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Preparedness of NAEM for 4IR based Professional Training Implementation: An Evaluation

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Abstract

The Fourth Industrial Revolution (4IR) presents both opportunities and challenges for professional training institutions worldwide, particularly in developing countries like Bangladesh. This study evaluates the institutional preparedness of the National Academy for Educational Management (NAEM) to implement 4IR-based professional training programs. Employing a mixed-methods approach, the research draws on surveys, in-depth interviews, focus group discussions, and competency assessments to examine the current status of NAEM's training courses, infrastructure, faculty readiness, and trainee digital literacy. Findings reveal that while NAEM maintains a strong tradition of professional development through programs such as the Foundation Training Course (FTC), Advanced Course on Education and Management (ACEM), and Senior Staff Course on Education and Management (SSCEM), it lacks the necessary digital infrastructure, faculty competencies, and policy frameworks to effectively integrate emerging technologies such as artificial intelligence, cloud computing, and learning management systems. The study identifies critical gaps in digital proficiency among both trainers and trainees and underscores systemic barriers, including limited institutional investment, policy inertia, and resistance to technological change. Based on the empirical findings, the article proposes a phased roadmap to transform NAEM into a 4IR-ready institution through targeted capacity-building, curriculum reform, infrastructure upgrades, and inter-institutional collaboration. The research offers policy-relevant recommendations for aligning Bangladesh's educational management training with global technological shifts, contributing to the broader vision of a Smart Bangladesh and Sustainable Development Goal 4

Key Words: Fourth Industrial Revolution (4IR), Professional Training, Institutional Readiness, Educational Technology.

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1. Introduction

The world is currently in the midst of a transformative phase driven by the Fourth Industrial Revolution (4IR), also known as Industry 4.0. This revolution, characterized by the convergence of digital, physical, and biological systems, is fundamentally altering how people live, work, and interact. Technologies such as artificial intelligence (AI), Internet of Things (IoT), big data, cloud computing, blockchain, virtual reality (VR), robotics, and advanced automation are reshaping industries, economies, and societies at an unprecedented pace. As traditional job roles evolve or become obsolete, the demand for a technology-oriented workforce continues to rise. It has become not just important but urgent to equip human resources with 4IR-based skills to ensure sustainable economic growth and societal development.

Bangladesh, a country with a demographic dividend, is uniquely positioned to harness the benefits of this technological transformation. With a significant portion of its population being young and energetic, the nation has the potential to survive and thrive in a 4IR-driven world. However, empowering the youth with the competencies required to thrive in a 4IR-driven world is essential to leverage this opportunity fully. This necessitates a paradigm shift in professional training, focusing on traditional skills, advanced digital literacy, problem-solving abilities, and adaptive learning. Bangladesh risks lagging in the competitive global economy without proper training and exposure to emerging technologies.

The National Academy for Educational Management (NAEM), under the Ministry of Education, Bangladesh, is a pioneering institution for professional training. It has long been at the forefront of providing foundation training, advanced training for educators, and leadership development programs. These programs aim to enhance the professional capacity of teachers, administrators, and education officials nationwide. However, the rapid advancement of technology demands continuous upgrades in infrastructure, curriculum, and training methodologies. As 4IR technologies reshape educational practices worldwide, NAEM must adapt to these changes to remain relevant and practical in the context of Bangladesh's 4IR transformation.

The central concern of this study is to evaluate the readiness of NAEM to implement 4IR-based professional training programs. This includes examining the institution's infrastructure, technological resources, trainers' competencies, and trainees' attitudes toward embracing new technologies. Without adequate preparation, training institutions may fail to equip professionals with the skills required for the modern workforce. Therefore, assessing the current state of preparedness at NAEM is essential for designing targeted interventions, upgrading facilities, and ensuring that trainers and trainees are ready to adopt 4IR-driven training methodologies.

This study employs a mixed-method research approach, using survey, in-depth interviews (IDIs), key informant interviews (KIIs), and focus group discussions (FGDs) with various stakeholders, including NAEM trainers, trainees, administrators, and policymakers. Document and thematic analysis also extract insights from qualitative data. NVivo software facilitates the organization and coding of data, enabling a comprehensive understanding of the institution's preparedness.

The findings of this study are crucial for policy formulation and strategic planning. The study provides practical recommendations by identifying the strengths, weaknesses, opportunities, and challenges of NAEM's capacity to deliver 4IR-integrated training programs. These recommendations contribute to bridging the skill gap, promoting quality education, and advancing socio-economic development in line with Sustainable Development Goal (SDG) 4" Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all."

