artificial Intelligence To Stop Bias In Hiring. [online] Analytics India Magazine. Available at: <https://analyticindiamag.com/employers-are-using-ai-stop-bias-hiring/>). This paper attempts to present the impact of AI on recruitment and selection process, incorporation of AI in eliminating unconscious biases during hiring. The study addresses the rising questions such as how AI has changed the landscape of recruitment industry, role of AI in recruitment and selection process, whether AI can help in eliminating the unconscious bias during recruitment and selection process. In order to uncover the understanding and figure out the potential solutions that AI brings to the HR process, an extensive review of literature has been carried out. It is concluded by analyzing the past contributions that AI offers potential solution to recruitment managers in optimizing the recruitment and selection process and is able to negate human biases prevalent during hiring. The future waits for augmented intelligence technologies offering better results taking over repetitive administrative jobs completely.

**Keywords:** Artificial Intelligence, Recruitment and Selection, Recruitment Industry, Unconscious Bias, Hiring Bias.

## 1. INTRODUCTION

To become one of the super powers, India is embracing Artificial Intelligence (AI) revolution at fast pace. In the era of global technology at its peak, Artificial Intelligence (AI) is composed to disrupt almost all industries. Along with data processing and big data analytics, the advancement of AI technologies also enables information processing cognitive level such as learning, perceiving, problem solving and decision making. AI have changed the way people live and work today by complementing and supplementing human intelligence [11]. The use of Cognitive technologies like "Artificial Intelligence (AI), Machine-To-Machine Learning, Robotic Process Automation, Natural Language Processing, Predictive Algorithms, and Self-Learning". Chatbots is becoming more common in recruitment industry. Tools which matches candidates to jobs through a—Fit Score based on candidate competencies are also available for assisting recruitment and selection process [2]. Yesterday style to invest in data for data analytics have leaped forward to put data into action by

leveraging AI technologies imitating human intelligence for making decisions. Not too recently, AI technology have enabled recruitment and selection process more efficiently saving time and cost [14]. Organizations can reach desired candidates with the help of AI that can automate the process of screening the application forms and also providing suggestions for making hiring decisions based on skills and experience of the candidates. Apart from cognitive processing support to recruitment industry, the most significant support is extended for eliminating the human bias that exists when employees are involved in hiring process. AI is helpful in overcoming unconscious biases in recruitment decision apart from accelerating the entire recruitment process.

## 2. OBJECTIVES OF THE STUDY

- To identify the hiring biases in recruitment and selection process.
- To analyze the role of AI in overcoming the unconscious biases during hiring.
- To study the recent trends in recruitment industry.

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### 3. METHODOLOGY

Independent academicians have attempted to synthesize their views regarding role of AI in reducing unconscious bias in hiring process and recent trends in AI by reviewing the relevant literature, recent reports, articles as well as research papers inline with similar topic. A systematic approach is followed to review available literature by firstly examining the unconscious human biases influencing recruitment and selection and then latests reports and articles about implementation of AI in recruitment process were examined. Finally, reports, articles and news regarding latest trends in AI that will supplement recruitment industry completely in coming days were studied. After the systematic study, the authors have concluded their views regarding future of Artificial Intelligence.

### 4. REVIEW OF LITERATURE

AI technology revolution have changed the way recruitment industry functions today. From sourcing to final selection of best latent across the globe is empowered by Artificial intelligence that saves time, cost and matches the job recruitment and talent more efficiently. Human intervention required for screening the job application to final selection of the candidate will be history very soon [12]. AI have become a part of recruitment industry automating the recruitment and selection process have moved ahead to its ability to obviate unconscious human biases influencing hiring process. Every human being is influenced by unconscious biases that are "mental shortcuts" used in information processing to make decisions. According to the meta-analysis study published by "PNAS (Proceedings of National Academy of Sciences of United States of America)", discrimination during hiring process remains same since decades. The study has reported about the discrimination among African-Americans and White job applicants irrespective of their qualifications. Implementation of AI technologies have offered a solution to withdraw any hindering human biases that limits the suitable candidate qualify the deserving job [13]. Some of the common human unconscious biases are:

#### 4.1. Halo Effect

The time available for the selection of an employee is limited particularly when more number of prospective candidate are there. There is a strong possibility of exhibiting halo effect during recruitment process when HR Manager may take the final decision to select a candidate based on a single trait, carrying over the positive image of single trait on other traits required to perform job task. Rather than assessing the skills and abilities objectively to perform the job, the decision is solely based on a single favorable trait. Such type of decision making is also common in performance appraisal where an employee is rated as high performer or low performer on the basis of single trait [8].

