Journal of Information Technology Education: Research

An Official Publication of the Informing Science Institute InformingScience.org

JITEResearch.org

Volume 19, 2020

INHIBITING AND MOTIVATING FACTORS INFLUENCING TEACHERS' ADOPTION OF AI-BASED TEACHING AND LEARNING SOLUTIONS: PRIORITIZATION USING ANALYTIC HIERARCHY PROCESS

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ABSTRACT

Aim/Purpose	The purpose of the present study is to prioritize the inhibiting and motivating factors underlying the adoption of AI based teaching and learning solutions by teachers in the higher education sector of India.
Background	AI based teaching and learning solutions are amongst the most important educational innovations. The intervention of AI in instructional methods can result in personalized teaching and learning experiences. AI enabled teaching and learning systems can give teachers a better understanding regarding their students' learning abilities, learning styles and progress.
Methodology	The Analytic Hierarchy Process (AHP) is employed to find the relative importance of inhibiting and motivating factors. The primary data for making the pair-wise comparisons between the factors were obtained from a convenient sample of 32 teachers, teaching in various higher educational institutions (HEIs) in the National Capital Region (NCR) of Delhi, India.
Contribution	Though, the acceptance of AI based solutions has been studied in other contexts such as retail, banking, ecommerce, and so on; nonetheless, the acceptance of AI in the education sector has not grabbed much attention of researchers. Hence the study has made worthwhile contributions to the literature as it has specifically focused on the adoption of AI based teaching methods by teachers in higher education

Accepting Editor Tharrenos Bratitsis │Received: June 29, 2020│ Revised: August 19, September 8, 2020 │ Accepted: September 23, 2020.

Cite as: Gupta, K. P. & Bhaskar, P. (2020). Inhibiting and motivating factors influencing teachers' adoption of AI-based teaching and learning solutions: Prioritization using analytic hierarchy process. *Journal of Information Technology Education: Research, 19,* 693-723. https://doi.org/10.28945/4640

Findings The findings suggest that institutional barriers are the major inhibitors and recognition is the main motivator that affect teachers' behaviour towards adopting AI based teaching solutions. Overall, the findings of the study highlight the importance of institutional support in terms of resources, time, and recognition that may be provided to the teachers so that they can willingly integrate AI based methodologies into their teaching.

Recommendations for Practitioners The study provides several implications for HEIs and developers of AI based educational solutions. The HEIs should provide adequate support to their teachers in terms of financial support, infrastructure and technical support. The developers should focus on developing such solutions that are compatible with the teachers' existing work style.

Recommendations for Researchers Future studies can employ statistical techniques such as multiple regression analysis or structural equation modelling to examine the impact of these factors on the actual use behaviour of teachers regarding AI based teaching methods. More diversified samples that are statistically significant in size, can be considered to examine the teachers' behaviour regarding AI based instructional methods.

Impact on Society AI technology can play a pivotal role in reshaping and remodeling higher education. AI is the technology of todays' times that has the capability of transforming the instructional methods. The educators need to understand that nowadays, teaching and learning are heading towards creative styles that embrace the use of innovative technologies such as AI.

Future Research The adoption of AI in the field of education is at a very nascent stage in India, constant changes are likely to happen in the factors influencing the adoption of AI enabled teaching solutions. Future studies may come up with a more holistic model of factors to address this research problem.

Keywords artificial intelligence (AI), adoption, higher education, teachers, analytic hierarchy process (AHP)

INTRODUCTION

Artificial Intelligence (AI) technology is already transforming all kinds of industries from manufacturing to banking, retail, and healthcare. This is also the case with higher education sector, where this technological revolution can bring magnificent transitions, thereby benefiting all the stakeholders including students, teachers, administrative staff, and institutions (Montebello, 2018). AI can increase the level of higher education by providing numerous benefits such as automatic curriculum creation, personalized engagement with students, interactive teaching, smart content, improved learning outcomes, simplified administrative tasks and so on.

AI applications in education have received growing attention in the recent years. AI based teaching and learning solutions are amongst the most important educational innovations (Adams Becker et al., 2018). Usage of AI applications in teaching and learning is expected to grow by 43% by 2022 (Alexander et al., 2019). Governments and big private players are making huge investments in developing and implementing AI in the higher education sector. The Ministry of Human Resource Department (MHRD) (2019), India is planning to set up several national tech universities by setting up AI centers for education, research, and development. Google has invested $400 million in acquiring UK AI start-up Deep Mind. With such initiatives, it is expected that AI will have a significant impact on higher education institutions (HEIs) in the near future (Gibbs, 2014; Popenici & Kerr, 2017).

Many AI based teaching and learning solutions have been developed and adopted so far by various countries. For example, Latin American countries has adopted "Mathematics Adaptive Platform" in its national curriculum that provides personalized feedback based on the analysis of student experiences (Perera & Aboal, 2018). The Brazilian government has created "Mec Flix" which is a video content platform that prepares students for competitive examinations. Other solutions include IBM's "Watson", and "Daptio" from South Africa that uses deep analytics and provides personalized learning to teachers, and students in Africa and other developing nations. Considering the growing initiatives in the field of AI based education, different studies have highlighted the role of AI in improving teaching and learning opportunities (Luckin & Holmes, 2016; Montebello, 2018). The intervention of AI in instructional methods can result in personalized teaching and learning experiences. AI enabled teaching and learning systems can give teachers a better understanding regarding their students' learning abilities, learning styles and progress. Based on the suggestions provided by the AI enabled solutions, teachers can customize their instructional methods to their students' individual needs, thus resulting in effective and efficient teaching (Luckin & Holmes, 2016; Montebello, 2018; Pedro, et al 2019).

Despite the numerous opportunities and benefits derived from introducing AI in higher education, research on the adoption of AI based solutions in HEIs has been very limited. Most of the existing studies in the area have focused on opportunities, benefits, issues, and challenges of AI based education (Atiku & Boateng, 2020; Chitra, 2019; Hinojo-Lucena et al., 2019; Popenici & Kerr, 2017; Zawacki-Richter et al., 2019), ignoring the perspective of teachers who can play an important role in successful diffusion of AI in teaching and learning. The adoption of AI based teaching and learning applications in HEIs is much dependent on the attitude and willingness of teachers, as they are the end users who implement AI in teaching. Thus, it is imperative to understand teachers' perceptions on the key factors that influence their adoption of AI-enabled teaching and learning solutions. To do so, the present study makes an attempt to examine the key inhibitors and enablers that influence teachers to start using AI applications in higher education. The study proposes two frameworks – one encompassing the inhibiting factors or barriers that refrain teachers from adopting AI enabled teaching and learning solutions; and the other including motivating factors or enablers that encourage teachers to make use of AI applications in teaching. The Analytic Hierarchy Process (AHP) is employed in the study to find the relative importance of factors in both the proposed frameworks. Premised in the Indian context, the present study is very timely as the usage of AI in Indian HEIs is at a very nascent stage. The study also contributes to the existing body of Information and Communication Technology (ICT) adoption literature by particularly focusing on AI technology.