As Bangladesh aspires to build a Smart Bangladesh and achieve Vision 2041, equipping its workforce with 4IR competencies is non-negotiable. Institutions like NAEM play a pivotal role in this transformation. This study seeks to illuminate the path forward, ensuring that professional training programs meet current demands and future-proof the nation's human capital. The research aims to create a state-of-the-art training ecosystem by identifying gaps and proposing actionable solutions, positioning NAEM as a leading hub for 4IR-based capacity building.

Statement of Problem

The Fourth Industrial Revolution (4IR) is reshaping global industries, including education and professional training, by introducing disruptive technologies and emphasizing the need for advanced digital competencies. In this evolving landscape, technical proficiency has become more critical than traditional skills, prompting institutions to adapt their training models accordingly. For Bangladesh, with its demographic advantage, preparing the youth for 4IR is essential to remain competitive in the global economy.

The National Academy for Educational Management (NAEM), as a central institution for professional development, plays a vital role in training educators and administrators through its FTC, ACEM, and SSCEM programs. However, the extent to which NAEM is ready to integrate 4IR technologies remains uncertain. A thorough evaluation of its infrastructure, trainers' competencies, and trainees' digital readiness is necessary to ensure the institution can deliver effective, technology-driven training.

This study addresses these gaps by assessing NAEM's preparedness to adopt 4IR-based methodologies. It also examines the challenges of integrating advanced technologies into existing training structures and identifies areas requiring policy support and institutional reform. As Bangladesh aims to become a Smart Nation, equipping its education sector with future-ready skills through institutions like NAEM is both timely and imperative.

The rationale of the study

Since a team of German scientists started Industry 4.0 in 2011, many changes have occurred in society and everyday life (Kagermann, 2014). In the 4IR, when robots and people work together to discover new possibilities, experts believe that technical competence will be crucial for developing education. According to Ebekozien et al. (2023), training institutions must conduct training based on 4IR to gain accreditation from international authorities. People in Bangladesh may have trouble finding work both at home and abroad as national and international companies quickly adopt the 4IR.

The training and professional courses offered by NAEM have been available to aspiring professionals for a long time. It is critical to ascertain if the NAEM is prepared to enhance the quality of the training for professionals based on the 4IR technologies since it has substantially transformed the skills businesses desire. We must evaluate the trainers' skills using cutting-edge technological tools to provide first-rate training to bridge the knowledge gap. This research is because it helps us learn what we do not know and how to learn it to get the benefits of 4IR. Training quality will be improved by implementing the study's recommendations and ideas using the proper 4IR-based technological tools. It makes sense for the research to evaluate the trainers' capacity to deliver excellent instruction based on 4IR and offer many recommendations for enhancing their abilities. Improving training programs might prove important to meet the Sustainable Development Goal of "Quality Education."

Objectives of the Study

The overarching objective of the research is to examine the readiness of NAEM to facilitate the 4IR-based training courses. The specific objective of the study is

1. To assess the feasibility and readiness of incorporating 4IR components into the training programs.

Research Question

Based on the research objective and the gaps identified from the literature, the following research question is formulated to guide this study:

1. What is the feasibility and readiness of using 4IR components in NAEM training programs?

Limitations of the Study

As this investigation continues, other limitations could be discovered. The study's scope is being constrained by time and budget limitations. Too little time to provide an in-depth assessment of NAEM's preparation to incorporate 4IR-supported professional training courses. Analyzing instructors' challenges in providing timely instruction on the 4IR while upholding the standards of excellent instruction will be complex. There could not have been much secondary data because this is a preliminary assessment of NAEM's preparedness for offering trainees professional development centered on the 4IR. Lack of finance is one significant issue that might restrict the investigation's reach. It is possible that insufficient financing will keep individuals from obtaining important data. Likewise, a shortage of financing would make it challenging for this study to survey and interview all the important parties. As a result, the conclusions of this investigation could not include some important details and data.

Review of Literature

Institutional Readiness in Incorporating 4IR

The readiness of educational institutions to integrate 4IR technologies is a critical determinant of their ability to provide practical training and skill development programs. Institutional readiness encompasses several dimensions: strategic planning, curriculum transformation, infrastructure development, organizational collaboration, and research initiatives. According to Al-Ghnimi et al. (2022), institutions must adopt a holistic approach to digital transformation, ensuring that all aspects of their operations align with the demands of the 4IR.