#### 4.2. Recency Bias

Recency Bias occurs when HR Manager base the final decision for selecting the candidate remembering the most recent event such as wonderful interview of the candidate that may not guarantee his/her successful work performance later post joining the organization [8]. It is similar to the situation where some employees perform better at the time of performance appraisal than throughout the year [6]. Likewise during the selection process, interviewers expects the pre-conceived answers from interviewees. The answers that match to the interviewer's pre-conceived answers are selected for the job. The answers that interviewer's expects acts as an anchors or reference points which influence the decision making [13].

#### 4.3. Similarity Attraction Bias

The tendency of recruiter's to hire people who are similar to them is similarity attraction bias. Study have proved that people hire candidates who have similarities that are unrelated to job performance such as hobbies, experience in life etc.

#### 4.4. Confirmation Bias

Often candidates are asked different questions from same interviewer's is due to confirmation bias. HR Managers favor candidates who confirms their beliefs and dismiss information that are disconfirming [16].

#### 4.5. Contrast

This type of bias occurs when there is a huge difference between the performance of two or more candidates. If the first candidate perform extremely well in the interview, the expected performance from the second one will be high. There are chances that second candidate may be rejected irrespective of good performance as compared to previous candidate. Similarly an average candidate may be selected even after their poor performance. Such error is called as contrast. Such error is common in the performance appraisal of employees too [8]. Human errors in judgment, distortion in decision making, and irrationality are due to cognitive bias of the decision maker (Murata and Nakamura).

#### 4.6. Discrimination Between Insider and Outsider

For few jobs both internal as well as external candidates compete. Human tendency to select internal employee over external candidate is due to discrimination [8]. opined that such type of bias occurs due to mental blocks developed as outsiders and insiders in the mind of selectors.

### 5. ROLE OF ARTIFICIAL INTELLIGENCE IN ELIMINATING HIRING BIAS

The unconscious biases based on gender, race, language can be eliminate with the use of AI in the shortlisting

process. AI not only automate the resume evaluation process at scale, analysing hundreds or resumes in short period but also it can categorise the candidates based on the provided job specification automatically [2].

According to Ref. [3], AI is playing a fundamental role in eliminating unconscious human biases in the following ways:

- **Use of data points by AI technology:** Recruitment and selection process requires to pool large set of data and analysing data at large scale. Human beings are prone to commit errors while working on large sets of data. AI technology enables the recruitment and selection process to match skills and abilities of candidates to job performance and create profile of each candidate indicating which candidate is most suitable for the job. The ability of AI algorithm that aid in selection of suitable candidate is free from any human unconscious biases analysing massive data sets objectively and testing and validating the results time and again.
- **AI programming dismiss demographic data:** AI software is being programmed in a way to eliminate demographic information from job application to be processed and analysed through AI to avoid any bias based on age, gender, race etc. It ensures that the suggestions offered by AI is free from any unconscious biases in hiring.
- **Value generation through an integrated analytical platform:** It is possible through AI. Having a robust integrated analytical platform can provide crucial insights to employers, recruiters, and even candidates themselves to help them make the right hiring decisions.
- **Superior matching for candidates:** Actively seeking new opportunities is possible with help of AI driven assessment. A proprietary engine can identify and prioritize job openings based on technical skills, cultural alignment, and the candidates' core motivators. Thus offering candidates an opportunity to understand themselves better.

Flow diagram how AI will eliminate biases:

Hiring biases	Role of AI
Halo effect i.e., selection or rejection based on one trait	AI uses an integrated approach after considering all the traits
Recency bias i.e., dependency on the recent performance or answers	AI will not consider recent performance or answers but also all the answers and complete performance of the candidate
Similarity attraction bias and confirmation biases.	AI will not have similarity events and it considers all the events equally. Thus such bias can be avoided. The same is true in case of confirmation biases also.

Hiring biases	Role of AI
Contrast	AI always look for candidate job fit rather than contrast performance of the candidates in the interview.
Discrimination between insider and outsider	AI software is being programmed in a way to eliminate all the demographic information including insider or outsider. Thus such bias can be avoided by AI

## 6. RECENT TRENDS IN RECRUITMENT INDUSTRY

Artificial Intelligence is a specialised branch of Computer Science which has the potential of creating machines which can think and act like human beings or sometimes more efficiently than human beings such as robotics, Machine learning and Machine Vision. With this potential, it can bring in more disruption in sectors like manufacturing, Information Technology, Banking and Recruitment. It is often feared by the Skeptics that there would be huge job losses across various sectors and one day machines may become smarter than human beings and rule the world. Will this happen in a recruitment industry?, let us see what is trending in recruitment industry.

