

Perception about Job Development and Training in Artificial Intelligence: A Study on the Basis of Educational Institutes

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[Abstract] This article aims to provide an overview on the role of skill building in AI applications in higher education through a systematic review. A detailed study was conducted with different stakeholders of selected educational institutes, which included administrators, students and their parents and of course, the teachers. They were asked questions about how the acceptance of AI in the areas of job development and training can be enhanced and about their perceptions on who should prepare employees with new AI technology for this type of training. They were also asked who should be considered accountable for accidents caused by an AI machine. Finally, they were asked to point out how the graduates or postgraduates can be at par in AI technology in the competitive global scenario. All these questions had the underlying objectives to understand the responsibility of different regulatory authorities for promoting required skills for AI applications in higher educational Institutes. The article finally suggests possible strategies the government may adopt to ensure responsibility with regard to the issues of AI, especially for higher education institutes.

[Keywords] Artificial intelligence, Higher education policies of Niti Aayog, Skilling and Re-skilling.

Introduction

Artificial Intelligence (AI) is concerned with understanding the nature of human intelligence and designing intelligent algorithm capable of performing the tasks that are said to require intelligence for a human being. Though the field of AI has been an area of extensive research since the term was coined in 1956, it has recently been used to describe various commercial applications. While AI is likely to bring substantial economic growth, it is also predicted that a number of jobs would be lost due to this automation.

A study was conducted on various issues a) the responsibility to build up skills or re-skills to adapt with AI technology, b) the means by which job development and training required for AI technology can be enhanced, c) who is considered responsible in case of an accident caused by an AI machine, and d) how the stakeholders of higher educational institutes can play an active role in job development and training in today's competitive global scenario.

Key findings are presented to address the growing and changing needs of job training and development and how they can be incorporated into the curriculum of higher education institutes. The employees, who are released by some IT companies in India and are not re-skilled, are likely to lose their jobs. Similar trends can be seen in other sectors also. How the issues of job securities of laid off employees in IT and other related sectors can be tackled are the challenges before all the stakeholders of higher education institutes.

Review of Literature

Countries around the world are becoming increasingly aware of the potential economic and social benefits of developing and applying AI. For example, China and the U.K. estimate that 26%

and 10% of their GDPs respectively will be sourced from AI-related activities and businesses by in 2030. The US, France, Japan, China, and the UK published their AI reports from November 2016 to March 2018. Building up infrastructure has been planned by various countries for creating a larger ecosystem of AI development. For building the future workforce for AI, countries are also significantly increasing the allocation of resources for Science, Technology, Engineering and Mathematics (STEM) talent development through investment in universities, paving new courses (e.g., AI and Law), and offering schemes to retrain people.

An effective education sector has the ability to transform a country through development of human resources and increased productivity. In the context of emerging countries particularly, levels of education and literacy of the population play an important role in development and overall transition towards an advanced economy. In this regard, following two issues are points of concern for Niti Aayog in the area of school education: Low retention rates and poor learning outcomes. The above scenario is a consequence of a complex interplay of the following factors:

- Multi-grade and multi-level classrooms
- Lack of interactive pedagogy and ineffective remedial instruction
- Inadequate attention / action for likely drop-outs
- Large teacher vacancies due to uneven distribution across locations
- Professional development courses / training do not cater to real needs
- Low adoption of existing technologies.

The incentive for corporate houses to participate in these areas will arise if the government ensures:

- a) Access to high quality training data
- b) Computational and physical infrastructure
- c) A chance for staff of corporate to be part of a national mission and work on challenging problems with a higher gestation period than traditional commercial problems
- d) Ability to evaluate expenditure incurred towards Corporate Social Responsibility (CSR)
- e) Gear up visibility by working on AI for social uplift directly with government institutions.

