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Localization of Implementation Indicators for New Technologies in the Media Industry: A Fuzzy Approach

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Abstract
Technology stands as one of the most pivotal elements driving change in the strategic landscape of the media industry and its destiny is fundamentally intertwined with technology. The rapid influx and progression of new technologies, particularly information and communication technologies within media organizations, have significantly impacted the societal and cultural dimensions of media existence over recent decades and has prompted significant foundational changes in the environment, structure and management approaches of media organizations. Consequently, identifying success factors in the implementation of new technologies within the media industry becomes imperative. To achieve this objective, dimensions, components and initial indicators were identified through reviewing existing studies, and to validate and localize the obtained indicators, a fuzzy Delphi method was employed, drawing on expert opinions. Ultimately, 166 relevant indicators were identified across eight influential dimensions: big data infrastructure, digital literacy of managers and employees, innovation in technology and content, technological capabilities of new media, media communication management, semiotics in the media industry, audience engagement and technology-based business strategy along with 33 components. These dimensions and components with incorporating relevant indicators can serve as a roadmap and guideline for any media entity intending to implement new technologies within its organizational framework.
Keywords: *Media Industry, Technology Implementation, Digital Transformation, Fuzzy Delphi, New Technologies*

Introduction

The emergence and advancement of new technologies, particularly information and communication technologies (ICTs), within media organizations are rapidly accelerating. Over recent decades, these technologies have profoundly impacted the societal and cultural dimensions of media entities and has prompted significant changes in their environments, structures and management approaches. Hatami et al. (2018) believe that media industries have grown alongside new forms of communication technologies and attribute their evolution to technological innovations whose history dates back to the era of printing and advancement within a uniform stream of technologies in innovative, recording, replicating, storing and distributive developments. Bagherpour (2021) also states that prior to the emergence of the internet, radio and television as electronic communication tools in comparison with printing and writing were considered a new medium which had a history of several centuries. However, today, with the emergence of new media and in the light of digital and electronic transformations in the media today, they are classified among

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traditional media. The development of new technologies in the realm of media and communications has led to shifts in audience behaviors, the creation of new audience needs, the entry of new competitors into the media market and the specialization of networks. These changes have caused to the expansion of new media markets and the removal of many existing markets. Furthermore, the emergence of these technologies has resulted in transformations in job descriptions, interaction methods, changes in business models and organizational processes within media entities. The rapid growth of new technologies is such that many media lag behind in adapting to these transformative trends. Media require adaptation to these new technologies to sustain their existence. In Iran, the utilization of innovative media technologies such as social networks like Instagram, Telegram, etc., for information gathering and news, the expansion of familial, friendly and social communications as well as the development of home-based businesses through the establishment of thousands of personal online pages or channels within a service provider framework and user acceptance, illustrate novel societal approaches within the modern media landscape in Iran. Sometimes, these social media platforms have outpaced mass media such as radio and television and also have surpassed them in attracting the audience. Therefore, given the soft threats facing the country from adversaries and their media offensives, the significant impacts of new media in the country and their growing penetration into societal lifestyles, studying and understanding the capacities and challenges of new media technologies should receive attention from cultural and media managers in the country.

Hence, the identification and localization f factors for the deployment of these technologies, especially in the digital realm, to serve Iran's national interests are crucial. It can assist policymakers in the media arena in intelligently and skillfully confronting the identification, attraction and deployment of new technologies. The present research aims to introduce these factors using the fuzzy Delphi method.

Background and Theoretical Foundations
Media Industry

The media industry encompasses a wide range of communication tools that are diverse in terms of customer interaction, content, presentation methods and more. In this industry, inputs such as news, arts, etc., are processed into products and information services that are sold and influential in the market (Roshandel-Arbatani et al., 2018). Building upon this definition, Forghani and Bani Tamim (2021) categorize media industries into a broad spectrum of print media (newspapers, magazines, books, environmental media, billboards), audiovisual media (film, television, radio), and virtual media (web-based media, mobile phones, social networks). According to Roshandel-Arbatani et al. (2018), some characteristics of the media industry such as its multi-nature (political, economic, social and cultural), multifunctionality (news or information dissemination, education, entertainment and advertising), diversity in service recipients (diversity and geographic dispersion of audiences), diversity in product nature (general and endless goods with consumption by one individual, product diversity, limited expiry date, inability to correct errors in the distribution cycle), highly creative employees, less structured organization, operating in an environment of uncertainty and a strong presence of technology distinguish it from other industries.