A strategic approach to digital transformation involves developing a clear vision, objectives, and action plans for integrating 4IR technologies. This includes identifying the skills required for the future workforce, designing training programs that address these skill gaps, and establishing partnerships with industry stakeholders to promote knowledge exchange and collaborative learning. Institutions must also define the characteristics of graduates they aim to produce, ensuring that learners have the technical competencies, critical thinking abilities, and adaptive skills required to thrive in the 4IR era.

Curriculum transformation is another critical aspect of institutional readiness. Traditional curricula often fail to address the demands of the 4IR, necessitating the incorporation of advanced technological concepts and interdisciplinary approaches. According to Yusuf et al. (2020), educational institutions should offer academic programs in data science, artificial intelligence, robotics, blockchain, and other 4IR-related fields. Moreover, pedagogical approaches should prioritize personalized instruction, experiential learning, and integrating digital technologies to enhance the learning experience.

The development of smart infrastructure is equally important in facilitating 4IR-based training. Intelligent classrooms, laboratories, and administrative systems can enhance the efficiency and effectiveness of training programs. For example, IoT-enabled devices can facilitate real-time monitoring of classroom activities, while cloud-based platforms enable seamless access to learning materials and collaborative tools. According to Al-Ghnimi et al. (2022), institutions with smart infrastructure are better equipped to deliver technology-driven training programs and foster innovation.

Organizational collaboration plays a vital role in promoting institutional readiness for the 4IR. Educational institutions must partner with industry stakeholders, research organizations, and government agencies to facilitate knowledge exchange, joint research initiatives, and collaborative training programs. As Cornwell and Stoddard (1999) emphasize, international collaborations can further enhance institutional capacity by exposing educators and learners to global best practices and emerging technologies.

Research and innovation are also critical components of institutional readiness. Training institutions must promote a culture of continuous learning and encourage faculty members to engage in research projects related to 4IR technologies. Access to current

research materials, participation in academic conferences, and collaboration with industry partners can further enhance institutional capacity and promote the adoption of innovative teaching methodologies.

However, institutional readiness for the 4IR is not without challenges. Limited financial resources, inadequate infrastructure, and resistance to change can hinder the adoption of technology-driven initiatives. Moreover, the lack of digital literacy among educators and learners remains a significant barrier to practical implementation. To address these challenges, institutions must adopt a phased approach to digital transformation, prioritizing investments in infrastructure, capacity-building, and stakeholder engagement.

In the context of NAEM, institutional readiness for the 4IR involves assessing the availability of technological resources, the capacity of trainers and administrators, and the overall organizational culture. This includes evaluating the current state of smart classrooms, digital platforms, and collaborative learning tools and identifying gaps in infrastructure and training methodologies. Moreover, NAEM must prioritize partnerships with industry stakeholders and research organizations to promote knowledge exchange and collaborative learning.

Ultimately, institutional readiness for the 4IR requires a comprehensive and collaborative approach that involves all stakeholders, including administrators, educators, learners, and industry partners. By investing in infrastructure, enhancing curricula, promoting research and innovation, and fostering industry collaborations, educational institutions can effectively navigate the challenges of the 4IR and deliver high-quality training programs that equip learners with future-ready skills. This approach enhances institutional capacity and promotes sustainable development and socioeconomic growth in an increasingly technology-driven world.

Methodology of the Study

Sampling

The research primarily focuses on NAEM's efficacy and readiness, so the sampling area is NAEM. The respondents comprise various stakeholders directly associated with NAEM, ensuring a comprehensive understanding of the institution's preparedness for 4IR-based training.

Firstly, NAEM administrative personnel, including Assistant Directors (ADs), Directors, Deputy Directors, Training Specialists, and other trainers are contacted for in-depth interviews and surveys. These individuals play a critical role in shaping, delivering, and managing professional training programs, making their perspectives essential for evaluating institutional readiness. Their insights help identify strengths, gaps, and opportunities for enhancing 4IR-driven training initiatives at NAEM.

In addition to NAEM personnel, the study engages policymakers and education specialists, including experts from National Academy for Planning and Development

(NAPD), Bangladesh Public Administration Training Centre (BPATC) and Bangladesh Administration Academy (BAA). These stakeholders bring valuable perspectives on national policies, strategic frameworks, and capacity-building initiatives related to 4IR integration in professional training. Their contributions are instrumental in formulating evidence-based policy recommendations for NAEM.

