Technology Driven Research and Innovations in Business, Social Sciences and Agriculture

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Abstract
Technology has evolved into a vital tool that propels innovation and research in a wide range of disciplines, including business, the social sciences, and agriculture. Innovations in artificial intelligence, big data analytics, and blockchain technology are transforming company operations, improving decision-making, and streamlining supply chains. With the use of these technologies, companies may enhance marketing tactics, obtain a greater understanding of customer behavior, and optimize internal processes to boost productivity and profitability. Technology helps in data collection, analysis, and interpretation in the social sciences, allowing researchers to investigate intricate societal issues and trends in more detail. Social scientists may now more thoroughly and accurately investigate socioeconomic issues, cultural dynamics, and human behavior thanks to digital platforms, social media analytics, and machine learning algorithms. Cutting-edge agricultural technology like drones, sensor-based systems, and precision farming are revolutionizing conventional farming methods. All things considered, technologically driven research and inventions are changing industry, advancing society, and tackling global issues in a variety of fields. Study survey was conducted among 269 people related to Business, Social Sciences and Agriculture sectors to know the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture and found that Data Analytics and Business Intelligence, Blockchain, social media and Network Analysis and Agri Tech Startups and Digital Platforms are the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture.

Keywords: Technology, Innovation, Artificial intelligence, Big data analytics, Blockchain technology, Social sciences, Agriculture, Research.

Introduction

The convergence of innovation, technology, and research has become a major force in India's many industries. Progress in science and technology has led to revolutionary shifts in fields such as business, social sciences, and agriculture. These innovations have reshaped conventional methods and cleared the path for sustainable growth. India is now a global leader in innovation thanks to the collaboration of technology and research, which has improved productivity and efficiency while addressing urgent societal issues. Stakeholders from many industries are utilizing technology-driven research to propel advancements and promote equitable growth in India by means of cooperative endeavors and multidisciplinary methodologies. India saw a paradigm change in the social sciences due to technology developments. Dutta and colleagues (2019) leveraged machine learning techniques and internet platforms to examine

complex social dynamics. Deeper comprehension of socioeconomic trends, cultural subtleties, and human behavior were made possible by this. Policymakers were able to create more informed responses that addressed urgent societal issues and promoted equitable development thanks to insights gained from technology-driven research.

Technology-driven research and inventions are now the cornerstone of revolutionary transformations in India's many sectors. According to Singh et al. (2022), advances in artificial intelligence and blockchain have transformed corporate operations by improving supply chain management and decision-making processes. Furthermore, firms may now obtain deep insights into customer behavior by utilizing big data analytics, which improves marketing tactics and boosts competitiveness. This focus on innovation driven by technology has not only increased productivity but also established Indian companies as strong competitors on the international arena.

The mainstay of India's economy for many years, agriculture underwent a dramatic upheaval due to scientific and technological breakthroughs. Pal (2023) shed light on the ways in which sensor-based technology and precision farming transformed conventional farming practices. In order to maximize resource use and achieve increased production and sustainability, farmers adopted cutting-edge techniques like drones and data analytics. By permitting more effective crop management techniques, these technical advancements significantly contributed to the improvement of food security. Additionally, by decreasing the abuse of pesticides and fertilizers and cutting down on water waste, they helped to mitigate environmental damage. As a result of these developments, India's agriculture industry is now more robust and thriving and is better equipped to handle both the urgent environmental issues and the demands of a fast changing global environment.

Literature Review

Significant progress has been made in India in a number of fields, including business, the social sciences, and agriculture, as a result of the integration of technology-driven research and innovation. Lele and Goswami (2017) showed that the "fourth industrial revolution" has caused revolutionary shifts in rural and agricultural innovation and has forced policymakers to reassess their approaches to investment and agriculture. This paradigm change emphasizes how important technology is to improving sustainability and productivity in India's agriculture industry. Additionally, there has been a deliberate attempt to support "science, technology, and innovation"-based incubators, as noted by Surana et al. (2020), especially in reaching Sustainable Development Goals (SDGs). These projects highlight how crucial it is to use technology breakthroughs to address urgent societal issues and advance equitable development.

Ghosh et al. (2020) stressed the necessity of "science-led innovation" and institutional reforms in order to address sustainability challenges in Indian agriculture. India can improve food security, reduce environmental degradation, and promote resilience in the face of changing global problems by utilizing technology-driven research and developments, such as sustainable agricultural methods and precision farming techniques. Mruthyunjaya (2022) provided an example of how new ideas and creative methods were brought about by developments in agricultural research and education. Modern farming practices and technology were adopted as a result of these initiatives, which improved production and sustainability while solving issues encountered by farmers all throughout the nation.