New Technologies in the Media Industry

New communication technologies have brought about fundamental changes in the media environment and this forces media managers to reconsider their management approaches regardless of their private or governmental nature. The level of media influence varies relative to new technologies with some media being forced to quickly change their management methods to stay

competitive while others have more opportunities to adapt to new technologies (Ahmadi, 2011).

In this study, "new technologies" are those that operate primarily in the digital realm. This term does not solely denote its novelty in historical terms or confine it to a specific time frame; rather, other criteria such as interactivity, digital nature and participatory aspects are determinants.

Key indicators in new information and communication technologies were outlined by khajeheian et al. (2009) as follows.
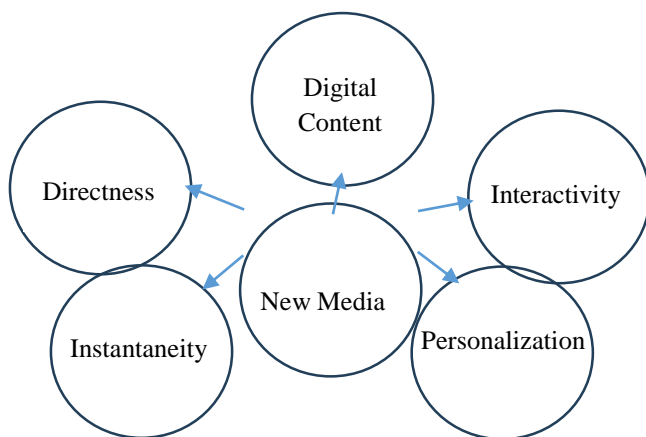

Figure 1. *Media features arising from new information and communication technologies (khajeheian et al., 2009)*

Strategic Factors in Implementing New Technologies in the Media Industry

Technology implementation, in the extensive literature of technology management, is a process that institutionalizes technological innovation and enables its internal dissemination within organizations. Engaging organizational members appropriately and creating commitment to technology usage are essential in this process (Khatami Firouzabadi et al., 2018).

A review of the literature indicates that numerous studies have been conducted on the impact and consequences of new technologies in the media industry. Some of these studies have explored the consequences of new technologies and digital transformations on media. Others have focused on topics such as the development and deployment, acceptance and adaptation and evaluation of technological capabilities in media as separate subjects. Therefore, despite the abundance of research, researchers have merely focused on examining restricted and scattered dimensions of the deployment of new technologies in the media industry and a comprehensive and cohesive framework for the successful deployment and implementation of these technologies remains unexplored. Each of the previous studies has focused on a distinct aspect and therefore there is a gap in the utilization of technology management skills for the identification, attraction, exploitation and development of these technologies.

In this study, based on the review of previous studies, all variables utilized in them were extracted and coded. Subsequently, considering the conceptual essence of each code, they were categorized into a similar concept. This process shaped the components into a new categorization and each group was placed into dimensions that best described them by categorizing similar components.

The results are summarized in Table 1, delineating 8 dimensions: big data infrastructure, digital literacy of managers and employees, innovation in technology and content, technological capabilities of new media, media communication management, semiotics in the media industry, audience engagement and technology-based business strategy along with 33 components and 160 indicators.

Table 1.

