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Technology or Organization: What is More Important for Artificial Intelligence Adoption?

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Abstract: Artificial intelligence (AI) technology is different from all other technologies that organizations have adopted in the past. A systematic literature review revealed that technological, organizational, and environmental factors have been explored to assess an organization's readiness for adopting a new technology. In this work, we have focused on the first two factors. From many subfactors, we selected 13 subfactors based on the discussion with the domain experts. Experts also provided ranks of the two factors and their sub-factors. These ranks are used to calculate the global ranking of the factors and their sub-factors. The top three subfactors from the technology context are the following - capabilities of AI, compatibility, and complexity of AI systems. The top two subfactors from the organization context are technology infrastructure & skilled workforce and support from the top management. The results reveal that organization and technology are equally important.

Keywords: AI capabilities; R-SWARA; Systematic Literature Review; TOE framework; Top management support

1 INTRODUCTION

This article focuses on Artificial Intelligence (AI), an innovative technology. We asked 30 technically savvy adults to define AI. Following are the consolidated responses –

- Tools that are part of our daily life.
- Tools that increase our productivity, perform repetitive tasks, and reduce human effort.
- AI has a cognitive ability to perform complex tasks that involve reasoning and decision-making.

We further asked them if they use AI. Everyone gave an affirmative answer. Some went to the extent of saying that life now revolves around AI. The following AI applications were mentioned: google-assistant, ChatGPT, recommendation engines in eCommerce websites, email spam filters, movie recommendations, Instagram filters, help in coding, and check grammar. It is interesting to note that no critical application of AI was mentioned.

However, the scenario changes when adopting AI at the organizational level. AI systems provide various business benefits, such as enhancing efficiency by automating repetitive processes, better decision-making by predicting multiple business metrics, improving customer service, and content generation [2,6]. The adoption of AI in Indian financial services organizations is growing and is currently at a moderate stage [8]. The business intention for adopting AI is to enhance the efficiency of backend operations and improve customer service through interactive AI conversational agents [7, 11].

Adopting an innovation such as AI is a multistage process [26]. Some studies treat this as a three-stage process consisting of the following stages: Pre-adoption, Adoption, Post-adoption, or Usage [23]. These stages have been expanded to the following five stages: Knowledge, Persuasion, Decision, Implementation, and Confirmation [22]. During the pre-adoption phase, an organization checks its preparedness for the technology. Factors that affect an organization's readiness for adopting AI have been studied using the technology-organization-environment (TOE) framework [1, 11]. However, AI is an emergent technology, and its adoption has yet to be widely studied. The extant literature is scarce on studies determining the factors and their importance in assessing organizations' readiness. The objectives of the study are the following –

- Determine the relative importance of the technology and organization factors in affecting AI adoption intention.
- Determine if Technology and Organization are two independent realities.

We use a multicriteria decision-making approach, Rough Stepwise Weight Assessment Ratio Analysis (R-SWARA) Method [27], to obtain the weight scores of the factors affecting AI adoption intention. We perform unpaired t-tests to obtain difference between the subfactors. The literature review is presented in Section 2, the research methodology, data analysis & results in Section 3, and the discussion & conclusion in Section 4.

2 LITERATURE REVIEW

Our focus in this work is to study the relative importance of two factors, namely organization and technology, concerning an organization's readiness for adopting AI. The technology-organization-environment (TOE) [25] framework has been widely used in the literature to study an organization's readiness. We have not incorporated environmental factors because earlier studies indicate it to be a less critical construct [20]. We conducted a systematic literature review to extract subfactors of organization and technology factors that affect AI adoption intention.

2.1 Organization and Its Subfactors

An organization is an entity that is represented by its constituent. For instance, the top management is an essential constituent of an organization. With the support of top management, an organization may be able to adopt AI. There are multiple reasons for the importance of their support. The top management support would provide the required resources for AI adoption [9]. The lack of financial capability could inhibit the intention to adopt AI [9]. The financial

resources are needed to create the assets and competency to leverage the potential of AI [13]. In addition, the human resources required for adopting AI would be made available only if the management would release them from their regular task.

The top management's understanding of AI and potential risks also facilitates the adoption of AI in an organization [11]. The understanding and preparedness of the management are influenced by the existing IT infrastructure in the organization. If the organization has computational power and data storage [13], the management will likely have a positive intention towards adopting AI. The management may have an understanding of AI and may be interested in leveraging the existing infrastructure. A related subfactor, the data ecosystem consisting of adequate data security and privacy measures, positively affects AI adoption [20].