According to Klerkx et al. (2019), social science has a major influence on how digital agriculture, smart farming, and Agriculture 4.0 are shaped in India. The socio-economic effects of these technical developments using interdisciplinary methods, offering stakeholders and policymakers insightful information. Social science viewpoints and technical advancements were integrated to create more inclusive agricultural development plans that benefit all facets of society. The significance of social innovation was emphasized by Cornet and Barpanda (2021) in rural India, especially when employing action research-based co-creation approaches. Through the active engagement of local communities and stakeholders in the innovation process, specific solutions were developed to tackle the distinct socio-economic obstacles that are common in rural regions. This cooperative strategy encouraged the creation of long-term solutions and gave communities the confidence to take an active role in their own growth, which advanced comprehensive socioeconomic advancement.

Gupta et al. (2020) explored the domain of "social innovation" driven by "new-age technologies," clarifying the "what," "how," "where," and "why" of these initiatives. This demonstrated how important technology is in bringing

about social change, solving urgent societal issues, and promoting empowerment and inclusive growth. Furthermore, Mysore et al. (2020) highlighted the enormous potential of cutting-edge technologies in "agri-business opportunities." Stakeholders have opened up new possibilities for growth and sustainability by utilizing innovations in agriculture, such as digital platforms and precision farming. Along with increasing efficiency and production, these technologies have opened up new markets and avenues for value addition in the agriculture industry, which has boosted both economic growth and food security.

The significance of "sustainability" and "innovations" in Indian agriculture and rural development was clarified by Nalwar (2023). Rural communities have benefited from enhanced livelihoods and environmental conservation as a result of research and development projects centered on sustainable practices and technology advancements. This focus on sustainable development highlights the role that technologically driven research and innovations play in promoting resilience and advancement in India's agriculture sector and guaranteeing future generations a more promising and sustainable future. Khadria and Mishra (2023) provide insight into the contribution that thrifty innovations make to the growth of entrepreneurship in the nation by illustrating the ways in which technical advancements have sparked entrepreneurial ventures. The resource-efficient and cost-effectiveness of these thrifty inventions have enabled aspirational business owners to use technology to provide meaningful solutions that propel economic growth and employment development.

Vinoth and Paramasivam (2016) highlighted the value of innovation in research and teaching for the growth of entrepreneurship in the agricultural sector. Farmers and agripreneurs have improved productivity, maximized resource usage, and gained access to new markets by implementing cutting-edge farming techniques and integrating technological innovations. In addition, Shan et al. (2018) emphasized the significance of technology-driven research and development projects and the nation's efforts to foster creative competitiveness. India has established itself as a major participant in science and technology on the world stage by investing in state-of-the-art equipment and creating an environment that is favorable to innovation. These improvements have benefited a variety of industries, including business, the social sciences, and agriculture.

Objective
1. To know the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture.

Methodology
Study survey was conducted among 269 people related to Business, Social Sciences and Agriculture sectors to know the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture. "Random sampling method" and "Factor Analysis" were used to collect and analyze the data.

Findings
Table below is sharing respondent's general details. Total 269 people were surveyed in which male are 60.6% and 39.4% are female. Among them 25.3% are below 38 years of age, 47.6% are between 38-42 years of age and rest 27.1% are above 42 years of age. 45.3% are from financial sector, 22.7% from social science and rest 32.0% from agriculture sector.

Table 1 General Details

Variables	Respondents	Percentage
Gender		
Male	163	60.6
Female	106	39.4
Total	**269**	**100**
Age (years)		
Below 38	68	25.3

38-42	128	47.6
Above 42	73	27.1
Total	**269**	**100**
Sectors		
Business	122	45.3
Social science	61	22.7
Agriculture	86	32.0
Total	**269**	**100**

Table 2 "KMO and Bartlett's Test"

"Kaiser-Meyer-Olkin Measure of Sampling Adequacy"		.841
"Bartlett's Test of Sphericity"	Approx. Chi-Square	2575.848
	df	120
	Sig.	.000

In the table above KMO value is 0.841 and the "Barlett's Test of Sphericity" is significant.

"Table 3 Total Variance Explained"

"Component"	"Initial Eigen values"			"Rotation Sums of Squared Loadings"		
	"Total"	"% of Variance"	"Cumulative %"	"Total"	"% of Variance"	"Cumulative %"
1	6.255	39.096	39.096	3.199	**19.991**	19.991
2	1.807	11.295	50.391	3.093	**19.332**	39.323
3	1.776	11.100	61.491	2.928	**18.300**	57.623
4	1.630	10.187	71.677	2.249	**14.055**	**71.677**
5	.785	4.904	76.581			
6	.637	3.978	80.559			
7	.502	3.136	83.696			
8	.459	2.868	86.564			
9	.458	2.862	89.426			
10	.378	2.365	91.790			
11	.294	1.835	93.626			
12	.278	1.735	95.361			
13	.240	1.500	96.861			
14	.212	1.326	98.187			
15	.181	1.133	99.320			
16	.109	.680	100.000			

The "principal component analysis" method was applied to extract the factors and it was found that 16 variables form 4 Factors. The factors explained the variance of 19.991%, 19.332%, 18.300% and 14.055% respectively. The total variance explained is 71.677%.