Dimensions, components and strategic indicators in the implementation of new technologies in the media industry

Dimensions	Components	Indicators	References
Big Data Infrastructure	Data Mining	Volume of available data/ Utilization of big data as a significant news source/ Relevant capabilities of big data	Özkent, 2022

Dimensions	Components	Indicators	References
in the Digital Transformation Space	Data Analysis	Level of access to data mining	Knight, 2022
		Utilization of personalized recommendation systems through data analysis/ Ability to analyze digital media/ Ability to configure algorithms through data analysis	Özkent, 2022
	Content Creation through Data Analysis	Ability to create content through data analysis/ Use of innovative technologies for digital content production	Özkent, 2022
		Ability to respond to post-truth and alternative facts	Kirchhoff, 2021
	Achieving Data Governance	Legal compliance for achieving data governance/ Achieving commercial value of data resources/ Utilization of big data opportunities for development	Qin et al., 2020
		Provision of necessary infrastructure for data	Shirazi et al., 2021
		Preservation of data privacy and security	Guinan et al., 2019
Digital Literacy of Managers and Employees	Digital Media Literacy of Managers and Employees	Mechanisms for enhancing technology literacy	Workman, 2014
		Level of digital literacy	Panagiotidis and Veglis, 2020
		Continuous in-service training programs	Shirazi et al., 2021
		Conducting virtual training sessions	Sidiropoulos et al., 2019
	Adoption and Utilization of New Media Technologies	Managers' openness to new technological advancements	Garcia-Perdomo and Magana, 2020
		Level of expertise, capability and skill of individuals in using digital technology	Shams et al. 2018
		Potential to perform a new function or perform existing functions with digital technologies	Panagiotidis and Veglis, 2020
	Formation of Digital Culture	Possession of digital mindset and thinking/ Possession of digital appeal/ Budget allocation for digital transformation culture building	Shirazi et al., 2021
Innovation in Technologies and Digital Content	Emphasis on Technological Innovation	Presence of innovative technologies in data collection, storage and processing	Özkent, 2022
		Existence of multi-purpose platforms/ Use of foundational architecture to enhance innovation	Sanasi et al., 2021
		Emphasis on innovation	Majdalawieh and Khan, 2022
		Providing of innovations related to genre and content	Ekdale et al., 2015
		Development of innovation in news production and distribution	Zabel and Telkmann, 2021
		Existence of editorial innovations	Garcia-Perdomo and Magana, 2020
	Development of Innovation Culture	Individual motivation level for awareness of new technologies among editors/ editorial sources (or other sources) as a significant factor in innovation acceptance	Zabel and Telkmann, 2021
		Interest level in media and digital innovation	Westlund, 2021
		Existence of an innovative culture in media organizations	Sharifi and Khatami, 2019
	Collaboration in Innovation (Open Innovation)	Implementation of open innovation/ focus on open innovation	Abbas and Singh, 2014
		Collaboration in digital media innovation	Westlund et al., 2021
	Research and Development	Improvement and development of new discoveries in knowledge domain	Bolivar and Munoz, 2022