### 6.1. Artificial Intelligence Based Start-ups

The number of Artificial Intelligence based Start-ups in the Recruitment Industry are growing and this trend is expected to continue in future. The Artificial Intelligence based technology platforms are capable of using big data make quick and intelligent hiring decisions as the entire process of recruitment is automated.

### 6.2. Dwindling Job Portals

The job portals like naukri.com, Monster.com are not able meet the expectations of growing number of job seekers in a highly networked and digital era, as a result of which the importance of Job portals is on the decline.

### 6.3. Social Media

Social Media such as Facebook, LinkedIn and GitHub have become almost indispensable part of our lives. The widespread usage of social media has enhanced real time interactions and networking. Crowdsourcing talent is becoming order of the day.

### 6.4. Growing Number of Freelancers

As the country is moving towards gig economy, companies are looking for Freelancers to perform specific

tasks most cost effectively. Full-time jobs are replaced by part-time jobs. Some companies like Uber and Airbnb are going that extra mile to make their workers micro entrepreneurs.

### 6.5. Loss of Weightage for Experience

In a rapidly changing world, past experience, skillsets, and qualification lose their relevance very fast. Ability to learn and adapt to the changing conditions play major role in Individual's success.

### 6.6. Benefits of Artificial Intelligence to Recruitment Industry

#### 6.6.1. Improved Efficiency

An artificial intelligence based resume parsing and matching technology improves the recruitment staff efficiency in identifying the right profiles and matching with right positions more accurately and in less time.

#### 6.7. Fast Updating of Resumes

Artificial Intelligence helps in scanning job seekers profiles and posts on Social Networks to update their resumes instantly.

But according to the recent World Bank report, 69% of jobs are under risk in India due to AI while 77% of jobs are under risk in China due to automation. Globally, the same figure is around 30% in banking industry.

## 7. CONCLUSION

The recruitment industry is continually disrupted through Artificial Intelligence. Automation in recruitment process is releasing human efforts to devote their time and efforts in understanding the desire and changing needs of the employees for employee retention thus reducing recruitment, selection and training and development cost. The next level of AI revolution will further impact white collar jobs as much as it is striking blue collar jobs today. Human intelligence that is fundamental to recruitment and selection process will be partially taken over by AI technologies due to its capability of 'unconscious bias-free' hiring process carried out at massive scale. But moving forward, as witnessed in other industries, 'Intelligence created artificially' cannot match the role of 'emotional intelligence' exhibited by HR Managers during hiring. Therefore, AI technology will keep growing in future but only to assist

and support recruitment industry to a point where it will be used as predictive analysis tool.

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Received: 30 September 2019. Accepted: 15 October 2019.



# E-Learning Adoption: An Empirical Study on App Based Learning Among Lower Primary Class Students in Karnataka Region

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The present research work essentially targets the audience who are using App based learning across Karnataka region. The core aim of the study is to identify the factors that influence the lower primary class students to opt for app based learning. The study has examined how well the students have adopted and are using the application in their day to day academic activities. By employing simple random sampling technique, a sample size of 54 respondents who are using app based learning were selected. The overall results showed that the respondents are highly satisfied with the app based learning and it has confirmed that the app based learning has helped the users enhance their academic performance.

**Keywords:** App Based Learning, Academic Performance, E-Learning, Mobile Learning.

## 1. INTRODUCTION

Like any other developing country, In India also Information Communication Technology (ICT) has been considered as a crucial component in education system. Education is one of the basic needs to every child and citizen of the country. The integration of technology in the education need of the hour. Gone are the days where chalk and talk method was being used for teaching learning. Present education system is transforming into a modern education system that includes flipped classroom, video lectures, remote classroom, live seminars etc. In spite of using myriad of ICT tools in class room students are still facing lot challenges in learning process. As all the ICT tools are not handy and user friendly, especially lower primary class children, the advent of smart phones offers at offer remarkable access to curriculum content paves the way to successful e-learning in the form of mobile learning [14]. The introduction of application model in Indian education system has led to the introduction of novel learning methods in the form e-learning or mobile learning. Innovations in mobile technology facilitates the young generation to access lot of academic content. The learning style that uses mobile technology devices to simplify and facilitate learning is called a mobile learning

by the researchers [6]. M-learning is the resulting form of e-learning and mobile learning has transformed the theoretical part of academic exploration into a real and valuable form of academic exploration [1]. Mobile learning is the latest method in learning which provide lot of advantages like cost saving, easy access, study aids, convenience and location based access [2]. The applications of mobile computing devices in the academic field varies from retrieval of information, contact and communication, assessment, learning and Personality development [8] and to enhance the learning opportunity, the mobile devices are also deployed to medical students [7]. The degree of interest and quantity of time that the school going children devote with internet and the inclination and orientation of the young children towards the usage of educational applications in digital media gives lot of scope for to supplement learning outside the school [11]. At this backdrop, the research paper explores how the "educational apps" which are developed for lower primary school children education has been adopted effectively among the targeted audience.