Scree Plot
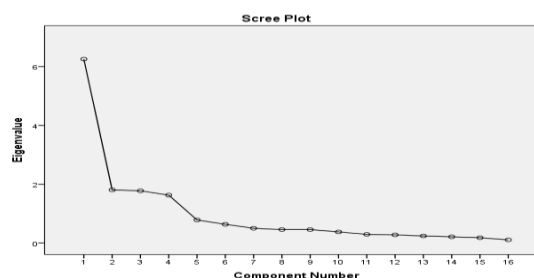
The graph above depicts the Eigen values generated from the "Total Variance Explained table" for an elbow with 4 components.

"Table 4 Rotated Component Matrix"

"S. No."	"Statements"	"Factor Loading"	"Factor Reliability"
	Data Analytics and Business Intelligence		**.902**
1	Derive insights from large datasets to make informed decisions	.846	
2	Help company to predict market trends	.840	
3	Data Analytics and Business Intelligence personalize customer experiences	.837	
4	optimize operations through automation, AI, and data analytics	.818	
	Blockchain		**.896**
6	Blockchain technology has introduced new possibilities for transparent and secure transactions	.876	
7	Enables decentralized systems for supply chain management	.844	
8	Technology helps to reduce the need for intermediaries	.844	
9	Blockchain technology contributes to increase trust among parties	.764	
	Social media and Network Analysis		**.866**
11	Provide rich sources of data for social scientists	.828	
12	Enable social scientists to study cultures, communities, and human interactions in digital environments	.814	
13	Facilitate collaboration among researchers and practitioners across geographical boundaries	.795	
14	Provide avenues for sharing knowledge and conducting experiments	.763	
	Agri Tech Startups and Digital Platforms		**.731**
15	Digital platforms connect farmers with markets	.807	
16	Empower farmers to access information and resources	.750	
17	Improving sustainability and productivity	.690	
18	Improve food security, reduce environmental degradation, and promote resilience	.573	

Table 4 is showing different factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture. First factor is Data Analytics and Business Intelligence which includes the variables like derive insights from large datasets to make informed decisions, help company to predict market trends, data Analytics and Business Intelligence personalize customer experiences and optimize operations through automation, AI, and data analytics. Second factor namely Blockchain and its associated variables are Blockchain technology has introduced new possibilities for transparent and secure transactions, enables decentralized systems for supply chain management, Technology helps to reduce the need for intermediaries and Blockchain technology contributes to increase trust among parties. Third factor is social media and Network Analysis which includes the variables like provide rich sources of data for social scientists, enable social scientists to study cultures, communities, and human interactions in digital environments, facilitate collaboration among researchers and practitioners across geographical boundaries and provide avenues for sharing knowledge and conducting experiments. Fourth factor is Agri Tech Startups and Digital Platforms which includes the variables like Digital platforms connect farmers with markets, empower farmers to access information and resources, improving sustainability and productivity and improve food security, reduce environmental degradation, and promote resilience.

"Table 5 Reliability Statistics"

"Cronbach's Alpha"	"N of Items"
.893	16

The reliability for 4 constructs with total of sixteen elements is 0.893.

Conclusion

To conclude, research and innovations driven by technology have shown to be powerful catalysts in a variety of Indian industries, such as business, social sciences, and agricultural. Innovation, efficiency, and creativity have been stimulated by the transformation in company operations brought about by advances in automation, AI, and data analytics. Through the incorporation of technology, social sciences have experienced a paradigm change that has enabled more thorough data analysis and evidence-based policymaking. Precision farming methods, Internet of Things-enabled monitoring systems, and the use of biotechnology have also brought about major changes in the agriculture sector, leading to higher sustainability and production.Improvements in productivity have been brought about by these technical developments, which have also addressed important issues including resource scarcity, resilience to climate change, and socioeconomic inequality. Equity in technological access, data privacy issues, and guaranteeing that innovation serves all societal segments are among the obstacles that still need to be addressed. In the future, it will be critical to invest in digital infrastructure, generate an environment that is favorable for research and innovation, and encourage interdisciplinary cooperation. Inclusive growth will also depend heavily on initiatives to close the digital divide between urban and rural areas and advance digital literacy. India can create new opportunities for growth, wealth, and sustainability in the fields of business, social sciences, and agriculture by utilizing the transformative power of technology in conjunction with strong institutional support and effective governance.

The study was conducted to know the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture and found that Data Analytics and Business Intelligence, Blockchain, social media and Network Analysis and Agri Tech Startups and Digital Platforms are the factors that determines Technology Driven Research and Innovations in Business, Social Sciences and Agriculture.

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