NASSCOM predicts that by 2022, a substantial 46% of the Indian workforce will be engaged in entirely new jobs that do not exist today or jobs that have radically changed skill sets (Future of Jobs in India: A 2022 Perspective, FICCI, NASSCOM and EY Study paper, September 15, 2017). Other sources estimate that demand for AI and machine learning specialists in India is expected to see a 60% rise by 2018 (KellyOCG, Times Of India 17th August,2017). In the data domain, an independent study (FICCI Report on Future of Jobs and its implications on Indian Higher Education, November 2016) estimated that India will face a demand-supply gap of 0.2 million data analytics professionals by 2020.

Impact on skill-based jobs: A combination of technology and advancements in instrumentation leads to a new era of production which requires progressively less human labor. Industrial automation and robotics have reduced labor requirements across a number of sectors such as transport and logistics and retail, putting a substantial share of employment at risk in the future.

Impact on rule-based jobs: Rule-based jobs are more vulnerable to be automated, with the ability of simple software to complete them in a faster and efficient way with less error. As a result, many aspirational jobs in the IT, banking and financial sectors have been made redundant by the use of technology.

Impact on analysis and judgment based jobs: Advancements in AI are also threatening expertise-driven roles; however, these jobs are less susceptible to be replaced mainly due to the cognitive or human judgment elements attached to these jobs. The non-routine jobs are relatively safe. New roles are being created due to increasing automation in the middle level rule-based jobs. Re-skilling of the current workforce will require integration with relevant skilling initiatives, building of new platforms that can enable improved learning, and innovative methods of allowing large scale employment generation through promotion of AI.

Objectives of the Study

The study objectives are

- 1) To understand who should be responsible to prepare the employees with skills or re-skills to adapt with new AI technology in the workplace.
- 2) To evaluate various means by which job development and training for AI can be enhanced.
- 3) To understand who is responsible in the event of an accident caused by an AI machine.
- 4) To evaluate general opinions of the stakeholders regarding quality of job development and training in India keeping in mind the competitive global scenario.

Research Method

The respondents for this study were: a) Age- below 20 years-2%, 21-40 years-59%, 41-60 years-37% and more than 60-2%. The study was mainly conducted over engineering and management Institutes. So, it is mainly comprised of the students and teachers, parents and administrators covering two distinct age groups. b) Educational Background- Below Graduate-2%, Graduate-36%, Postgraduate-41.4%, PhD or above-20.6%.

A questionnaire was developed on Google Forms to understand various dimensions or beliefs of the different stakeholders of fifteen Management and Engineering Institutes offering UG and PG degrees, predominantly in the state of West Bengal. The stakeholders included the administrators, the students and their parents and the teachers at those institutes. There were 20 questions in total: three were marked for understanding the demographic characteristics of the participants and the remaining 17 were related to AI and its impact. The survey was well received by the respondents and the response of 119 participants was expected during the period of March 2nd to March 28th, 2020. Out of 105 responses received, only 85 were found correct and considered for analysis. The respondents were divided into subgroups based on age, background, and educational qualifications etc. to get a detail picture of views of various demographics of the Indian society on AI related issues.

On the basis of answers received from respondents, each of the questions was analyzed. Some of the answers were tested by applying various statistical tests like Correlation, Chi-square test etc. on the basis of certain hypotheses formulated at the earlier stage of the study. Mainly the Advanced Excel Statistical tools were used for different statistical tests.

Hypotheses

NH1: There is no difference of opinions regarding various reasons for public acceptance of AI and its enhancement ($\mu_1=\mu_2=\mu_3=\mu_4$)

AH1: At least one of the reasons differ with others in regard to public acceptance of AI and its enhancement ($\mu_1\neq\mu_2\neq\mu_3\neq\mu_4$)

NH2: There is no difference of opinions regarding various reasons by which India can develop job

development and training in AI technology ($\mu_1=\mu_2=\mu_3= \mu_4= \mu_5$)

AH2: At least one of the reasons differ with others in regard to opinions by which India can develop job development and training in AI technology ($\mu_1\neq\mu_2\neq\mu_3\neq\mu_4\neq\mu_5$)

Data Analysis and Findings

Objective 1

The respondents were asked who is responsible to prepare the employees with skills or re-skills to adapt with new AI technology in the workplace. They were given four options to select one out of: Employer (56.9%), Central Government (10.2%), State Government (5%), and Individual (27.9%) with percentage result in the bracket. The result clearly shows that the respondents primarily consider the employers to be responsible for building up skills or re-skills to mitigate the loss of job due to AI. They consider individuals are also responsible to adapt with the skills required in this rapidly changing AI world.