## 2. STATEMENT OF THE PROBLEM

Though the mobile Apps have gained its cynosure very recently, its level of adoption and penetration among people have both positive and negative impact. The sweeping

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technological change has had significant effects on the daily lives of adults and particularly its ultimate impact may be more with the children [11]. Next to gaming application in mobile technology, educational application has huge potential in the market [17]. Vast Customer base and steady education expenses made educational apps to create a huge market share [15]. Though the customer base for mobile apps are escalating at one side the challenges faced by the online educational service providers are unavoidable. Presently, educational apps are not offering a balance between the value and benefit and there is lot of bottlenecks which are limiting the penetration of educational apps. Further, majority of the App developers design a product based on their individual idea which may fail to consider the needs of users [17]. In this scenario it is very imperative to understand the level of usage and adoption pattern mobile learning among various age group. In this context the present study is an attempt to explore the adoption and usage of application based learning among lower primary class students.

### 3. THEORETICAL FRAMEWORK

The usage of mobile devices for the purpose of teaching and learning is called as mobile learning [12]. Learning through mobile is comparatively first-hand between students as its introduction has not surpassed even five years [4]. Mobile learning is meant for the people those who are not familiar with ICT tools and have an interest for e-learning. By integrating mobile learning to traditional learning methods, unenthusiastic learners are being encouraged to learn [9]. Mobile learning also provides a personalized platform for the learners to grapple ideas at their own speed [10]. Accordingly, "m-learning" aids to enhance the confidence and self-respect of the learners [5] (Vishwakarma, 2015). The mobile technology development mount ways for more users to reap the benefit of education, thereby one can enhance the academic performance for personal development [13]. Application based learning may possibly develop the respondents' potential and ability to comprehend the problems [16].

#### 3.1. Objectives of Study

- To determine the acceptance level of students of e-learning program.
- To identify the factors which influence the respondents to use learning app.
- To identify the adoption pattern of application based learning programmes students among various age group.
- To identify whether there exist significant improvements in academic performance of usage of app based learning program.
- To understand the difficulties faced by students while using the application.

## 4. RESEARCH METHODOLOGY

In order to achieve the objectives and to answer the research question a systematic methodology will be followed for the proposed study.

The study has been started with identification of problem based on review of available literature and found the best possible way to understand how problem is addressed by various researchers on the same topic. After understanding the literature, the objectives were defined. Then questionnaires were framed according to the objectives. Data collection was carried out through the digital platform. Data analysis is done through the IBM's SPSS data analysis tool. General analysis is done through the google form's graphs and charts. Finally, the findings and discussion were made upon the same.

#### 4.1. Research Design

Descriptive research design has been implemented for the research. As the study attempts to explore the various parameters like acceptance level of application based learning, effectiveness of e-learning in understanding concepts and difficulties faced by students while using the application, the descriptive research design is found to be more appropriate.

#### 4.2. Sampling Technique

Simple Random sampling technique was used to collect a sample of 54 respondents who are the users of application based learning.

#### 4.3. Sources of Data Collection

##### 4.3.1. Primary Data

The research is essentially based on first-hand information from the respondents. The required primary data has been gathered based on focus group discussion and interview schedule method. The primary information pertaining to objectives of the study has been collected from users of application based educational services. The data has been gathered using questionnaire method. The researchers have taken free will consent from participants while obtaining data.

##### 4.3.2. Reference Period of the Data to be Covered

*Time Scope:* The proposed study was conducted for a period of 3 months to effectively gather the information that successfully meets the study objectives. The data collection was carried out for a period of 2 months.

#### 4.4. Scope of the Study

The study has been conducted among lower primary class students who use apps for learning. Majority of the users who participated in the study was from across Karnataka. As the researchers found difficult to obtain the database of the opted users of educational app, the sample size is

kept 50. However, the researchers could be able to get 54 samples which was complete in all the aspects.

## 5. RESULTS AND DISCUSSION

### 5.1. Age Group

Among the user's app based learning, 27% of students belongs to 8–10-year age group and 23% students belongs to 11–14-year age group which depicts that much of app based learning methodology is prevailing among the school children. Further, among the participants the students in fourth standard have enrolled for app based education and reason for the same is the respondents needed a basic strong academic foundation.