LITERATURE REVIEW

Artificial Intelligence (AI) is the simulation of human intelligence processes by computer systems. AI is defined as "the abilities of machines to carry out tasks by displaying intelligent, human-like behaviour; and to behave rationally by perceiving the environment and taking actions to achieve some goals" (Russell & Norvig, 2010). Expert systems, machine vision and speech recognition are some of the applications of AI. With media streaming services such as Netflix and YouTube, navigation services like Google or Apple maps, and smart assistants like Google assistant, Alexa and Siri, we have begun to interact with AI, almost on a daily basis. Several studies in the past have discussed the use of AI applications in education and teaching through computer games, simulation, virtual classrooms, and game design (Spiro et al., 2017; Timms, 2016; Du Boulay, 2016; McArthur et al., 2019; McNair, 2015). Teachers have been using AI to teach courses with the help of the classic game Pac-Man (Denero & Klein, 2010); car racing tournament (Kim & Cho, 2004), Mario (Taylor, 2011), and Angry birds (Yoon, 2015). AI based applications are being utilized for teaching in various disciplines such as mathematics (Knill et al., 2003; Balacheff, 1993), engineering (Patel, 1996), and computer programming (Yoon, 2015). HEIs strongly favor the use of AI for their curriculum development and teaching (Barik, 2013), as it combines entertainment with teaching and provides playful learning that is more effective for students (Resnick, 2004).

Research on the adoption of AI has recently gained attention in various sectors such as finance (Belanche et al., 2019), retail (Gursoy et al., 2019; Lu et al., 2019), elderly care services (Caic et al., 2018), telecom (Chen, 2019 and hospitality (Bowen & Morosan, 2018). Nonetheless, there is currently a lack of knowledge about the key factors influencing the adoption of AI by teachers in higher education sector. The perspectives of teachers on the adoption of AI in teaching and learning is very important as they are the ones who can bring AI into their classrooms. As the AI based teaching and learning solutions attempt to revolutionize higher education, the present study seeks to close this gap by proposing frameworks of inhibiting factors and motivating factors that influence teachers in HEIs to adopt AI based teaching and learning solutions. Since there is a dearth of literature on teachers' adoption of AI in education, the current research attempts to conceptualize the frameworks on the basis of extant literature on ICT adoption by teachers.

INHIBITING FACTORS

Teachers' unwillingness to adopt innovative educational technologies can be attributed to various barriers such as personal barriers, technological barriers and institutional barriers (Graham et al., 2013; Kafyulilo et al., 2015; Lawrence & Tar, 2018). Teachers face both external as well as internal challenges while integrating digital technologies into their teaching. External challenges such as low internet bandwidth, inadequate financial support, lack of ICT infrastructure, inadequate training programs, lack of technical support, ambiguous plan and policies (Al-Azawei et al., 2017) may hinder teachers' likelihood of adopting the digital technologies in education. Similarly, internal challenges such as ICT Competence (Jones, 2004; Peralta & Costata, 2007), computer self-efficacy (Holden & Rada, 2011; Knezek et al., 2000; Yuen & Ma, 2008), lack of motivation and lack of awareness (Al-Azawei et al., 2017) can refrain teachers from adopting innovative technologies.

Buabeng-Andoh (2012) argues that institution-level and system-level barriers discourage teachers to use technology in teaching processes. Haghighia and Eskandari (2012) also highlight the role of infrastructural barriers, human resource barriers, and lack of educational equipment in technology adoption by teachers. Wee and Zaitun (2006) conclude that extra time and efforts are required for integrating technology in teaching and management doesn't provide any incentive to teachers for their hardship; hence teachers are not interested in using ICT. Teacher's knowledge, skills, and attitudes also affect their use of technology in teaching. Many researchers believe that teachers' negative attitudes (Huang & Liaw, 2005) and resistance to change (Alsheibani et al., 2018) also affect their acceptance of technology and its integration into teaching. Teachers find it difficult to integrate their course contents with technology (Rizvi et al., 2017). Under such circumstances, lack of training and support acts as a major barrier for them (Rakhyoot, 2017; Alwani & Soomro, 2010). Poor technical support staff make a negative impact on teacher's willingness to integrate teaching with technology and develop negative attitude towards the use of technology into teaching (Rizvi et al., 2017). Lack of direction or leadership and vague policies added to the oppressive practices to adopting technology through ill-defined processes and procedures also develop a negative attitude in teachers towards technology adoption (Rizvi et al., 2017).

MOTIVATING FACTORS

Teachers' efforts to integrate AI into teaching are restricted by many barriers and challenges. However, the effect of these barriers can be minimized by increasing motivation among teachers to adopt technology in their regular teaching and other related tasks. Ibrahim and Nat (2019) opine that both extrinsic and intrinsic motivational factors are significant for teacher's motivation to adopt ICT. Teachers can be motivated to use ICT in teaching through recognition, promotion, and monetary rewards (Bower, 2001; Baylor & Ritchie, 2002). Ungar and Baruch (2016) also argue that if teachers are rewarded because of their digital initiatives, they feel motivated to keep using technological innovations.

Cox et al. (2000) argue that teachers feel interested in using innovative technologies because of their benefits in terms of interesting teaching and learning, improved learning outcomes and improved teaching quality. The relative advantages of using ICT in teaching encourage teachers to adopt ICT enabled teaching methodologies (Ahmad et al., 2017; Hao & Lee, 2015). Teachers who are more concerned with their teaching quality and students' feedback are more inclined to incorporate ICT into their teaching styles to make their teaching more impactful (Ragupathi & Booluck, 2007).

Teachers' self-satisfaction with their work and sense of achievement by using ICT tools (Chigona et al., 2014; Ounis, 2016) can also motivate them for using innovative technologies. Similarly, teachers who are concerned about their professional development always feel motivated to make use of digital technologies in teaching (Kusumaningrum, 2019). According to Perkmen and Cevik (2010), self-motivated teachers are personally innovative and always look for the opportunity for continuous learning for professional development.

CONCEPTUAL FRAMEWORK

Based on the extant literature, the present study has identified inhibiting and motivating factors influencing teachers' adoption of AI-enabled teaching solutions. Inhibiting factors are divided into three main categories namely, institutional barriers, technological barriers, and personal barriers. Similarly, motivating factors are divided into three main dimensions namely, recognition, educational benefits, and self-motivation. These factors are further divided into sub-factors as indicated in Table 1 (Inhibiting factors) and Table 2 (Motivating factors). All the factors along with their sub-dimensions are discussed below:

INHIBITORS OF AI-ENABLED TEACHING SOLUTIONS

Institutional barriers

Teachers' unwillingness to adopt innovative educational technologies can be attributed to various barriers such as personal barriers, technological barriers and institutional barriers (Kafyulilo et al., 2015; Lawrence & Tar, 2018)

Institutional barriers refer to barriers related to the institutional support and facilities required by teachers in adopting AI based teaching solutions. Previous researchers have identified that lack of institutional support in terms of resources, time, and support, is an important inhibiting factor in technology adoption by teachers (Lucas & Wright, 2009; Porter et al., 2014; Reid, 2014).

"Lack of availability of resources" in the institution acts as a major obstacle to the faculty members to use recent technologies such as AI (Ahmad et al., 2017). Though ICT infrastructure such as laboratories, internet services, computers, software, hardware equipment are available in HEIs; yet, it lacks proper AI-enabled teaching resources. Many institutions provide basic ICT infrastructure, but require upgrade and integration with teaching curriculum (Salem & Mohammadzadeh, 2018; Teeroovengadum et al., 2017).