An organization with the IT infrastructure and the data ecosystem will likely have digitally skilled human resources that may positively impact AI adoption intention [24]. The right talent and digitally skilled human resources are needed to transform business processes through AI. However, employees may lack an understanding of AI's impact and may fear job security [4, 13]. The fear of change could inhibit an organization's intention to adopt AI.

One of the reasons for not adopting AI is uncertainty about the return on investment in AI due to a lack of understanding of AI technology, business needs, and technology vendors [2]. Uncertainty about the return on investment could inhibit the intention to adopt AI [2]. Clear AI-business case involves identifying suitable tasks for AI and performance evaluation matrices [26]. Assessing AI-process fit could positively affect AI adoption [13].

2.2 Technology and Its Subfactors

AI has been categorized based on its capability into three broad classes as follows:

Automation Intelligence - AI possesses automation intelligence if it can be used to automate processes. Examples of such systems include chatbots, customer service, and customer claim settlement [7]. Automation intelligence requires a large amount of training data. These are the least complex and expensive among the three variants of AI [2, 19]. Business teams may own and use automation intelligence for good ROI [15, 18].

Analytical Intelligence - Analytical AI systems create a cognitive representation of the world based on the patterns in data that represent prior learning and experience to make predictions [2, 12, 14]. Virtual insurance advisors [18], fraud detection in insurance claims [7], predicting consumer buying behaviour, and accurate actuarial modelling [2] are some of the examples of analytical intelligence.

Empathetic Intelligence - Empathetic Intelligence (a.k.a Human-Inspired AI) [12, 14] can recognize and incorporate human emotions. Despite numerous applications of empathetic intelligence [2, 12], it continues to be more of a theoretical concept. We told ChatGPT, one of the most talked about intelligent systems, the following, “The gift for my son arrived late; his birthday and party were yesterday.” The responses from ChatGPT were annoying in the least:

- Explain the situation to your son and let him know that the gift is on its way.
- Assure him that you still want to celebrate his birthday and make it special.
- Schedule another time to celebrate your son's birthday when the gift arrives.

ChatGPT has completely ignored the fact that his birthday was yesterday. Nevertheless, it has provided some useful advice.

In order to adopt AI, the organization must have a clear idea of its capability. If the organization finds a fit between AI and its business processes, the organization may be more inclined toward adopting AI. The compatibility of AI with the organization would affect AI adoption intention [1, 11]. AI systems are vulnerable to cyberattacks, adversarial data, and denial-of-service attacks [21]. The organization may want assurance of its data security and privacy while adopting AI [5].

A characteristic of AI systems that makes them unique is the lack of explainability. AI systems are often called black boxes due to lack of explainability and transparency. For instance, a linear multi-regression predictive model finds a linear relationship between independent variables and the dependent variable based on historical data. The coefficients of the independent variables are virtually meaningless, as the model might have used centering scaling and regularization techniques. Lack of explainability may inhibit an organization from adopting AI [3, 16].

The quality of data used for training AI systems is very important, i.e., it should be free of biases and prejudices [3]. These biases in AI systems could affect an organization's intention to adopt them. Adopting AI systems may be complex due to the effort required to learn and work with them [9, 11]. A related issue is trust in AI systems, especially in empathetic AI systems [10]. We summarize the discussion on factors and their subfactors in Tab. 1.

3 RESEARCH METHOD, DATA ANALYSIS & RESULTS

Our objective is to assess the relative importance of the factors, Technology, and Organization directly and through their subfactors. Our first method to establish was very simple and straightforward. We asked 20 experts to rank technology and organizations according to their relative importance in adopting AI. Half of the industry experts were from the financial services sector, and the other half were from the technology consultancy sector.

The selected experts from the consultancy services area were employed in multi-national companies with revenue exceeding $ 40 million. The financial services organizations that employed the selected experts were the leading major insurance firms in the country. The work experience of all the experts was around 15 years. The profile of all 20 experts is shown in Tab. 2.