The total sample size for this research is 55 respondents, distributed as follows:

Table 1. Sampling Details

Type of Respondents	Samples per type
NAEM personnel (AD, Director, Deputy Directors, Training Specialists and other trainers)	40
NAPD personnel	5
BPATC personnel	5
BAA personnel	5
Total Size of Research Sample	**55**

This purposive sampling approach ensures that the study captures the views of key stakeholders involved in designing, delivering, and overseeing professional training programs at NAEM. By focusing on individuals with direct experience and expertise in the field, the research generates comprehensive insights into NAEM's current capacity, readiness, and potential for integrating 4IR-driven training methodologies.

Tools for Data Collection

As mentioned, the data collection tools are open-ended IDI, KII, and FGD questionnaires.

Representative of the Samples	Tools to Collect Data
NAEM personnel (as per the sampling), Policymakers, education specialists, AD, DD, Trainers	Open-ended IDI, KII, and FGD questionnaires
Total	**50**

The study employed a task-based competency evaluation questionnaire designed to assess the digital proficiency of NAEM trainees in key areas related to 4IR technologies. The structured questionnaire consisted of closed-ended and open-ended questions covering practical skills in digital platforms, cloud collaboration, and digital literacy. The questionnaire was divided into the following sections:

- Section 1: Google Drive Skills—The tasks included folder creation, file sharing, subfolder organization, and collaborative document editing.

- Section 2: Internet Tools and Research—The tasks involved scheduling and managing online meetings, screen sharing, and designing surveys using Google Forms.
- Section 3: Cloud Collaboration – Trainees were required to edit shared spreadsheets and upload training resources via Google Drive.
- Section 4: Presentation and Digital Literacy – Tasks included creating PowerPoint slides, designing multimedia posters using Canva, and sharing them in digital formats.
- Section 5: Open-Ended Reflection – Respondents reflected on task difficulties, resource needs, and their vision for using digital platforms in NAEM training.

Conceptual Research Framework

The primary goal of the research is to find out if NAEM has what it takes to provide training programs associated with the Fourth Industrial Revolution. The picture shows NAEM's readiness from three important angles. Examining participants' technical competence, inspiration, perceived viewpoint on learning programs, and professional development, this research assesses their attitudes and views regarding 4IR-based professional training courses. The NAEM trainers are important players because they determine how well the classes work. The trainers' level of readiness, technical skills, attitudes, traits, and perspectives on training programs based on 4IR were all evaluated in this evaluation. Evaluation of readiness to execute the 4IR is an important function of the institution. As a result, we assessed the administrative support and assets.

Theories pertinent to the study's objectives must be included throughout the conceptualization process. An exhaustive review of the research relies heavily on the conceptualization and theoretical framework. This research uses the Theory of Change and another pertinent theory, the Technology Acceptance Model. These theories provide equitable social transformation using cutting-edge technology and other proven approaches (Funnell & Rogers, 2011). The TAM hypothesis provides cause for optimism that individuals will begin to see the merit of reusing and recycling technology for educational goals (Chuttur, 2009).