Institutional support is required not only in terms of providing resources, but the institution also needs to provide "time" to learn and implement the technology (Kafyulilo et al., 2015). One of the most cited factors hindering the adoption of ICT is the "lack of time" (Kafyulilo et al., 2015; Dougherty, 2015). The preparation for an AI-enabled course requires more time than traditional delivery and can result in extra working hours and an increase in the workload. Institutions underestimate the time factor required for delivering technology-based courses (Pirani, 2004). Teachers are reluctant to adopt technology when they are required to take additional workload with their current responsibilities (Neyland, 2011; O'Quinn & Corry, 2002).

Teachers also require "technical support and training" to implement AI effectively in their instructional methods (Al-Senaidi et al., 2009). Zhao et al. (2002) draw attention to the fact that organizational arrangements are required for successful integration of technology in the classroom. Chandio et al. (2019) observe that lack of training and technical support act as a major obstacle to the teachers 'use of computer technology. Poor communication between the technical staff and teachers results in failure of educational technologies (John, 2015). Thus, teachers need to be trained in integrating the existing curriculum with AI-enabled teaching.

Technological barriers

Technological barriers are related to technical features of AI applications such as "complexity" and "compatibility". Integrating technology in teaching can be a complex process and sometimes may not be compatible with teaching courses. Rogers (2003) defines complexity as "the degree to which an innovation is perceived to be difficult to understand" and compatibility as "the degree to which an innovation is perceived as compatible with the adopters' work and values".

The difficulties faced in using AI based applications can refrain teachers from using the same. Complex AI applications that are difficult to use and understand can demotivate the teachers to integrate AI into their teaching (Sánchez-Prieto et al., 2019; Ahmad et al., 2017).

Similarly, compatibility issues linked with using AI based teaching and learning applications can pose challenges for teachers. Salem and Mohammadzadeh (2018) argue that implementing technological innovations in real teaching practices is not an easy task as teachers need to put extra efforts to align their courses and teaching material according to the requirements of the technology. John (2015) also claims that compatibility is the strongest antecedent for ICT integration in the teaching and learning process.

Personal barriers

Personal barriers are related with the individual characteristics of teachers that make many teachers skeptical and cautious about the integration of ICT in teaching.

"Lack of computer self-efficacy" is a significant determinant of teachers' levels of engagement for using ICT in their teaching. Teachers who lack confidence in using computers in their work generally try to avoid them altogether. John (2015) advocates that computer self-efficacy and computer anxiety influence the faculty's attitude towards ICT adoption in the teaching process.

"Computer anxiety" makes teachers cautious or fearful of ICT integration in their teaching. They become reluctant and have anxiety about the implications of computer usage such as losing data or making any serious mistakes (Thatcher & Perrewé, 2002).

"Lack of AI knowledge" is another factor that can act as a barrier in the path of adopting AI based teaching and learning solutions. Literature suggests that teachers may have negative attitudes towards ICT applications because of lack of ICT knowledge (Alsheibani et al., 2018; Huang & Liaw, 2005). Teachers are unaware of AI-enabled teaching solutions and don't have sufficient knowledge of integrating those in their teaching methodologies. Some teachers are aware of basic ICT but they do not consider themselves qualified to teach with technology. Due to the lack of computer competence, teachers get anxious and form negative attitudes towards ICT (Buabeng-Andoh, 2012; Albirini, 2006).

Teachers may also have "innovation resistance" as it requires a lot of effort to learn a new technology such as AI. Many researchers have reported that teachers are resistant to adopting new technologies in their teaching exercise and wish to continue with traditional approaches only (Senik & Broad, 2011; Watty et al., 2016; Zarei et al., 2014). Teachers report pedagogical challenges for designing new learning environments by integrating ICT into their courses (Schneckenberg, 2009).

Table 1: Inhibiting Factors

Factor	Sub-Factors	Focus	Referred by
Institutional barriers	Lack of resources	AI resources are unavailable or inaccessible	Ahmad et al. (2017); Beri and Sharma (2019); Kafyulilo et al. (2015); Palagolla and Wickramarachchi (2019); Pima (2019); Pima and Mtui (2017); Sahin and Thompson (2007); Tarawneh and Allahawiah (2014); Thompson (2003).
	Lack of time	Lack of time due to heavy workload	Al-Senaidi et al. (2009); Boettcher and Conrad, (2016); Dougherty (2015); Martin (2003); Palloff et al. (2001); White and Myers (2001).
	Lack of training and technical support	Non availability of training and technical support required for using AI based applications	Ahmad et al. (2017); Al-Alwani (2005); Al-Senaidi et al. (2009); Asiri et al. (2012); Buabeng-Andoh (2012); Korte and Husing (2007); Martin (2003); McLean (2005); Nicolle and Lou (2008); Singh and Hardaker (2014); Surry and Ensminger (2006); Thompson (2003); Usluel et al. (2008); Yılmaz (2011).
Technological barriers	Complexity	AI based teaching solutions are difficult to use	Agarwal and Prasad (1998); Ahmad et al. (2017); Cox et al. (2000); Kebritchi (2010); Martin (2003); Sánchez-Prieto et al. (2019).
	Compatibility	AI-based solutions are not compatible with existing teaching methods	Cox et al. (2000); Dougherty (2015); Gibson et al. (2008); Jebeile and Reeve (2003); John (2015); Karahanna et al. (2006); Kebritchi (2010); Lawrence and Tar (2018); Rogers (2003).
Personal barriers	Lack of computer self-efficacy	Lack of computer expertise to use AI-based solutions	Agarwal and Karahanna (2000); Al-Senaidi et al. (2009); Fagan et al. (2004); Hackbarth et al. (2003); John (2015); Kao and Tsai (2009); Lestari and Indrasari (2019); Rohatgi et al. (2016); Shiverdecker (2002); Vekiri and Chronaki, (2008); Wozney et al. (2006); Yuen and Ma (2008).
	Computer anxiety	the fear or apprehension felt by individuals when they used computers	Ball and Levy (2008); Fagan et al. (2004); Hackbarth et al. (2003); He and Freeman (2010); John (2015); Van Raaij and Schepers (2008); Venkatesh et al. (2003).
	Lack of AI knowledge	Lack of awareness and knowledge about AI-based teaching methods	Buabeng-Andoh, (2012); Butler and Sellbom (2002); Lawrence and Tar (2018); Oye et al. (2012); Palagolla and Wickramarachchi (2019); Pima and Mtui (2017).
	Innovation resistance	Resistance to change	Beri and Sharma (2019); Cleveland-Inne et al. (2018); Glenn (2008); Kisanga (2016); Mnyanyi et al. (2010); Rolfe et al. (2008); Sánchez-Prieto et al. (2019).

MOTIVATORS OF AI-ENABLED TEACHING SOLUTIONS

Recognition

Recognition refers to the acknowledgement of the teachers' efforts put in learning and adopting innovative teaching technologies. In the present study, recognition is sub-divided into three dimensions namely, "rewards/incentives", "credit towards promotion", and "professional prestige and status" (see Table 2).

Past research indicates that appreciation of teachers' accomplishments through rewards/incentives and promotion opportunities can encourage them to be creative and experimental in classrooms (Thompson, 2003; Ungar & Baruch, 2016). Researchers argue that rewards in terms of monetary or non-monetary incentives can motivate teachers for infusing technology into their classrooms (Baylor & Ritchie, 2002; Hadley & Sheingold, 1993).

Similarly, linking teachers' promotion with their extra efforts for using innovative educational technologies can enhance the usage of ICT in teaching and learning (Baylor & Ritchie, 2002; Cox et al., 2000). If the teachers will get credit towards promotion for using recent technologies such as AI, they will be more likely to experiment in the class by using AI-enabled teaching solutions (Chandio, 2019).