Objective 2

The respondents were given four options against the question “How public acceptance of AI can be enhanced” a) Developing trustworthy and safe AI technology, b) Making public familiar with AI technology, c) Effective interaction between AI industry and public, d) Government interventions to address public concerns. Here respondents were almost unanimous regarding the four options. We present the result below:

Table 1

Observed Frequency Distribution

	Trust	Familiarity	Ind & Public	Govt Int	Total
Strongly Agree	50	37	30	32	149
Agree	30	44	46	40	160
Neither	5	3	9	13	30
Disagree	0	0	0	0	0
Strongly Disagree	0	1	0	0	1
Total	85	85	85	85	340

We applied the Chi-square test against hypothesis 1 to understand difference of opinions (Strongly agree to strongly disagree) has any influence over the four reasons. We find the calculated chi-square value is less than the critical value at 12 degrees of freedom, 1% los. Hence we accept the null hypothesis and conclude that there are no significant differences among opinions for possible reasons of public acceptance of AI.

Table 2

Chi-Square Summary Table

Chi-Square Calculated Value	21.48535
Deg of Freedom	12
Critical Value at 12 d.f, .01 Level	26.22
Calculated Value < Critical Value	H0 has to be Accepted

Objective 3

The respondents were asked who among the following will be considered responsible in case an accident is caused by the AI machine: a) The AI machine, b) The human involved in the incident, c) The Company who has made the machine, d) The Government, e) No idea. They were asked to select one option only and the percentage in order of reasoning was: The Company who made it (40%), No idea (30%) while options a, b, and d was 5%, 20% and 5% respectively. The result clearly shows that the maker of the machine will primarily be held responsible. An interesting finding is 30% of the respondents do not want to put the blame on anybody. Differing from other categories, people between age group (41-60) and PhD holders were the protagonists of this view.

The result is quite justified if we consider the composition of two demographics- Age and Educational background. If we look at the composition of respondents, we see almost 62% of them were PG or PhD. This is probably the reason of not fixing blame on anyone for an accident.

Objective 4

The respondents were given five options to evaluate various opinions by which India can develop cutting-edge AI technology in the competitive global scenario. The options given were a) India can compete with AI development globally b) Indian Government should promote financial investment for AI development c) Tax incentives for AI developers d) An independent agency to ensure transparent AI technology e) India needs more job development, training and awareness programs on AI. We present the result below:

Table 3*Observed Frequency Distribution*

Strongly Agree	31	29	14	11	30
Agree	27	22	12	10	25
No Side	12	14	25	25	13
Disagree	8	12	20	25	9
Strongly Disagree	7	8	14	14	8
Total	85	85	85	85	85

We applied the Chi-square test against Hypothesis 2 to understand if the difference of opinions (Strongly agree to strongly disagree) has any influence over the five statements. We find the calculated chi-square value is more than the critical value at 16 degrees of freedom, 5% level of significance. Hence, we cannot accept the null hypothesis and conclude that there are significant differences among opinions by which India can develop job development and training in AI technology.

Table 4*Chi-Square Summary*

Chi-Square Calculated Value	70.72984
Deg of Freedom	16
Critical Value at 16 d.f, .05 Level	26.296
Calculated Value > Critical Value	H0 cannot be Accepted

We find quite an interesting observation for this objective. Maximum participants have agreed between two contrasting scenarios: India can compete with AI development globally but India needs more job development and training, and awareness programs on AI. In fact, the fifth statement was deliberately included in the questionnaire with this negative doctrine: “India does not have the human resources to develop cutting edge AI technology”. Promotion of financial investment by Government was accepted as a means but other two options found little favour from respondents. We used a correlation analysis to understand the dynamics between different opinions:

	<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>
Column 1	1				
Column 2	0.974623	1			
Column 3	-0.53458	-0.40219	1		
Column 4	-0.70694	-0.57349	0.934729	1	
Column 5	0.99835	0.983532	-0.50518	-0.68639	1

Broadly we have to agree with this contrasting scenario for building up the skills and re-skills required in the human resources of AI technology. In fact, through another relevant question the participants were asked to identify means of training that can empower the youth to adapt with forthcoming AI revolution. Out of the three options, their responses were Soft Skill (45%), Hard Skill (72.7%), and Coding and Programming (72.7%), which clearly identifies the prevailing gap in the areas of skill building required for quality human resources.

Suggestions and Educational Implications

On the basis of the findings of the study, following suggestions are summarized. There will be a severe decline in rule-based jobs. Hence the curriculum and pedagogy of Engineering and Management Institutes must include content which enhances judgment-based skill elements. The learners will be free to pick up life skills as per their own judgment, which they may come across during their future work life. This paradigm shift needs a transition from teaching hard skills to emphasizing the learning of cognitive thinking. This should be the approach by which the outcomes for Indian engineering and management graduates can keep pace with the global requirement. Students must be allowed to learn from anytime, anywhere courses using technological innovations even during their working life. MOOCS can be a possible solution in this regard.

Digital India and Startup India initiatives by the Government of India in this regard will build up the platform for job development and training in AI. These initiatives will automatically enhance the acceptance of AI by reversing various wrong perceptions among the stakeholders. Higher educational institutes under the leadership of parent Universities can identify various courses which will help re-skilling through job development and training. Employers will then be interested to go for collaboration with educational institutes, paving more funds for AI as a change element in India.

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Annexure

Objective 2

Chi-Square Calculation Table					Total
Obs-Exp Freq	12.75	-0.25	-7.25	-5.25	
(O-E) ²	162.5625	0.0625	52.5625	27.5625	
(O-E) ² /O [Strong agree]	3.25125	0.0016892	1.752083333	0.861328	5.866351
Obs-Exp Freq	-10	4	6	0	
(O-E) ²	100	16	36	0	
(O-E) ² /O [Agree]	3.333333	0.3636364	0.782608696	0	4.479578
Obs-Exp Freq	-2.5	-4.5	1.5	5.5	
(O-E) ²	6.25	20.25	2.25	30.25	
(O-E) ² /O [Neither]	1.25	6.75	0.25	2.326923	10.57692
Obs-Exp Freq		0.75			
(O-E) ²		0.5625			
(O-E) ² /O [Strong disagree]		0.5625			0.5625

Objective 4

Chi-Square Calculation					Total	
Table						
Obs-Exp Freq	8	6	-9	-12	7	
(O-E) ²	64	36	81	144	49	
(O-E) ² /O [Strong Agree]	2.06451613	1.2413793	5.7857143	13.09090909	1.6333333	23.81585
Obs-Exp Freq	7.8	2.8	-7.2	-9.2	5.8	
(O-E) ²	60.84	7.84	51.84	84.64	33.64	
(O-E) ² /O [Agree]	2.2533333	0.356366	4.32	8.464	1.3456	16.7393
Obs-Exp Freq	-5.8	-3.8	7.2	7.2	-4.8	
(O-E) ²	33.64	14.44	51.84	51.84	23.04	
(O-E) ² /O [No Side]	2.8033333	1.031486	2.0736	2.0736	1.772307	9.75427
Obs-Exp Freq	-6.8	-2.8	5.2	10.2	-5.8	
(O-E) ²	46.24	7.84	27.04	104.04	33.64	
(O-E) ² /O [Disagree]	5.78	0.653333	1.352	4.1616	3.737778	15.6847
Obs-Exp Freq	-3.2	-2.2	3.8	3.8	-2.2	
(O-E) ²	10.24	4.84	14.44	14.44	4.84	
(O-E) ² /O [Strong Disagree]	1.4628574	0.605	1.031428	1.03142857	0.605	4.73574