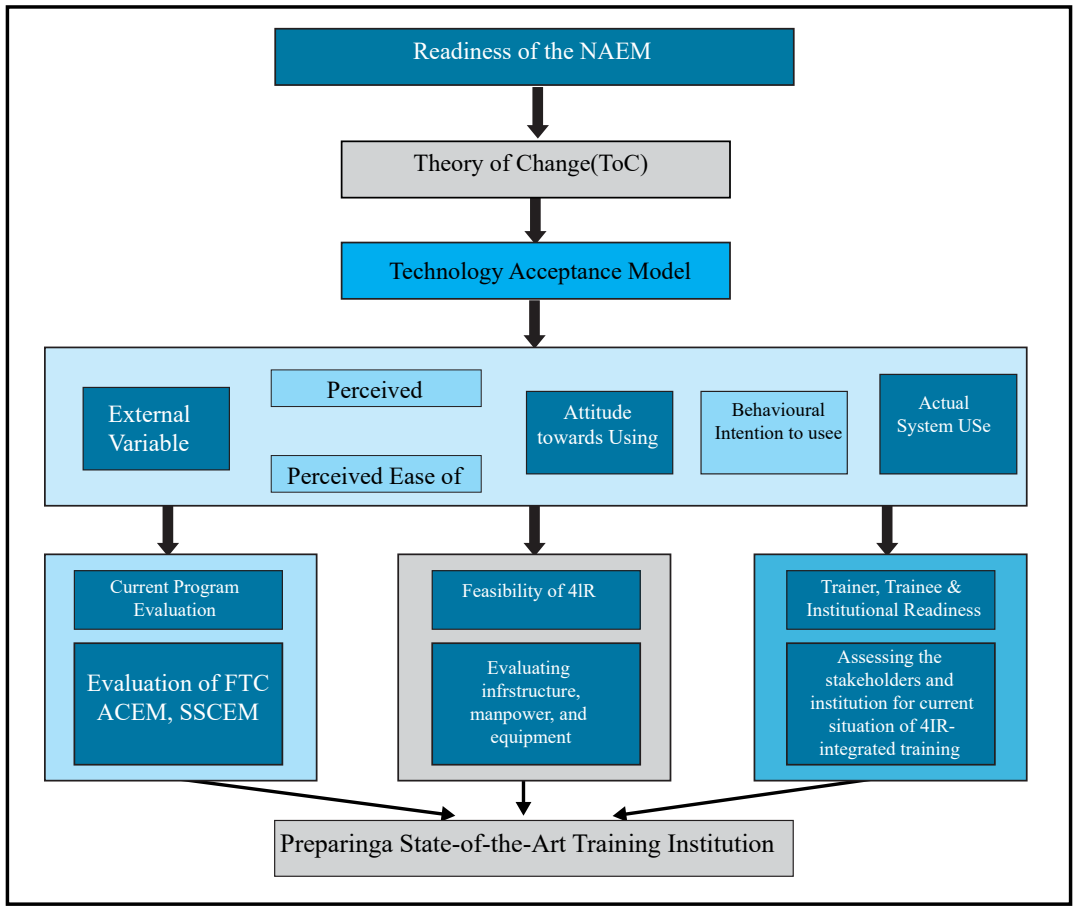

Figure 1: Conceptual Framework of the Study

It will be easier to notice the ongoing process of change associated with integrating modern technology thanks to this study's use of the ToC paradigm. The theory gets a deeper comprehension of the emotions and behaviors associated with adopting 4IR technology via the use of the TAM. In order to make surveys and interviews more relevant, it is recommended that all the relevant questionnaire criteria from this research be utilized. Finally, professional training programs equipped with 4IR will help NAEM achieve long-term sustainability and become a state-of-the-art training institution for teachers and other officials.

Findings and Discussion

Feasibility of Using 4IR Components in NAEM Training Programs

The feasibility of integrating 4IR components into NAEM's training programs depends on multiple factors, including technological infrastructure, trainer readiness, policy support, and financial viability. Based on the survey analysis, expert interviews, and document

review, the findings suggest that while there is potential for 4IR integration, several systemic challenges must be addressed before full-scale implementation can be achieved.

A primary barrier is the lack of infrastructure to support 4IR-based training. NAEM does not currently have dedicated digital learning spaces, and internet connectivity remains weak, making it difficult to conduct real-time interactive training using AI-powered platforms or virtual simulations. High-speed internet access, cloud storage solutions, and modernized classrooms are prerequisites for implementing data-driven training models.

Another major challenge is the skill gap among trainers and trainees. While trainees show interest in learning new technologies, their limited competency in digital tools poses a challenge for implementing self-paced, AI-driven learning environments. Similarly, trainers lack sufficient exposure to data analytics, virtual learning environments, and AI-powered teaching platforms, reducing their ability to effectively deliver 4IR-based training.

Policy-related constraints also hinder the scalability of technology-driven learning initiatives. Currently, NAEM's curriculum design does not mandate the integration of AI, IoT, or big data in training modules, meaning that trainers lack institutional support to experiment with these technologies. Without a structured policy framework, the adoption of 4IR technologies will remain fragmented and inconsistent.

However, there are several opportunities for successful integration. The use of AI-driven personalized learning and cloud-based data storage could help optimize training resources, track progress in real-time, and personalize learning experiences for trainees. Additionally, virtual and augmented reality (VR/AR) simulations could be introduced to enhance experiential learning, particularly in leadership and decision-making training.

The following table summarizes the feasibility assessment for integrating 4IR into NAEM's training programs:

4IR Component	Current Feasibility
AI for Personalized Learning	Limited; trainers are unfamiliar with AI-driven educational tools, but potential exists for future adoption
IoT for Interactive Training	Not feasible; lack of IoT-enabled infrastructure in training rooms
Big Data for Performance Analysis	Feasible with investment; requires cloud-based data systems and analytical tools for tracking trainee performance
Virtual Simulations (VR/AR)	Potential exists; requires investment in VR-based learning environments
Cloud-Based Learning Platforms	Moderately feasible; requires stronger internet connectivity and structured LMS integration

The findings indicate that partial adoption of 4IR technologies is feasible, but a phased approach is necessary to overcome technical, financial, and human capacity barriers. Immediate efforts should focus on digital infrastructure upgrades, faculty training, and gradual incorporation of AI-driven learning analytics before attempting full-scale implementation of 4IR-based training models.