Using new technology also enhances teachers' status among colleagues and students, which make them feel more respected in society and becomes a matter of prestige as they get to feel achievements for doing something innovative in their profession (Chigona et. al., 2014; Cox et al., 2000). Thus, recognition in terms of increased prestige and status can also act as a motivating factor for teachers to adopt AI based teaching and learning solutions.

Educational benefits

AI-enabled teaching and learning is beneficial both for teachers as well as students. The educational benefits of using AI into teaching include "improvement in teaching quality" and "improvement in student learning".

Through the use of AI, teachers can have customized content that is aligned with their students' needs. The personalized, customized and interactive instructional methods can make their teaching more effective (Baylor & Ritchie, 2002). Moreover, the use of AI can assist them in content development, assignment designing, and assessments, thereby providing them sufficient time for quality teaching (Ahmad et al., 2017). Their teaching quality also gets improved as they keep on learning new technology and get updated with new trends of AI-enabled teaching solutions.

AI can also enhance students' learning by making teaching more interesting and engaging. Through the use of game technology and simulations, AI based teaching and learning solutions can provide immersive learning experiences to students. Such methods can make learning more adaptive and intuitive, thereby resulting in better performance of students (Pima, 2019; Ungar & Baruch, 2016).

Self-motivation

Self-motivation of teachers can also drive teachers to experiment with latest technologies such as AI. Self-motivation is conceptualized as a combination of "personal innovativeness", "opportunity for continuous learning" and "professional development" (see Table 2).

Teacher's personal motivation to be innovative in their teaching can stand reason for motivating them to adopt new technologies (Fong et al., 2010; Hall & Hord, 2006; Hao & Lee, 2015). Self-motivation for continuous learning can make a positive difference in the teaching and learning environment. Copriady (2014) opine that self- motivation acts as a mediator for teachers' readiness in applying ICT in teaching and learning. As technology keeps on changing, teachers also need to upgrade themselves regularly to learn new technology. Change in the technology also provides teachers with opportunities for continuous learning, which helps them in regularly upgrading their knowledge, skills, and abilities (Khatoon & Kader, 2007; Kwache, 2007).

Table 2: Motivating Factors

Factor	Sub-Factors	Focus	References
Recognition	Rewards/incentives	Monetary recognition of effort for using new technology	Baltaci-Goktalay and Ocak (2006); Dougherty (2015); Martin (2003); Mnyanyi et al. (2010); Nicolle and Lou (2008); Parker (2003); Saekow and Samson (2011); Thompson (2003); Ungar and Baruch (2016).
	Credit towards promotion	Advancement of an employee's rank or position in a hierarchical structure for using a new technology	Baylor and Ritchie, (2002); Bower (2001); Brown (1999); Cox et al. (2000); Thompson (2003).
	Professional prestige and status	Status or reputation achieved by using new technology	Baylor and Ritchie (2002); Cox et al. (2000); Kusumaningrum (2019); Thompson (2003); Ungar and Baruch (2016).
Educational benefits	Improvement in teaching quality	Up-gradation of technical knowledge, skills, and abilities	Ahmad et al. (2017); Buabeng-Andoh (2012); Hao and Lee (2015); Martin (2003); Mumtaz (2000); Nicolle and Lou (2008); Ragupathi and Booluck (2007).
	Improvement in student learning	Enhancement of students' performance	Baylor and Ritchie (2002); Buabeng-Andoh (2012); Martin (2003); Mumtaz (2000); Nicolle and Lou (2008); Pima (2019); Sheingold and Hadley (1990); Ungar and Baruch (2016).
Self-motivation	Personal innovativeness	Personal motivation to use a new technology	Baylor and Ritchie (2002); Birch and Burnett (2009); Fong et al. (2010); George et al. (2006); Hall and Hord, (2006); Hao and Lee (2015); Parker (2003); Ragupathi and Booluck (2007).
	Opportunity for continuous learning	Chance for regularly upgrading knowledge and skills	Baylor and Ritchie (2002); Buabeng-Andoh (2012); Hao and Lee (2015); Kafyulilo et al. (2015); Nicolle and Lou (2008); Pima (2019).
	Professional development	Growth in a person's professional career	Baylor and Ritchie (2002); Buabeng-Andoh (2012); Cox et al. (2000); Hsu (2016); Kisanga (2016); Korte and Husing, (2007); Kusumaningrum (2019); Nicolle and Lou (2008); Ungar and Baruch (2016).

Previous research also indicates that using ICT in teaching, provide opportunities for professional development of teachers which encourages them to make use of ICT (Hsu, 2016) and other innovative technologies such as AI (Kusumaningrum, 2019). Learning and using new educational technologies such as AI can equip teachers with latest trends of instructional methodologies thereby resulting in their professional development. Teachers can find better growth opportunities and career prospects through such self-development activities. This can encourage them to integrate AI based teaching solutions into their traditional instructional methods.

METHODOLOGY AND DATA COLLECTION

THE ANALYTIC HIERARCHY PROCESS (AHP)

We have used the AHP technique to prioritize the inhibiting and motivating factors influencing the adoption of AI-enabled teaching solutions by Indian teachers. Prior research indicates that the AHP technique has been widely used by researchers to prioritize or rank factors or dimensions in varied contexts such as service quality factors (Green & Ramroop, 2014); factors influencing organizational readiness (Sadeghi et al., 2013); factors influencing employee adoption of e-government (Gupta et al., 2017); influencing factors of the whistle-blowing intention of teachers (Gupta & Chaudhary, 2017); and factors influencing adoption on Massive Open Online Courses (Gupta, 2019). The AHP method employs pair-wise comparisons of criteria (or factors), on the basis of which the ranks or priorities of the factors are calculated. The AHP methodology includes the following steps (Saaty, 1980, 2000):

Step I: Establishing the AHP hierarchy

In this step, the decision problem is broken down into a hierarchical structure consisting of goal, criteria, sub-criteria and (or) alternatives. The present study deals with two problems: 1) prioritizing the inhibitors and 2) prioritizing the motivators. For the first problem, the goal is "to prioritize the inhibiting factors of AI adoption in teaching", which is kept at the first level of the hierarchy. The second level consists of the main inhibiting factors i.e. institutional barriers, technological barriers and personal barriers. The third level comprises of the sub-factors within each of the main inhibiting factors. Similarly, for the second problem, the goal is "to prioritize the motivating factors of AI adoption in teaching", which is kept at the first level of the hierarchy. The second level consists of the main motivating factors i.e. recognition, educational benefits, and self-motivation. The third level comprises of the sub-factors within each of the motivating factors. The AHP hierarchical structures of both problems are depicted in Figure 1 and Figure 2. Since the present study focuses only on prioritizing the factors, hence there are no alternatives in the AHP hierarchies.

Step II: Constructing pair-wise comparison matrices

In this step, the data obtained from the respondents on pair-wise comparisons of factors, are converted into reciprocative comparison matrices. The pair-wise comparisons are obtained using Saaty's nine-point scale of relative importance.

Step III: Calculating priorities (weights)

The comparison matrices obtained in step 2 are utilized to calculate the global and local priorities (weights) of factors using the weight determination technique of AHP. Global weights are associated with the main factors and local weights are associated with the sub-factors within a specific main factor.