### 5.2. Usage Pattern of Learning App

While exploring various reason for using the learning app, majority (i.e., 75%) of the respondents opined that to gain understanding of the basic and fundamental concepts they are using the learning app. Further, the respondents have also opined that they are exposed to the art of using application based learning for the past 2 years. When the respondents are expected to answer for the source of influence for learning app, majority of them think that they are

influenced by advertisement in the social media as a major source. Further, the respondents have expressed that the quality of content provided in the learning app are exemplary and need a kind of technical support while using the learning app initially.

In addition to that an attempt has been made to check whether the usage of learning app has brought a significant improvement in the academic performance of the respondents. To decipher the same, the researchers have selected the variables viz., improvements in academic score, level of understanding of basic concepts, improvement in the recollection level and increase in the duration of study time.

### 5.3. Determinants of Usage of M-Learning

To examine the challenges faced by the respondents in using mobile app, the respondents stated that connecting with the mentors is the biggest challenge faced by users while using mobile learning app.

In order to group the factors which influence the respondents to use mobile learning app, factor analysis has been used. The factors viz., Quality of content, Ease of language, Teachers in the Videos, Mentor support, Ease of usage of tablet learning, Technical support, Student portal for doubts clearing, Education Counsellors counselling session, Competitive exam preparation material and Quality of video.

Based on "Kaiser-Meyer-Olkin (KMO)" measures the "sampling adequacy" for the study is 74.5 percentage. The following Table I–III shows the results of commonalities based on the "Principal-component method" for extracting the variables into components, "total variance method" and "rotated components matrix."

All the selected 10 variables have been categorised into two components and each component have a group of factors which are correlated with each other and has influence on each other.

Based on the following Table III it can be inferred that the first group of factors viz., Teachers in the Video (0.624), Mentor Support (0.862), Technical Support

**Table I.** Commonalities: Extraction method: Principal component analysis.

Component	Parameter	Initial	Extraction
1	Quality of content	1.000	.815
2	Ease to English usage	1.000	.564
3	Teachers in the video	1.000	.684
4	Mentor support	1.000	.796
5	Ease of usage of table learning	1.000	.565
6	Technical support	1.000	.785
7	Student portal for doubts clearing	1.000	.634
8	Education councillors counselling session	1.000	.595
9	Competitive exam preparation material	1.000	.509
10	Quality of tablet and accessories	1.000	.674

Extraction method: Principal component analysis

**Table II.** Total variance explained: Extraction method: Principal component analysis.

Component	Initial eigenvalues			Extraction sum of squared loadings			Rotation sum of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	5.144	51.443	51.443	5.144	51.443	51.443	3.328	33.275	33.275
2	1.477	14.771	66.214	1.477	14.771	66.214	3.294	32.939	66.214
3	.752	7.518	73.733						
4	.672	6.715	80.448						
5	.617	6.167	86.615						
6	.439	4.390	91.005						
7	.315	3.146	94.151						
8	.267	2.672	96.822						
9	.178	1.782	98.604						
10	.140	1.396	100.000						

Extraction method: Principal component analysis

Table III. Rotated component matrix.

Component	Parameter	Component matrix*	
		Team support	Quality of material
1	Quality of content		.895
2	Ease to English usage		.693
3	Teachers in the video	.624	
4	Mentor support	.862	
5	Ease of usage of table learning		.695
6	Technical support	.815	
7	Student portal for doubts clearing	.782	
8	Education counsellors counselling session		.763
9	Competitive exam preparation material		.657
10	Quality of tablet and accessories	.807	

Extraction method: Principal component analysis

(0.815), Student portals for doubt clearing (0.782) and Quality of videos (0.807) are highly correlated with each other and the same has been named as "Team Support."

The second group of factors viz., Quality of content (0.895), Ease of Language (0.693), ease of usage of app (0.695), Education Counsellors (0.73) and material provided (0.65) are highly correlated with each other each other and same has been named as "Quality of material."

## 6. CONCLUSION

The overall results of the study indicate that among lower primary class students who are using mobile learning app, majority of them are satisfied with the usage of application and there is a scope for accelerated adoption among the children in both lower primary and upper primary group. The study has proved that the application also helped users to perform better in their academic performance. Though there exist some challenges in using the mobile learning app, the rapid technological development and through the augmented services of Telecommunication sector, mobile learning has become a valuable complement to formal learning. It has become an extension of e-learning. If m-learning can be used appropriately along with "Information and Communication Technology" the quality education among the masses can be brought in without any hindrances.

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Received: 20 September 2019. Accepted: 15 October 2019.