Table 1 Subfactors of Organization and Technology factors

Factor	Subfactor	References
Organization	Top management support (O1)	[9, 11]
	Technology Infrastructure & skilled workforce (O2)	[9, 24]
	Lack of Funding (O3)	[9]
	Employee Fear of Change (O4)	[4, 13]
	Uncertainty of the Return on Investment (O5)	[2]
	Strategic alignment of AI systems & Unclear Business case (O6)	[26]
Technology	Compatibility of AI (T1)	[1, 11]
	Security and Privacy Concern (T2)	[5, 21]
	Capability of AI (T3)	[12]
	Lack of Explainability (T4)	[3, 16]
	Inherent Biases (T5)	[3]
	Complexity of AI (T6)	[9, 11]
	Anthropomorphism of AI system (T7)	[10]

Table 2 Profile of the selected experts

Expert	Job profile	Experience	Sector
E1	Technical support manager	14	Technology Solution provider
E2	Manager - IT delivery	14	Strategy & Consulting
E3	Senior manager - Digital transformation	18	IT consultancy
E4	Manager - Digital products	15	Cloud services
E5	Senior consultant - Digital transformation	15	IT consultancy
E6	Technical architect	16	IT consultancy
E7	Senior consultant - Digital transformation	14	IT consultancy
E8	Manager - Client relationship	15	Technology Solution
E9	Senior Analyst - R&D	15	IT consultancy
E10	Solutions architect	16	IT consultancy
E11	Regional manager - Marketing & Sales	14	Life Insurance
E12	Regional manager - Operations	15	Life Insurance
E13	Manager - Underwriting	14	Life Insurance
E14	Zonal manager	14	Life Insurance
E15	Divisional manager - Operations	15	General Insurance
E16	Senior manager - Claims	17	General Insurance
E17	Manager - Risk & Audit	13	General Insurance
E18	Manager - KYC & AML	14	Ecommerce - Insurance
E19	Manager - Business strategy	13	Health Insurance
E20	Manager - Customer service	15	Health Insurance

Three experts pointed out that we had left Individual and Environment out, which are also important factors. These three experts ranked Individual, Environment, Technology, and Organization factors 1, 2, 3, and 4, respectively. Respecting their opinion, we retained their ranks. All other experts ranked Technology and Organization between 1 and 2. The average ranks were 1.7 and 1.8, with standard deviations 0.98 and 0.83 for Technology and Organization, respectively. The difference between these two turned out to be insignificant at a 95% confidence level. Thus, the relative importance of technology and organization factors could not be established through this simple exercise for AI adoption.

We added the subfactors under technology and organization factors and consulted experts again to help us drop some subfactors. We started with 20 subfactors spread across Organization and Technology and reduced them to 13 with the help of experts. Experts were asked individually to rank these subfactors. Ranks were converted into weight scores using R-SWARA. Experts ranked the subfactors in order of importance. The ranks provided by 20 experts were used as the input for R-SWARA.

R-SWARA (Rough Stepwise Weight Assessment Ratio Analysis Method) [27] is a multi-criteria decision-making (MCDM) method that calculates the weights of the factors based on individual rankings. R-SWARA has been used earlier to rank the critical success factors for AI adoption in the food supply chain [4] and healthcare supply chain [17].

The analysis shows that Technology and Organization weigh 0.463 and 0.303, respectively. The weight scores based on combined individual ranks for the subfactors are also obtained using R-SWARA. These weight scores represent ranks of subfactors.

The weight scores and respective ranks for the subfactors obtained from R-SWARA are presented in Tab. 3. The high-ranking sub-factors from the technology factor were the capability of AI (T3), compatibility of AI (T1), and complexity of AI (T6). The high-ranking sub-factors from the organization factor were top management support (O1) and technology infrastructure & skilled workforce (O2) in the organization. We retained the top three sub-factors of Technology and two subfactors of Organization for further analysis.

We further investigated and assessed the impact of the technology and organization subfactors on readiness for adopting AI. When we look at AI technology standing in an organization, we feel that it is the technology that has to be ready for our organization. At the same time, when we spoke to a few technology experts and consultants, they suggested that an organization should be ready for the technology. There is a possibility that both are right.