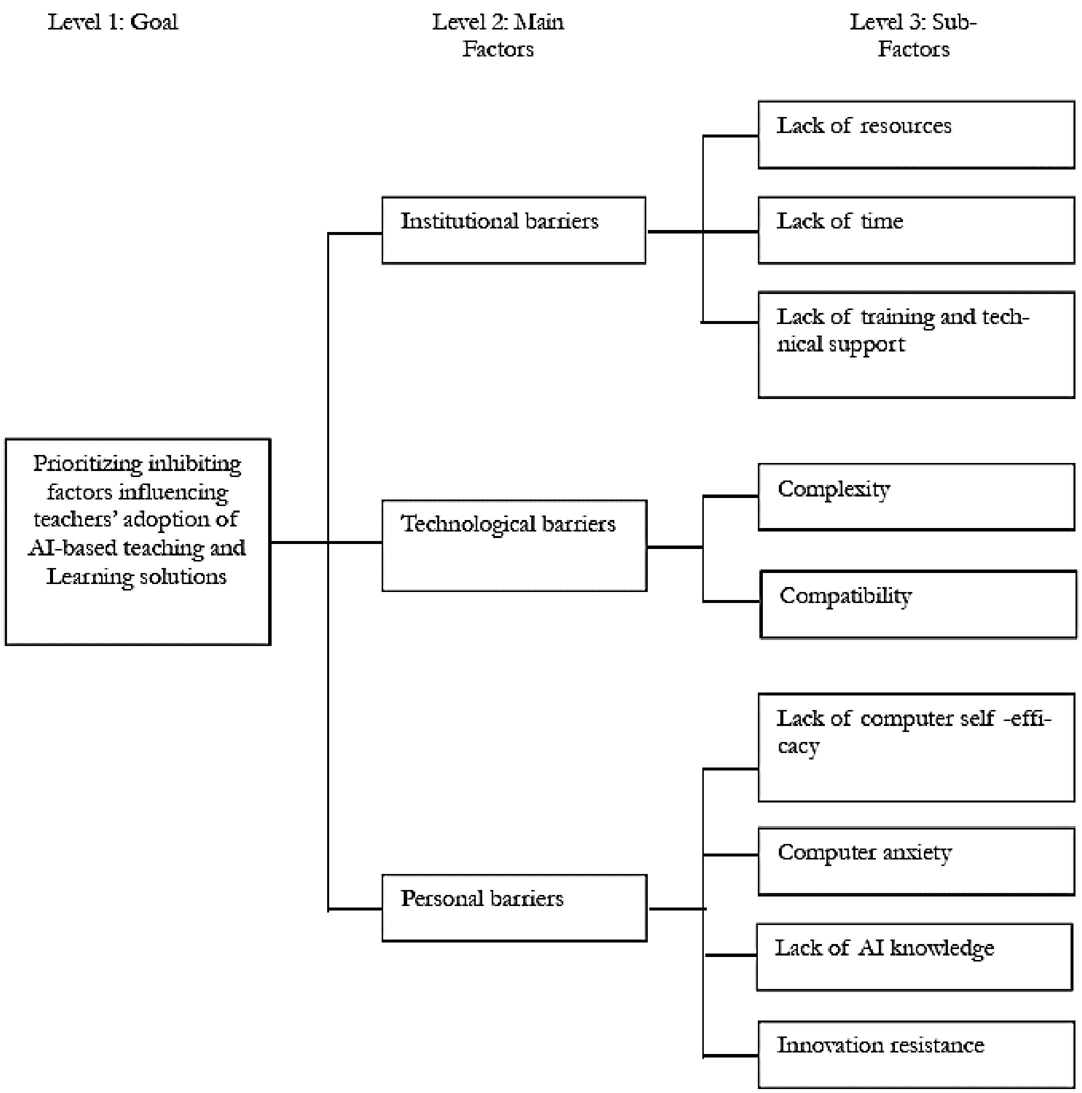

Figure 1: The AHP Hierarchy for Inhibiting Factors

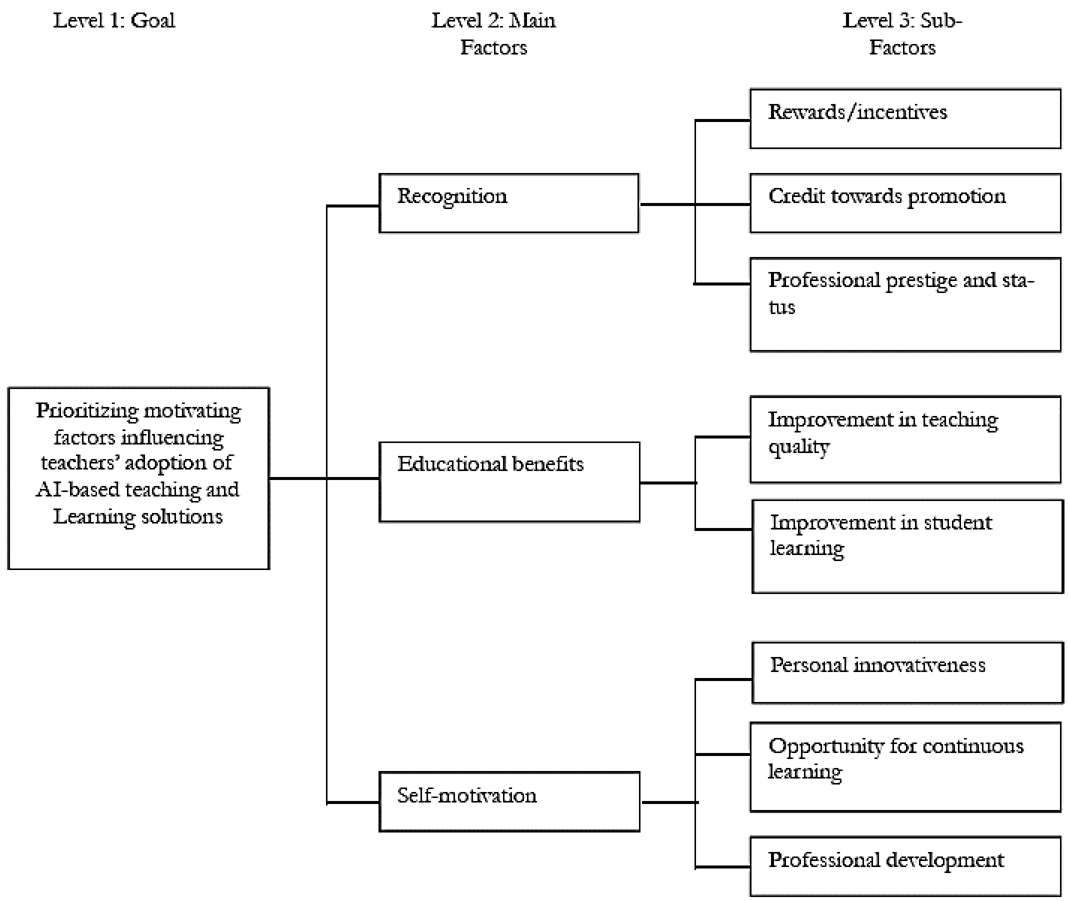

Figure 2: The AHP Hierarchy for Motivating Factors

Step IV: Consistency check

In order to ensure the reliability of the weights calculated in step 3, the consistency ratio (CR) for each comparison matrix is calculated. If the CR value is less than 0.10, then the matrix is considered to be consistent and hence the weights are deemed acceptable.

The CR is determined using the following formula:

$$CR = \frac{CI}{RI} \quad \ldots(1)$$

Here, CI is the consistency index and RI is the random consistency index. For a matrix of order n, CI is calculated using Equation (2) and RI is obtained from Table 3.

