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E-readiness Assessment of National Agricultural Research in India

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ABSTRACT

The digital era has ushered in profound transformations across global industries, where the integration of information and communication technologies (ICTs) is crucial for growth, productivity, and sustainability. Agriculture, in particular, relies on this digital imperative to enhance food security, sustainability, and economic development. The National Agricultural Research System (NARS) plays a pivotal role in shaping the nation's agricultural progress addressing food security, productivity, climate change, and farmer livelihoods, the NARS must embrace digital advancements. The study was conducted at NARS of India, 660 scientists were selected from 102 ICAR institutes using multistage stratified random sampling techniques. E-readiness was measured based on a conceptual framework developed by Tugrul & Maru (2003) and the STOPE framework. The framework measures the dimensions like strategy, technology, organizational support, HR support, and e-culture. The result provides a comprehensive understanding of NARS's preparedness for digital transformation. While there are clear strengths in strategy, technology, and human resources support, areas requiring improvement, particularly organizational support and aspects of e-culture readiness, should be addressed with strategic initiatives.

INTRODUCTION

The digital era has ushered in transformative changes across industries and sectors worldwide. In an increasingly interconnected world, the adoption and integration of information and communication technologies (ICTs) are pivotal for driving growth, enhancing productivity, and achieving sustainable development goals. This digital imperative holds across various sectors, but perhaps none is more critical than agriculture, where the ability to leverage technology can significantly impact food security, sustainability, and economic development.

India, with its vast agricultural landscape and diverse agro-climatic zones, stands at the nexus of agricultural innovation and development. The National Agricultural Research System (NARS) of India, encompassing a multitude of research institutions and universities, plays a central role in shaping agricultural innovation and development in the country. The NARS is entrusted with the monumental task of harnessing science and technology to address the multifaceted challenges facing Indian agriculture, including food security, agricultural productivity, climate change, and improve the livelihoods of millions of farmers. As India continues its journey towards agricultural modernization and sustainability, the readiness of the National Agricultural Research System to embrace digital advancements is of paramount importance.

The concept of "e-readiness" has gained prominence as a holistic assessment of an organization's preparedness to leverage ICTs to achieve its goals and objectives. E-readiness encompasses a spectrum of factors, including technological infrastructure, human capital, policy frameworks, and the willingness to adopt and adapt to digital solutions. According to the United Nations Development

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Program (UNDP), "e-readiness assessments are meant to guide development efforts by providing benchmarks for comparison and gauging progress (Sergey, 2004). They help diagnose ICT problems, advocating required ICT changes, and develop sound ICT plans. Although most e-readiness assessment studies were performed at the country level, for different countries, it has been emphasized that the e-readiness of organizations in a country, is an integral part of the overall e-readiness of that country (Dawn, 2002). Keeping in view the above facts and their importance, the present study was conducted to study the E-readiness assessment of the National Agricultural Research System in India.

METHODOLOGY

The study was conducted at NARS of India, the Indian Council of Agricultural Research system was purposively selected for the study because it mainly focuses on agricultural research and development and many ICT interventions developed under this system. The study used the multistage simple random sampling framework. All 102 ICAR institutes were classified into 11 zones based on ICAR's classification of Agricultural Technology Application Research Institute. And from each zone, randomly 3 institutes were selected considering subject matter divisions, small and big institutional criteria. A total of 33 institutes were selected and from the selected 33 institutes, 20 scientists were selected randomly. Hence, the total sample size was 660. Data were collected by personally interviewing the respondents as well as online through Google forms. E-readiness was measured based on a conceptual framework developed by Tugrul & Maru (2003) and the Strategy, Technology, Organisation, People and E-culture framework. The framework measures the dimensions like strategy, technology, organizational support, HR support, and e-culture in the organization having 79 items on a five-point continuum indicating the status of ICT/ICM in the organization. The respondents were classified into 5 categories least e-ready to very high e-ready based on frequency and percentage.

RESULTS AND DISCUSSION

Dimensions of E-readiness

Data in the Table 1 Strategy e-readiness indicate that notably, 38.48 per cent of respondents perceived a medium level of strategy e-readiness, followed by 24.24 per cent high level, 13.64 per cent low, 13.03 per cent of very high, and only 10.61 per cent perceived the least strategy e-readiness. These findings indicate that NARS has established strategies that position it within the medium to high e-ready category. The possible reason for these findings may be that NARS has developed and implemented different policies for ICT use like, Information communication and dissemination system (ICDS) components in National Agricultural Innovation Project (2006), Open access and open data policy (2013), ICT Road map (2021) and many other policies and strategies for harnessing the potential of ICT. A medium to high readiness level in strategy is a positive indicator of NARS's commitment to leveraging digital technologies for agricultural research and innovation. This also suggests that NARS has articulated clear and effective strategies for integrating digital technologies into its operations. These strategies can serve as a roadmap for aligning research goals with digital initiatives. To further enhance strategy e-readiness, NARS should ensure that these strategies remain dynamic and adaptable to evolving technological landscapes. Regular reviews and updates are essential to maintain alignment with the organization's digital goals and changing external factors. These findings are in line with Rai (2013).