Table 3 Ranking of affecting subfactors affecting AI adoption

Factor	Subfactor	Weight	Rank
Organization (Weight = 0.303)	Top management support (O1)	0.357	1
	Technology Infrastructure & skilled workforce (O2)	0.268	2
	Lack of Funding (O3)	0.029	6
	Employee Fear of Change (O4)	0.188	3
	Uncertainty of the Return on Investment (O5)	0.059	5
	Strategic alignment of AI systems & Unclear Business case (O6)	0.110	4
Technology (Weight = 0.463)	Compatibility of AI (T1)	0.263	2
	Security and Privacy Concern (T2)	0.113	4
	Capability of AI (T3)	0.328	1
	Lack of Explainability (T4)	0.064	5
	Inherent Biases (T5)	0.034	6
	Complexity of AI (T6)	0.183	3
	Anthropomorphism of AI system (T7)	0.017	7

We treated the selected subfactors as constructs and measured those using scales from the literature. Top management support (TMS), Technology infrastructure & skilled workforce (TI), Capability of AI (AICapa), Compatibility of AI (CB), and Complexity of AI (CX) are the constructs. Top management support (TMS) and Technology infrastructure & skilled workforce (TI) were under the organization context. The capability of AI (AICapa), compatibility of AI (CB), and complexity of AI (CX) were under the technology context.

A questionnaire was constructed, and a survey was conducted. The 7-point Likert scale was used. The respondents were professionals from the financial services sector. The questionnaire was sent to 858 professionals. A total of 327 responses were received.

Demographic profile of respondents: The respondents from the financial services sector worked as operations managers, IT systems managers, business development managers, area managers, and zonal area managers. There were 214 (65.44%) male respondents and 113 (34.55%) female respondents. Most respondents (59.02%) were from (25-34) years age group, and 23.85% of respondents were from (35-44) years age group. All the respondents had around 15 years of work experience.

The top management support (TMS) was measured using three variables, namely, TMS1: support to employees; TMS2: providing necessary resources; and TMS3: promoting AI as a strategic priority. Technology infrastructure & skilled workforce (TI) were measured using four variables, namely, TI1: high-quality data; TI2: IT infrastructure; TI3: multi-disciplinary teams; and TI4: data governance policy. The capability of AI (AICapa) was measured using three variables: AuCapa: automation capability, AnaCapa: analytical capability, and EmCapa: empathetic capability. Similarly, measurement scales for the compatibility of AI (CB) and complexity of AI (CX) were taken from the extant literature, consisting of three variables each.

They responded to measurement variables of each of the five constructs based on their perception using a 7-point Likert scale. They were providing responses to questions such as:

- Top management would provide necessary support to the employees for AI adoption.
- Our organization has high quality data.
- My organization thinks implementing AI is not simple.
- Our organization will use AI analytics for information driven decision making.
- AI will be compatible with our organization's work practices.
- My organization thinks implementing AI is not simple.

We tested convergent, divergent, and discriminant validity to check validity of our measurement scales.

The convergent and divergent validity of the measurement scales were found above the 0.7 threshold. The discriminant validity of the measurement scales was measured using the Heterotrait-monotrait ratio (HTMT). All values were below the 0.9 threshold.

A series of t-tests were performed between various pairs of measurement variables wherein one variable was taken from the Organization constructs, such as TMS1, TMS2, etc., and the other one was taken from the Technology constructs, such as AuCapa, AnaCapa, etc. A person from an organization considering adopting AI may feel that the organization will arrange the required resources, but implementing AI will be complex. On the other hand, a person from the IT industry may feel that implementing AI is not really complex, but the organization may lack resources. In order to avoid such a situation, we included personnel from the organization who were considering AI deployment. We hypothesized that most of the respondents would be assured of the readiness of their organizations and would be skeptical about AI technology. The results of comparing pairs using t-tests are shown in Table 4. The first variable belongs to the organization, and the second variable belongs to the Technology. There were 63 pairs, out of which 27 pairs showed a difference that was statistically significant. In other words, in more than half of pairs, there was no significant difference in perception of technology and organization variables. We are not able to draw a conclusion that the technology factors are more important than the organization factors.

4 DISCUSSION AND CONCLUSION

We started with the assumption that AI as a technology is probably challenging to adopt, and our respondents will help us confirm our hypothesis. The extant literature has utilized the full Technology-Organization-Environment (T-O-E) framework to assess factors that influence the readiness of an organization for AI. The T-O-E framework has been extended to the T-O-E-H framework by including Human factors [1, 9, 20]. The overall picture indicates that Technology and Organization factors dominate compared to environment and human factors.