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad \ldots(2)$$

λ_{max} is calculated using Equation (3) where A is the comparison matrix and W is the corresponding weight vector.

$$AW = \lambda_{\max} W \quad \ldots(3)$$

Table 3: Table of Random Index (Saaty, 1980)

n	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.58	1.56

DATA COLLECTION

Since AHP is not a statistical technique, it is not necessary to have a significantly large sample size to employ AHP (Dias & Ioannou, 1996). Moreover, the unit of analysis in the AHP methodology are the decisions made and not the decision makers (Duke & Aull-Hyde, 2002); hence large sample sizes are not required while employing AHP technique (Shrestha et al., 2004). For the present study, the data for making the pair-wise comparisons between the factors were obtained from a sample of 32 teachers, teaching in various higher educational institutions (HEIs) in the National Capital Region (NCR) of Delhi, India. Convenience sampling was used to select the target respondents. There were 35% males and 65% females in the sample. The average age of the respondents was 36 years with a standard deviation (SD) of 1.2 years. The average teaching experience of the respondents was 6.2 years with a SD of 1.1 years.

A structured questionnaire (see Appendix A) comprising of questions on pair-wise comparisons of various inhibiting and motivating factors influencing the adoption of AI enabled teaching methods, was used to collect the data. The respondents were asked to compare the relative importance of two factors at a time, using Saaty's nine-point scale (see Appendix A).

RESULTS

The collected data on pair-wise comparisons of factors were aggregated using geometric mean method (Forman & Peniwati, 1998). MS Excel was used to apply the AHP technique for data analysis. The detailed weight analyses of inhibiting and motivating factors and their sub-dimensions are indicated in Appendix B.

Table 4 indicates the local as well as global weights of the inhibiting factors and their sub-dimensions. As can be observed from Table 4, 'institutional barriers' (weight = 0.7443) is ranked as the topmost inhibiting factor of adopting AI based teaching and learning methods. This is followed by 'technological barriers' and 'personal barriers' with weights equal to 0.1663 and 0.9894 respectively. These findings imply that the institutional barrier is the main barrier because of the non-availability of infrastructural resources and the latest educational technologies within the institutions refrain the teachers to adopt AI-based teaching and learning solutions. The technological barrier is the second important barrier. If a teacher faces technical difficulties in working with the AI-based teaching, he/she may get discouraged and hence may not use the same. Personal barriers have been found to be the third important factor that may influence adopting AI-based teaching and learning methods. Many teachers lack awareness of AI-based teaching tools and feel nervous to use innovative education technologies.

Within the 'institutional barriers', lack of resources carries the highest weight (local weight = 0.6044), followed by lack of time (local weight = 0.3302) and lack of training and technical support (local weight = 0.0654). Within the 'technological barriers', compatibility (local weight = 0.7675) is found to be more important barrier than complexity (local weight = 0.7675). Finally, amongst the four sub-dimensions of 'personal barriers', lack of AI knowledge (local weight = 0.5492) is found to be the foremost barrier whereas innovation resistance (local weight = 0.0649) is observed to be the least important barrier in adopting AI enabled teaching solutions. With regards to the global weights and overall rankings of the inhibiting factors, the findings indicate that lack of resources (global weight = 0.4499), lack of time (global weight = 0.2458), and compatibility (global weight = 0.1276) are the top 3 barriers of adopting AI enabled teaching methods and solutions. On the other hand, personal barriers such as computer anxiety (global weight = 0.0171) and innovation resistance (global weight = 0.0058) are the least important inhibitors of AI adoption in teaching and learning.

Table 4: Local and global weights of inhibiting factors

Main factors	Weights	Sub-factors	Local weights	Global weights	Overall rank
Institutional barriers	0.7443	Lack of resources	0.6044	0.4499	1
		Lack of time	0.3302	0.2458	2
		Lack of training and technical support	0.0654	0.0487	5
Technological barriers	0.1663	Complexity	0.2325	0.0386	6
		Compatibility	0.7675	0.1276	3
Personal barriers	0.0894	Lack of computer self-efficacy	0.1944	0.0174	7
		Computer anxiety	0.1915	0.0171	8
		Lack of AI knowledge	0.5492	0.0491	4
		Innovation resistance	0.0649	0.0058	9

Table 5 indicates the local as well as global weights of the motivating factors and their sub-dimensions. As indicated in the table, 'recognition' (weight = 0.7545) is the most important factor that motivates the teachers to adopt AI enabled teaching and learning solutions. 'Educational benefits' (weight = 0.1535) is found to be the second important motivator whereas self-motivation (weight = 0.0919) is observed to be the least important motivator of AI adoption in teaching. These findings imply that the teachers look for recognition in terms of monetary or non-monetary rewards for the hard work and initiative taken to integrate innovative technology with their courses. Teachers also recognize the importance of AI-based teaching and learning solutions for educational benefits because it helps in the improvement in teaching quality and student learning. Teachers give more importance to external motivation but lacks self-motivation because they don't find any personal benefits for themselves in adopting AI-based teaching and learning solutions.

Amongst the three sub-dimensions of 'recognition', rewards/incentives (local weight = 0.5366) and credit towards promotion (local weight = 0.3886) are fond to be more important motivators as compared to professional prestige and status (local weight = 0.0747). Within the two sub-dimensions of 'educational benefits', improvement in teaching quality (local weight = 0.6667) is found to be more important than improvement in student learning (local weight = 0.3333). Lastly, within the three sub-dimensions of 'self-motivation', personal innovativeness (local weight = 0.4585) carries the highest priority, followed by professional development (local weight = 0.1926) and opportunity for continuous learning (local weight = 0.0686).

The global weights of the motivating factors indicate that the top 3 factors that motivate the teachers to adopt AI enabled teaching methods are rewards/incentives (global weight = 0.4049), credit towards promotion (global weight = 0.2933) and improvement in teaching quality (global weight = 0.1024). The findings also suggest that the dimensions of self-motivation i.e. professional development (global weight = 0.0177) and opportunity for continuous learning (global weight = 0.0063) are the least motivating factors for teachers.

Table 5: Global and local weights of motivating factors

Main factors	Weights	Sub-factors	Local weights	Global weights	Overall rank
Recognition	0.7545	Rewards/incentives	0.5366	0.4049	1
		Credit towards promotion	0.3886	0.2933	2
		Professional prestige and status	0.0747	0.0564	4
Educational benefits	0.1535	Improvement in teaching quality	0.6667	0.1024	3
		Improvement in student learning	0.3333	0.0512	5
Self-motivation	0.0919	Personal innovativeness	0.4585	0.0421	6
		Opportunity for continuous learning	0.0686	0.0063	8
		Professional development	0.1926	0.0177	7

DISCUSSION

The present study has prioritized the inhibiting as well as motivating factors of adopting AI based teaching and learning solutions by teachers in higher education.

INHIBITING FACTORS

The findings of the study suggest that institutional barriers such as lack of resources and lack of time are the key hurdles that refrain teachers from adopting AI enabled teaching solutions in higher education. Without the support of their institution in terms of availability of infrastructural resources and time, teachers find it difficult to adopt AI enabled solutions in their teaching pedagogy. The findings are in consistence with those of prior research (Salem & Mohammadzadeh, 2018; Teeroovengadum et al., 2017) that indicate insufficiency of equipment and infrastructural resources as a major hurdle in applying latest educational technologies. Non-availability or lack of time is also a key barrier affecting the uptake of latest technologies in higher education. Teachers in higher educational institutions are busy with varied tasks including teaching, research and administrative activities. This leaves them with little time to engage with technological innovations such as AI. It is very difficult for already overloaded teachers to embrace new educational technologies (Watty et al., 2016).