From Table 2 regarding technology readiness it can be said that a substantial 43.33 per cent of respondents perceived a medium level of technology e-readiness, followed by 23.33 per cent high level, 14.85 per cent lower level, 11.82 per cent at a very high level, and only 6.67 per cent at perceived least technology e-readiness. The medium to high readiness in technology indicates that NARS has invested in the necessary infrastructure and technological capabilities to support its digital initiatives. The possible reason might be that under the NAIP project, one component was strengthening ICAR as a catalyzing agent for the management of change in the Indian NARS. One sub-component was the information communication, and dissemination system (ICDS) in which different efforts were made to harness the transformative power of information and communication technology (ICT) to make public services more efficient in which different initiative was taken up to strengthen infrastructure and technology support to all ICAR institutes. It is a positive indication, as it suggests that the organization is equipped with the hardware, software, and connectivity needed for digital transformation (Lahiri et al., 2017). This level of readiness positions NARS well for harnessing the benefits of digital technologies in agricultural research. However, sustaining this readiness requires ongoing investments in technology. Regular updates, maintenance, and the integration of emerging technologies such as artificial intelligence, cloud computing, the internet of things, and many more are essential to ensure that NARS remains at the forefront of digital advancements. The same finding was reported by Rai (2013); Navani (2016) & Mwangi (2019).

The data in Table 3 represent organizational support e-readiness, and it can be said that the majority of respondents, 37.42 per cent perceived a medium level of organizational support

Table 1. Distribution of respondents based on Strategy e-Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	10.61
Less e-ready (R2)	(>20 – ≤40)	13.64
Medium e-ready (R3)	(>40 – ≤60)	38.48
Highly e-ready (R4)	(>60 – ≤80)	24.24
Very Highly e-ready(R5)	(>80 – ≤100)	13.03
Total		100

Table 2. Distribution of respondents based on Technology e-Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	6.67
Less e-ready (R2)	(>20 – ≤40)	14.85
Medium e-ready (R3)	(>40 – ≤60)	43.33
Highly e-ready (R4)	(>60 – ≤80)	23.33
Very Highly e-ready(R5)	(>80 – ≤100)	11.82
Total		100

Table 3. Distribution of respondents based on organizational support e-Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	11.97
Less e-ready (R2)	(>20 – ≤40)	26.67
Medium e-ready (R3)	(>40 – ≤60)	37.42
Highly e-ready (R4)	(>60 – ≤80)	13.48
Very Highly e-ready(R5)	(>80 – ≤100)	10.45
Total		100

e-readiness, followed by 26.67 per cent lower level, 13.48 per cent high level interestingly, 11.97 per cent least e-ready, while only 10.45 per cent considered a very high level of organizational support e-readiness (Nirmalkar et al., 2022). Overall, it is at medium to less e-ready which reveals a gap between the medium to high readiness observed in other dimensions. The possible reason might be that in every NARS institute, there was establishment of an Agriculture research information system cell in 1994. Later, it known as the Agricultural Knowledge Management Unit which works at the IT cell and provides IT-related services. Medium level of e-readiness suggests that while NARS has made progress in terms of strategy and technology, it might be facing challenges in providing the necessary organizational support structures. Efforts should be directed toward creating an environment that fosters digital initiatives. This includes establishing clear roles and responsibilities for digital projects, providing training and development opportunities for staff, and ensuring adequate budget allocation for digital initiatives. A lack of support in these areas can hinder the effective implementation of digital strategies (Lahiri et al., 2020). These findings are supported by Navani (2016) & Mwangi (2019).

The data in Table 4 indicate that People/HR support e-readiness and it found notably that 36.97 per cent of respondents perceived a medium level of e-readiness in terms of People/HR support, followed by 27.58 per cent high level, 14.85 per cent lower level, 12.42 per cent very high level, and only 8.18 per cent perceived least People/HR support e-readiness. The medium to high e-readiness in People/HR Support is a promising sign. The possible reason for these findings is that ICAR regularly organizes different training and capacity-building programs under IASRI on various topics related to ICT like data management, e-governance systems, cyber-security, and application of advanced technology like machine learning and artificial intelligence. As well as ICAR-IASRI has also developed and implemented many ICT interventions related to e-HRM Like, E-office, ERP, CBP, FMS, etc. The medium to high level of e-readiness suggests that NARS recognizes the importance of its human resources in digital transformation efforts and has likely implemented HR strategies and policies to support these initiatives. However, sustaining and further improving this readiness requires ongoing investment in skill development, training, and capacity development programmes, promoting a culture of continuous learning, and aligning HR practices with digital goals. An institution with below-average skills needs to upgrade itself so that it can meet the demand of the hour. Similar reports were made by Rai (2013); Navani (2016) & Mwangi (2019).