Situation Analysis of National Academy for Planning and Development (NAPD), Bangladesh Public Administration Training Centre (BPATC) and Bangladesh Administration Academy (BAA)

The situation analysis of NAPD, BPATC, and BAA provides insights into the institutional perspectives on integrating 4IR technologies in training. The findings suggest that while there is an awareness of 4IR components, their practical implementation remains largely absent or limited to specific administrative uses rather than training applications. The responses indicate gaps in infrastructure, trainer readiness, policy support, and resistance to digital transformation.

Institution	Key Finding	Quote
NAPD	Lectures on 4IR, integration of automation technology in hostel management	"We have begun integrating 4IR concepts through lectures and have taken initial steps like automating hostel management, but broader curriculum integration is still a work in progress."
BAA	No active use of 4IR components in training, only conceptual discussions.	"Right now, there is no active integration of 4IR technologies in our training. The discussions are more about future possibilities rather than present implementation."
	There is no structured national policy on 4IR adoption in training institutions.	"No concrete government-level policy ensures the adoption of 4IR technologies in training programs, leaving institutions without clear direction."
BPATC	AI and IoT are discussed in theory, but practical use is minimal.	"AI and IoT are touched upon in our curriculum, but in reality, they are not being applied in any practical way. Most of it remains just theoretical discussion."
	Generative AI is used for lesson planning, but IoT is mostly restricted to security purposes like CCTV monitoring.	"Some faculty members use AI to prepare lesson plans, but IoT is mainly used for things like managing security cameras and vehicle tracking, not for actual training sessions."
	Trainees are interested in 4IR, but trainers and infrastructure are not ready yet.	"Trainees are quite eager to learn about 4IR, but the trainers themselves are not adequately trained, and we don't have the infrastructure to support these advancements."
	Limited funding is not a major issue, but financial incentives sometimes go to unqualified trainers.	"We don't struggle much with funding, but the issue is that some trainers with limited knowledge receive financial incentives to conduct 4IR-related sessions. This affects the quality of training."
	Resistance to change among older faculty members slows down digital adoption.	"Some senior faculty members are hesitant about adopting new technologies. They prefer traditional methods and do not see the urgency of 4IR integration."
	Internet connectivity and smart classrooms are lacking, preventing technology-based training.	"The lack of proper infrastructure, including high-speed internet and smart classrooms, is one of the biggest challenges. Without these, even the best training modules will be ineffective."

The responses highlight a critical gap between awareness and execution. While institutions recognize the importance of 4IR technologies in modern training, the lack of practical implementation stems from multiple factors. The absence of structured infrastructure means that even if there is interest among trainees, the environment is not conducive to meaningful skill development. The findings also reveal that while some faculty members experiment with AI for lesson planning, this is not a formalized practice but rather an individual effort by some trainers. IoT is primarily restricted to security management, such as CCTV and vehicle tracking, rather than hands-on learning applications.

Trainees express interest in learning about 4IR technologies, but they face barriers due to the lack of institutional readiness. A major concern is that some trainers lack the expertise to conduct effective sessions on 4IR but still receive financial incentives to do so, which reduces the overall quality of training. This raises concerns about the credibility of training sessions and the long-term impact on skill-building.

Resistance to technological change, especially among senior faculty members, further slows down the integration process. Some faculty members are comfortable with traditional teaching methods and see no urgency in adopting 4IR technologies. This reluctance contributes to the stagnation in digital transformation efforts within these institutions.

The lack of a structured policy framework at the national level is another key issue. Training institutions do not have a clear roadmap for 4IR integration, and decisions regarding digital adoption are left to individual institutions without government-mandated guidelines. This results in inconsistent adoption rates across different institutions, with some experimenting with AI while others have not incorporated any 4IR components at all.

Infrastructure challenges, including poor internet connectivity (varying around 10~80 mbps) and the absence of smart classrooms, further exacerbate the situation. Without adequate digital infrastructure, the practical application of 4IR in training remains unrealistic. Even the best-designed training modules cannot be executed effectively if the necessary technological backbone is missing.