Another issue that impede teachers' intention to incorporate AI in their teaching methods is compatibility, which is a technological barrier. Teachers resist the usage of AI in teaching if they face difficulties in aligning their teaching pedagogy with the requirements of AI. John (2015) also argued that compatibility of technology with the existing methods, is the strongest influencer of integrating ICT in teaching processes.

Findings also suggest that personal barriers including lack of computer self-efficacy, computer anxiety and personal innovativeness are relatively less important as compared to institutional and technological barriers. These findings are similar with those of John (2015) who reported computer self-efficacy and computer anxiety to be the significant determinants of ICT adoption in teaching processes. However, the findings of the present study give least weightage to such personal characteristics of teachers.

MOTIVATING FACTORS

With regards to the motivating factors, the findings indicate that teachers in higher education sector are more likely to adopt AI based teaching solutions if their efforts are well recognized by their institutions. The monetary incentives or non-monetary rewards in lieu of the hard work that they put in integrating technological innovation with their pedagogy, can motivate them for adopting educational technologies (Hadley & Sheingold, 1993) such as AI. Teachers also feel motivated for adopting AI based teaching solutions if their initiatives are linked with promotion opportunities. Our findings are in line with those of Chandio et al. (2019) who also argue that teachers' likelihood of adopting new educational technologies can be enhanced if they get recognition for the same, in the form of promotions or performance appraisals.

Besides recognition, educational benefits in terms of improvement in teaching quality is another important factor that can motivate teachers for adopting AI based teaching solutions. AI enabled teaching solutions provide teachers with customized content aligned with their students' abilities and learning styles. Moreover, by integrating AI into their teaching practices, teachers can simplify their tasks such as content building, assignment designing, evaluations and so on, thereby freeing up time for quality teaching. Hence the educational benefits of AI encourage teachers in higher education sector for adopting AI based educational innovations.

The self-motivation of teachers is found to be the least important factor that may influence teachers' adoption of AI in higher education. This can be attributed to the fact that the teachers are so occupied with teaching and administrative workloads that they fail to find self-motivation for experimenting with any technology. They are less concerned with their own learning and development as compared to other factors such as recognition and educational benefits.

CONCLUSION

AI technology can play a pivotal role in reshaping and remodeling higher education. AI is the technology of todays' times that has the capability of transforming the instructional methods. The educators need to understand that nowadays, teaching and learning are heading towards creative styles that embrace the use of innovative technologies such as AI. The present study has made an attempt to understand the main barriers and motivators that influence teachers' intention to adopt AI based teaching and learning solutions in imparting higher education within the Indian context. The study has employed the AHP technique to prioritize the inhibiting and motivating factors. The findings suggest that institutional barriers are the major inhibitors and recognition is the main motivator that affect teachers' behaviour towards adopting AI based teaching solutions. Overall, the findings of the study highlight the importance of institutional support in terms of resources, time, and recognition that may be provided to the teachers so that they can willingly integrate AI based methodologies into their teaching.

There have been several studies in the past focusing on the adoption of general ICT in teaching, however there is a dearth of studies addressing the acceptance behavior of teachers towards AI based teaching solutions. Though, the acceptance of AI based solutions has been studied in other contexts such as retail, banking, ecommerce, and so on; nonetheless, the acceptance of AI in education sector has not grabbed much attention of researchers. Hence the study has made worthwhile contributions to the literature as it has specifically focused on the adoption of AI based teaching methods by teachers in higher education. Furthermore, the study has not only addressed the barriers that inhibit the teachers to use AI enabled teaching methods, but also the motivators that encourage them to adopt the same.

PRACTICAL IMPLICATIONS

Ministry of Human Resources and Development (2020) has recently proposed a draft on National Education Policy (NEP)-2020 where the focus is made on enhancing learning and teaching through the use of innovative digital technologies. In the NEP-2020, HEIs are directed to dedicate a budget for purchasing innovative educational technologies (such as artificial intelligence, big data, virtual reality, 3D printing, robotics and so on). Though the NEP-2020 draft is pending for its approval, however HEIs can start taking initiatives from their end to transform the educational ecosystem by adopting AI-based teaching and learning solutions. The study provides several implications for HEIs in this regard. Firstly, resource constraints can hinder teachers' abilities to experiment with new technological innovations such as AI based teaching methods. Hence, higher educational institutions should provide adequate resources directed towards the development of educational technologies. Institutions can make budgetary provisions for their teachers through funding schemes or grants, in order to encourage them to adopt creative and innovative technologies for teaching purposes. Secondly, teachers in higher education sector are disinclined to adopt AI based teaching solutions because of lack of time. To become skilled in using AI based teaching solutions, teachers need to take out extra time from their schedules. Thus, institutions should try to provide sufficient time to those teachers who wish to innovate in their teaching. This can be done by reducing their administrative workload. Thirdly, institutions should provide formal technical training to their teachers and involve them in workshops where AI based teaching solutions are demonstrated. This will encourage them to adopt such innovative teaching methods. Finally, institutions should also recognize the efforts of teachers who invest their time and energy to pioneer the use of new technologies such as AI in their teaching pedagogy. These recognitions may be provided through incentives, rewards or credits in performance appraisal.

The findings of the study also provide implications for the developers of AI based teaching solutions. Firstly, it is difficult for teachers to put extra efforts for aligning their teaching material with the requirements of AI technology. Hence the developers need to develop such solutions that are compatible with the teachers' existing work style, and can be integrated in their teaching pedagogy with minimal adjustments. Secondly, developers need to ensure that AI based teaching solutions bring adequate educational benefits to the teachers in terms of improving their teaching quality.

Limitations and Scope for Further Research

Though the study has made an attempt to fill the gaps in the literature, yet it is not without limitations and there is ample scope for further research. Firstly, the inhibiting and motivating factors and their sub-dimensions considered in the study can be extended to more comprehensive hierarchies. As the adoption of AI in the field of education is at a very nascent stage in India, constant changes are likely to happen in the factors influencing adoption of AI enabled teaching solutions. Future studies may come up with more holistic model of factors to address this research problem. Secondly, the present study has used the AHP methodology wherein pair-wise comparisons between factors are made using a conceptual rating scale. As there are chances of biasing because of using such a conceptual scale, therefore due care should be taken while interpreting the relative weights of the factors. Thirdly, the present study has only prioritized the inhibiting and motivating factors of adopting AI based teaching solutions, and determined their weights through AHP. Future studies can employ statistical techniques such as multiple regression analysis or structural equation modelling to examine the impact of these factors on the actual use behaviour of teachers regarding AI based teaching methods. More diversified samples that are statistically significant in size, can be considered to examine the teachers' behaviour regarding AI based instructional methods.