Table 4. Distribution of respondents based on People/HR support e-Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	8.18
Less e-ready (R2)	(>20 – ≤40)	14.85
Medium e-ready (R3)	(>40 – ≤60)	36.97
Highly e-ready (R4)	(>60 – ≤80)	27.58
Very Highly e-ready(R5)	(>80 – ≤100)	12.42
Total		100

Regarding E-culture readiness the data presented in Table 5 indicate that a substantial 44.09 per cent of respondents perceived a highly e-ready level of E-culture, followed by 27.12 per cent medium level, 14.85 per cent very high level, 10.30 per cent lower level and only 3.64 per cent fell into the category of least e-ready. Overall it ranges from highly e-ready to medium e-ready. The possible reason for this finding is that the ICAR has implemented a number of digital solutions for office automation, reporting, and management systems for effective e-governance in the organization. Some of the major systems in this regard are e-office, PIMS, PERMISNET, ICAR-ERP, HYPM, FVMS, PMS, PGS, CBP, etc. which shows the great degree of e-governance in NARS and being a great instrumental in driving digital transformation. A highly e-ready culture typically embraces change, innovation, and digital fluency, which are essential for the successful adoption of new technologies. Efforts should be made to foster a culture of digital readiness consistently across the organization. This may involve promoting innovation, encouraging knowledge sharing, collaboration, development, and implementation of other important e-governance initiatives. These findings are supported by Navani (2016) & Mwangi (2019).

Table 5. Distribution of respondents based on E-culture Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	3.64
Less e-ready (R2)	(>20 – ≤40)	10.30
Medium e-ready (R3)	(>40 – ≤60)	27.12
Highly e-ready (R4)	(>60 – ≤80)	44.09
Very Highly e-ready(R5)	(>80 – ≤100)	14.85
Total		100

Overall organizational e-readiness

The Table 6 indicates that notably, 33.94 per cent of respondents perceived a medium level of overall organizational e-readiness. Followed by 28.03 per cent high level, 14.85 per cent lower level, 14.24 per cent very high level, and only 8.94 per cent perceived as least e-ready in the context of overall organizational e-readiness. The assessment of overall e-readiness for NARS falls within the medium to highly e-ready range. This suggests that NARS has made significant progress in its journey toward digital transformation. It is likely that a combination of strategies, technological infrastructure, HR support, and elements of an e-ready culture contribute to this overall readiness. Moving forward, NARS should continue to assess and address the gaps in the less

Table 6. Distribution of respondents based on overall organisational e-Readiness

Categories	Score	Percentage
Least e-ready (R1)	(00 – ≤20)	8.94
Less e-ready (R2)	(>20 – ≤40)	14.85
Medium e-ready (R3)	(>40 – ≤60)	33.94
Highly e-ready (R4)	(>60 – ≤80)	28.03
Very Highly e-ready(R5)	(>80 – ≤100)	14.24
Total		100

e-ready areas, such as organizational support, to ensure a holistic and sustainable approach to e-readiness. However, achieving and maintaining this level of readiness requires ongoing commitment and strategic planning. It is essential that NARS continuously assesses and addresses the gaps, particularly in areas like organizational support and specific aspects of e-culture readiness. These findings are supported by Aydin & Tasci (2005); Rai (2013); Navani (2016); Mwangi (2019) & Syahputr (2021).

CONCLUSION

The assessment of e-readiness using the STOPE framework provided a comprehensive understanding of NARS's preparedness for digital transformation and NARS has made significant progress in its journey toward digital transformation. The NARS has established strategies within the medium to high e-ready category. The medium to high readiness in Technology indicates that NARS has invested in the necessary infrastructure and technological capabilities to support its digital initiatives. Organizational support at medium to less e-ready reveals a gap between the medium to high readiness observed in other dimensions. The medium to high e-readiness in People/HR Support is a promising sign. E-culture readiness ranged from highly e-ready to medium e-ready. Moving forward, NARS should continue to assess and address the gaps in the less e-ready areas, such as organizational support, to ensure a holistic and sustainable approach to e-readiness. However, achieving and maintaining this level of readiness requires ongoing commitment and strategic planning.

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