The findings suggest that for institutions like NAEM to successfully integrate 4IR technologies, they must address these challenges holistically. This includes investing in trainer capacity-building, ensuring that financial incentives align with actual expertise, advocating for policy-level interventions, and prioritizing infrastructure development. Without these measures, the gap between theory and practice in 4IR training will continue to widen, leaving trainees unprepared for the evolving demands of the professional landscape.

Competency Assessment by Task Category

The competency assessment analysis revealed significant variations in respondents' ability to perform tasks related to 4IR technologies. Based on a five-point rating scale, the evaluation covered four core task categories: Google Drive skills, internet tools and research, cloud collaboration, and presentation and digital literacy. The ratings ranged from 1 (unable to complete) to 5 (easily completed), providing a detailed understanding of task performance among the 30 respondents.

In the category of Google Drive skills, 8 respondents rated themselves at level 1, indicating an inability to complete basic tasks such as folder creation, file sharing, and document organization. Another 10 respondents rated themselves at level 2, reflecting significant difficulty in task execution. Only 3 participants rated themselves at level 5, suggesting a high level of proficiency in using Google Drive for collaborative work.

Similarly, 10 respondents rated themselves at level 1 for internet tools and research, while 8 rated at level 2, indicating considerable challenges in navigating platforms like Zoom and Google Meet. Only 3 respondents reported ease in task completion, highlighting a limited familiarity with virtual meeting platforms and online survey tools.

The trend continued in the cloud collaboration category, where 12 participants rated themselves at level 1 and another 10 rated at level 2, demonstrating significant difficulty in shared spreadsheet editing and resource uploading. Only 2 respondents rated themselves at level 5, indicating advanced proficiency.

In the presentation and digital literacy category, 11 respondents rated themselves at level 1, while 10 rated at level 2, highlighting struggles with basic multimedia creation tasks such as PowerPoint preparation and poster design using Canva. Only 2 respondents rated themselves at level 5, indicating ease in task execution.

The detailed breakdown of ratings for each task category is presented in the following table:

Task Category	Unable to complete	Very difficult to complete	Moderately difficult to complete	Easily completed	Completed without any mistakes
Google Drive Skills	8	10	5	4	3
Internet Tools and Research	10	8	6	3	3
Cloud Collaboration	12	10	4	2	2
Presentation and Digital Literacy	11	10	5	2	2

These findings highlight the significant skill gaps among trainees. Most respondents rated themselves at the lower end of the scale (1 or 2) across all task categories. The limited number of respondents achieving higher ratings (4 or 5) underscores the need for targeted training programs to enhance digital literacy, cloud-based collaboration, and practical online tools to prepare NAEM trainees for 4IR-based professional training environments.

Performance Analysis and Skills Gap

The competency assessment's performance analysis revealed significant variations in digital proficiency across task categories. The following table provides a detailed breakdown of respondents' self-rate competency levels, based on a five-point scale where 1 indicates an inability to complete the task and 5 indicates ease of completion.

Task Category	1	2	4
Google Drive Skills	7	10	4
Internet Tools and Research	10	9	3
Cloud Collaboration	12	11	2
Presentation and Digital Literacy	9	10	4

The table reflects a clear trend where most respondents rated themselves at levels 1 or 2, indicating significant difficulty completing tasks related to 4IR technologies. For example, in the category of cloud collaboration, 23 out of 30 respondents (12 at level 1 and 11 at level 2) reported substantial challenges in performing tasks such as shared spreadsheet editing and resource uploading. Similarly, 19 respondents rated themselves at the lower end of the scale for internet tools and research, highlighting difficulties using virtual meeting platforms and conducting online surveys.

Conversely, only a small proportion of respondents demonstrated higher proficiency, with fewer than 20% rating themselves at levels 4 or 5 across all task categories. This suggests that while some trainees possess moderate to advanced skills, the overall readiness for integrating 4IR technologies into professional training remains limited.

These findings underscore the need for targeted capacity-building initiatives, focusing on foundational digital skills, cloud-based collaboration, and effective use of Internet platforms. Without structured interventions, the existing skill gaps may hinder NAEM's ability to implement 4IR-driven training programs effectively.

Readiness for 4IR-Based Training

The assessment of NAEM trainees' readiness for 4IR-based training revealed significant gaps in digital literacy and technological proficiency, highlighting the institution's current challenges in adopting modern training methodologies. Based on task-based evaluations and self-rated competency levels, the findings indicate a general lack of preparedness among trainees to integrate 4IR technologies into their professional training environments effectively.