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APPENDIX A: QUESTIONNAIRE

Section A

1. Please indicate your gender

   ❒ Male ❒ Female

2. Please indicate your age group

   ❒ Less than 26 years ❒ 26 years to 35 years ❒ 36 years to 45 years

   ❒ 46 years to 60 years ❒ 61 years and above

3. Please indicate your teaching experience

❒ Less than 3 years	❒ 3 years to 5 years	❒ 6 years to 10 years
❒ 11 years to 15 years	❒ 16 years to 20 years	❒ More than 20 years

Section B

In the following section, please compare two factors at a time on the basis of the relative importance of one factor over the other with regard to the Inhibiting and Motivating Factors in adoption of AI-based teaching and Learning solutions. Please rate the importance of a factor by choosing a number from the scale provided. If factor 1 is more important than factor 2, tick towards left hand side else tick toward right hand side.

Scale of Relative Importance

Intensity of Importance	**Definition**
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extremely Strong Importance
2,4,6,8	Intermediate Values (For compromise between the above values)

Inhibiting Factors in adoption of AI-based teaching and Learning solutions

Comparisons among Main Factors

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Institutional barriers																		Technological barriers
Institutional barriers																		Personal barriers
Technological barriers																		Personal barriers

Comparisons among Employee's Personal barriers

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Lack of computer self -efficacy																		Computer anxiety
Lack of computer self -efficacy																		Lack of AI knowledge
Lack of computer self -efficacy																		Innovation resistance
Computer anxiety																		Lack of AI knowledge
Computer anxiety																		Innovation resistance
Lack of AI knowledge																		Innovation resistance

Comparisons among Institutional barriers

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Lack of resources																		Lack of time
Lack of resources																		Lack of training and technical support
Lack of time																		Lack of training and technical support

Comparisons among Technological barriers

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Complexity																		Compatibility

Motivating Factors in adoption of AI-based teaching and Learning solutions

Comparisons among Main Factors

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Recognition																		Educational benefits
Recognition																		Self-motivation
Educational benefits																		Self-motivation

Comparisons among Employee's Recognition

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Rewards/incentives																		Credit towards promotion
Rewards/incentives																		Professional prestige and status
Credit towards promotion																		Professional prestige and status

Comparisons among Employee's Self-motivation

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Personal innovativeness																		Opportunity for continuous learning
Personal innovativeness																		Professional development
Opportunity for continuous learning																		Professional development

Comparisons among Employee's Educational benefits

Factor 1	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor 2
Improvement in student learning																		Improvement in teaching quality

APPENDIX B: WEIGHT ANALYSIS

Tables B1 – B4 and Tables B5 – B8 show the weight analysis of inhibiting factors and motivating factors respectively. Specifically, the Tables indicate the comparison matrices, weights and consistency tests for all the factors as well as the sub-factors included in the AHP hierarchies. As indicated in the Tables, the CR values of all the matrices are less than 0.10 which implies that the calculated weights are acceptable.

WEIGHT ANALYSIS OF INHIBITING FACTORS

Table B1: Analysis of main inhibiting factors

Factor	Institutional barriers	Technological barriers	Personal barriers	Weights	Consistency test
Institutional barriers	1.00	5.65	6.95	0.7443	λmax=3.0434 CI=0.0217 RI=0.58 CR= 0.0374<0.10
Technological barriers	0.18	1.00	2.29	0.1663	
Personal barriers	0.14	0.44	1.00	0.0894	

Table B2: Analysis of sub-factors of institutional barriers

Factor	Lack of resources	Lack of time	Lack of training and technical support	Weights	Consistency test
Lack of resources	1.00	2.29	7.65	0.6044	λmax=3.0455 CI=0.0227 RI=0.58 CR= 0.0392<0.10
Lack of time	0.44	1.00	6.32	0.3302	
Lack of training and technical support	0.13	0.16	1.00	0.0654	

Table B3: Analysis of sub-factors of technological barriers

Factor	Complexity	Compatibility	Weights	Consistency test
Complexity	1.00	0.30	0.23	λmax=2.00 CI=0.00 RI=0.00 CR= 0.00<0.10
Compatibility	3.30	1.00	0.77	

Table B4: Analysis of sub-factors of personal barriers

Factor	Lack of computer self-efficacy	Computer anxiety	Lack of AI knowledge	Innovation resistance	Weights	Consistency test
Lack of computer self-efficacy	1.00	1.00	0.26	3.91	0.19439	λmax=4.04999 CI=0.0166 RI=0.90 CR= 0.0185<0.10
Computer anxiety	1.00	1.00	0.37	2.88	0.19154	
Lack of AI knowledge	3.78	2.71	1.00	6.95	0.54918	
Innovation resistance	0.26	0.35	0.14	1.00	0.06489	

Weight Analysis of Motivating Factors

Table B5: Analysis of main motivating factors

Factor	Recognition	Educational benefits	Self-motivation	Weights	Consistency test
Recognition	1.00	6.00	7.00	0.7545	λmax=3.0326 CI=0.0163 RI=0.58 CR= 0.0281<0.10
Educational benefits	0.17	1.00	2.00	0.1535	
Self-motivation	0.14	0.50	1.00	0.0919	

Table B6: Analysis of sub-factors of recognition

Factor	Rewards/incentives	Credit towards promotion	Professional prestige and status	Weights	Consistency test
Rewards/incentives	1.00	1.59	6.32	0.5366	λmax=3.0188 CI=0.0094 RI=0.58 CR= 0.0162<0.10
Credit towards promotion	0.63	1.00	6.00	0.3886	
Professional prestige and status	0.16	0.17	1.00	0.0747	

Table B7: Analysis of sub-factors of educational benefits

Factor	Improvement in teaching quality	Improvement in student learning	Weights	Consistency test
Improvement in teaching quality	1.00	2.00	0.67	λmax=2.00 CI=0.00 RI=0.00 CR= 0.00<0.10
Improvement in student learning	0.50	1.00	0.33	

Table B8: Analysis of sub-factors of self-motivation

Factor	Personal innovativeness	Opportunity for continuous learning	Professional development	Weights	Consistency test
Personal innovativeness	1.00	4.64	3.63	0.4585	λmax=3.1068 CI=0.0534 RI=0.58 CR= 0.0921<0.10
Opportunity for continuous learning	0.22	1.00	0.33	0.0686	
Professional development	0.28	3.00	1.00	0.1926	

BIOGRAPHIES

Dr. Kriti Priya Gupta is a post-graduate in Industrial Mathematics & Computer Applications and Ph.D. in Mathematics. She is presently working as Professor with Symbiosis Centre for Management Studies, Symbiosis International (Deemed University), NOIDA. She has more than 18 years of teaching experience, including two years of industry experience with Datum Technology, New Delhi and HCL Infosystems, NOIDA. She has more than 25 research papers to her credit that have been published in various reputed National and International journals. She has conducted various training programs and workshops on topics such as "Data Analytics and Presentation Skills", "Data Analysis using SPSS", "Research Techniques in Information and Communication Technology", "Research Methods", "Statistical Analysis using AMOS", and "Data Analytics using Excel". Her research interests include Statistical Modeling, Operations Research, Decision Making Techniques, and Technology Adoption Models.

Ms. Preeti Bhaskar is working as faculty at University of Technology and Applied Sciences, Ibra, Oman. She possesses 9 years of teaching experience in the area of Human Resource Management. She is pursuing PhD from ICFAI University, Dehradun, India. Her research interest includes Technology adoption, E-government, Job performance, Job Satisfaction, sustainable development, continuing education and E-learning. She has published research papers in many reputed national and international journal and presented research papers at various conferences. She has also authored two books on "general Management" & published two case studies in Case Centre, the United Kingdom. She has also completed minor research projects sponsored by the Symbiosis international university, Pune. She is actively engaged in conducting student development programs and faculty development programs at various colleges and universities.