We zoomed into the Technology and Organization factors and discovered that both are important. Our findings are in conformance with earlier findings. We discovered that capability of AI, compatibility of AI, and complexity of AI are important in affecting AI adoption. The top management support, technology infrastructure & skilled workforce in an organization are important in affecting AI adoption. If an organization has a strong IT ecosystem, the top management is positively influenced to adopt AI. These findings are also in synchronization with extant literature.

Top management support to the employees (TMS1) is significantly different from 4 variables, High-quality data (TI1) is significantly different from 5 variables, and Data ecosystem (TI4) is significantly different from 7 variables across technology subfactors. Collectively, 27 variable pairs between Organization-Technology are significantly different from each other out of a total of 63 pairs. This indicates that both technology and organizations are two realities that are significantly different from each other. The implication is that an organization should comprehend the various aspects of AI before deploying it. The focus should be on identifying

relevant capabilities of AI systems and assessing their perceived compatibility and complexity.

An organization should evaluate AI compatibility, complexity issues, and IT infrastructure. The organization should explore the technology and its appropriateness before committing to it. In brief, an organization needs to comprehend technology.

Adopting AI technology requires certain characteristics in the organization. For example, Top Management Support, the presence of a data ecosystem, and IT infrastructure are required to undertake an AI project. Thus, to adopt AI, an organization needs to pay attention to both the technology and the organizational factors.

Table 4 Result of t-tests of TMS and TI paired with CB, CX and AICapa

Organization	Technology	Two-tailed *p*-value	Conclusion
TMS1	CB1	0.0083	Statistically significant
	CX3	0.0117	Statistically significant
	AuCapa	0.0474	Statistically significant
	AnaCapa	0.0001	Very statistically significant
TMS2	CB1	0.0212	Statistically significant
	CX3	0.0281	Statistically significant
	AnaCapa	0.0001	Very statistically significant
TMS3	CB2	0.0132	Statistically significant
	AnaCapa	0.0001	Very statistically significant
	EmCapa	0.0402	Statistically significant
TI1	CB2	0.0001	Very statistically significant
	CB3	0.0303	Statistically significant
	CX1	0.004	Statistically significant
	CX2	0.0143	Statistically significant
	EmCapa	0.0001	Very statistically significant
TI2	CB2	0.0003	Very statistically significant
	CX1	0.039	Statistically significant
	AnaCapa	0.0099	Statistically significant
	EmCapa	0.0014	Statistically significant
TI3	AnaCapa	0.0001	Very statistically significant
TI4	CB1	0.0001	Very statistically significant
	CB3	0.0019	Statistically significant
	CX1	0.0254	Statistically significant
	CX2	0.007	Statistically significant
	CX3	0.0001	Very statistically significant
	AuCapa	0.0001	Very statistically significant
	AnaCapa	0.0001	Very statistically significant

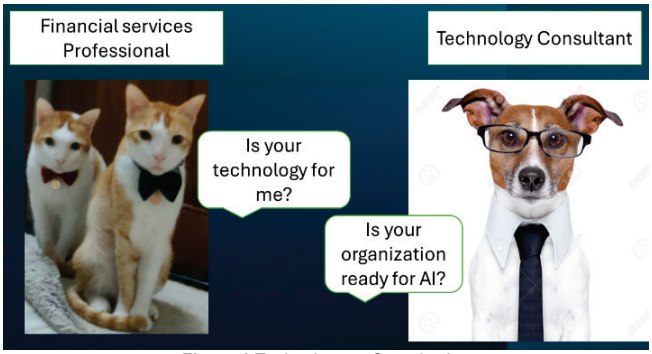

Figure 1 Technology or Organization

We discussed our findings with AI consultants informally. One of the consultants confirmed that if the top management doesn't show commitment and support, we don't undertake their AI project. In addition, we also check their existing IT infrastructure. If an organization doesn't have an IT infrastructure, we conclude that there will be a lack of understanding of AI among management and employees. This is a red flag, and we hesitate to work with such an organization. We summarize our findings in Fig. 1. Organization and IT consultants should both evaluate each other before embarking on AI deployment. When implementing new software applications in a company, it is always a problem whether to adapt the software to the company's organization or to adapt the company's organization to the software requirements. Namely, employees and managers always face covert or open resistance to change because they fear their current and future positions in the company's hierarchy.

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