Regarding technical readiness, most respondents exhibited low proficiency across essential digital platforms and tools. Among the 30 respondents, 17 rated themselves at levels 1 or 2 for core digital tasks such as Google Drive management, cloud collaboration, and online meeting facilitation. Only a tiny fraction of trainees (6 out of 30) rated themselves at levels 4 or 5, indicating advanced proficiency in managing technology-driven training activities. This disparity suggests that while a few trainees are equipped to adapt to 4IR-based training environments, most lack the skills to navigate digital platforms confidently.

Google Drive-related tasks, such as folder creation, file uploading, and collaborative document editing, were particularly challenging for trainees. Eighteen respondents rated

their ability at levels 1 or 2, while only 8 rated themselves at levels 3, 4, or 5. This limited proficiency undermines the potential for seamless resource sharing and collaborative learning, both critical components of 4IR-based training ecosystems.

The readiness for using internet tools and research platforms further reflected the digital divide among trainees. While 20 respondents rated themselves at the lower end of the scale (levels 1 and 2) for tasks such as virtual meeting facilitation and screen sharing, only 5 rated themselves at levels 4 or 5, indicating ease of task completion. This finding highlights most trainees' limited exposure and practical experience with virtual learning platforms, which are fundamental for modern, flexible training delivery.

Cloud collaboration emerged as one of the most challenging areas, with 23 out of 30 respondents rating themselves at levels 1 or 2 for tasks involving shared spreadsheets and resource uploading. Only 3 participants rated themselves at level 4 or 5, emphasizing the lack of familiarity with cloud-based platforms essential for collaborative learning and digital content management.

Regarding presentation and digital literacy, 19 respondents rated themselves at levels 1 or 2, struggling with multimedia creation, PowerPoint presentation development, and digital poster design using platforms like Canva. Only 6 participants rated themselves at levels 4 or 5, indicating that most are not yet equipped to develop and present training materials in digital formats.

The readiness assessment underscores a significant skills gap among NAEM trainees, limiting their capacity to adopt and implement 4IR-based training methodologies effectively. The findings suggest that while some trainees demonstrate moderate to advanced proficiency, most require targeted capacity-building initiatives, hands-on training, and continuous support to bridge the digital divide and enhance their readiness for technology-driven professional training environments. Without focused interventions, the institution's ability to deliver practical, 4IR-integrated training will remain constrained.

Currently, NAEM has no formal requirement for incoming trainers to possess prior ICT or AI competencies. Faculty appointments are based primarily on administrative or teaching experience, with no standardized assessment of digital proficiency. This has resulted in a wide disparity in digital readiness, with some trainers struggling to conduct even basic cloud-based tasks or use AI-supported instructional tools.

Interviews with administrative personnel revealed that while NAEM receives regular funding for training operations, there is no dedicated or sufficient budget allocated specifically for 4IR implementation. Infrastructure upgrades (e.g., smart classrooms, high-speed internet, and cloud servers) remain unfunded or rely on ad hoc donor support. Without earmarked financial resources, even well-conceived plans for digital transformation remain stalled. To ensure sustainable 4IR integration, NAEM requires an annual dedicated 4IR budget line in its operational expenditure, along with access to development grants or public-private partnerships.

Conclusion

This study set out to assess the feasibility of incorporating Fourth Industrial Revolution (4IR) components into the training programs of the National Academy for Educational Management (NAEM). The findings reveal that while there is growing awareness and interest among stakeholders, the practical integration of 4IR technologies remains limited due to significant infrastructural, pedagogical, and policy-related challenges. Key 4IR elements such as artificial intelligence, cloud computing, and virtual simulations are largely absent from NAEM's current curriculum and training delivery models. Trainers demonstrate limited proficiency in digital tools, and the institution lacks essential infrastructure, such as high-speed internet, centralized learning platforms, and smart classrooms, which are prerequisites for effective 4IR-based training.

Despite these limitations, the study identifies several opportunities that underscore the potential for future implementation. The presence of motivated trainees, initial experiments with tools like Zoom and Google Classroom, and isolated uses of generative AI for lesson planning indicate a foundation upon which more structured efforts can be built. To realize this potential, NAEM must adopt a phased approach: first addressing infrastructure deficits, then upskilling trainers, and finally embedding 4IR technologies into course design and delivery. Strategic investment, policy guidance, and inter-institutional collaboration will be crucial for transforming this feasibility into actionable and sustainable outcomes. This research affirms that while NAEM is not yet fully ready to operationalize 4IR-based training, a clear and achievable path forward exists.

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