Dimensions	Components	Indicators	References
Technological Capabilities of New Media	Formation of Audience-Centric Creative and Innovative Teams	Organization of knowledge, connecting individuals and facilitating communication through new technologies	Treem, 2011
		Speed of quantitative and qualitative enhancement in media productions	Shams et al., 2018
		Studying and addressing audience metric questions/ studying and addressing fact-checking questions/ studying and addressing misinformation questions	Westlund et al., 2021
		Utilization of agile methods for better collaboration with customers for problem-solving/ customer satisfaction level	Guinan et al., 2019
		Continuous user attention	Uduak, 2021
		Attracting young audiences	Rubio and Esteban, 2021
		Utilizing individual and social behaviors and attitudes in social media	Ngai et al., 2015
		Problem-solving through dynamic, creative and innovative methods	Majdalawieh and Khan, 2022
		Development of project-oriented creative teams	Guinan et al., 2019
	Digital Journalism	Growth of mobile news production/ amateur user-generated content/ media owners' familiarity with using mobile phones for content production and sharing	Sidiropoulos et al., 2019
	Technology-Centric Journalism	Adoption of new journalism forms (citizen, data-driven and networked)	Knight, 2016
		Enhancement and diversification of channel capacities/ access to high-speed internet satellites/ use of drones and smart robots (for covering events in hazardous locations and obtaining clearer and more comprehensive images than naked eye)	Almalki et al., 2022
	Utilization of Media Personnel from New Media Technologies	Use of social media as a new reporting tool/ referencing social media in terms of credibility and verification / social media as a useful news source/ channel for various voices from minorities and communities	Moon and Hadley, 2014
		Level of media owners' use of user-friendly apps	Sidiropoulos et al., 2019
		Integration of new technology tools into media workflow	Panagiotidis and Veglis, 2020
		Existence of defined software apps for public functions	Atkin et al., 2015
		Real-time information availability/ data transfer quality/ powerful storage capacity of new media technology/ powerful information dissemination capacity of new media technology	Guo, 2021
	Media Convergence and Integration	Nurturing talent in media convergence / effective integration of traditional and emerging media/ combination of advanced "online" and "offline" modes	Qi, 2022
		Presence of technological convergence space	Roshandel-Arbatani et al., 2018
		Access to media integration	Torrents, 2018
Media Communication Management	Level of Media Intercommunications	Creation of a suitable environment for businesses/ change in media relationship methods	Chukwu et al., 2019
		Increase in wireless communication capabilities	Almalki et al., 2022
		Level of media interrelations	Torrents, 2018
		Communication among journalists, technologists and businesses	Westlund et al., 2021
	Level of Intra-organizational Collaboration	Level of employees' inclination to use new technologies (e.g., smartphones)/ paradigm shift and alignment of various information flows among involved representatives	Sanchez and Armengol, 2021

Dimensions	Components	Indicators	References
		in the company/ use of new technologies in internal communication management	
		Level of interest and willingness for intra-organizational collaboration/ better understanding of the scope of work and changing media conditions for journalists	Westlund et al., 2021
	Level of Public Media Services	Implementation of providing public services and e-government/ utilizing blockchain services for public service delivery	Bolivar and Munoz, 2022
		Level of collaboration with customers for issue resolution/ customer satisfaction level/ development of customer services	Guinan et al., 2019
		Establishing reputation with new technologies	Chukwu et al., 2019
Semiotics in the Media Industry	Empowerment of social media for Meaningful Engagement	Empowering social media for creation, execution and management of meaning/ the cognitive multi-dimensionality potentials of social media as indicators of social performance	Søren and Gunhild, 2018
		Performing meaningful innovation as a relevant role in industry dynamics	Sanasi et al., 2021
	Formation of Meaningful Journalism Paradigm	Establishing meaningful journalism/ offering more automated research methods with new tools/ presenting a new perspective in journalism/ enhancing journalists' interpretation of data	Panagiotidis and Veglis, 2020
Audience Engagement	Media Owners' Communication with Audiences	Growing participation spirit as a central element in digital culture/ employing new methods for proposing, amending, praising and claiming in event coverage/ impacting communications between journalists and their communities	Ekdale et al., 2015
	Audience's Technological Dependence	Reducing the digital divide among users/ alleviating concerns about technology loss/ fostering a sense of dependency on technology among audiences	Rosen et al., 2013
		Increasing audience dispersion	Rubio and Esteban, 2021
		Positive public attitudes towards using new media technologies	Uduak, 2021
		Acceptance and utilization of new media technologies	Workman, 2014
Technology-Based Business Strategy	Institutional Environment	Alignment with the political environment	Atkin et al., 2015
		Business constraints/ better governance/ regional differences in social, institutional and geographical nature/ opportunities presented by digital technology	Madichie et al., 2020
	Competitive Advantage in Media Industry	Level of competition in the media industry/ access to competitive positions in an unstable media environment/ expansion of company environment in terms of geographical coverage and range of products and services	Oliver and Picard, 2022
		Attention to competitive space and market conditions/ reference points for competition	Khojaste Bagherzadeh and Faramarzi, 2012
		Gaining competitive advantages	Madichie et al., 2020
	Change Management	Increasing awareness of change management importance/ changing business processes for long-term sustainable business/ aligning business needs/ aligning information technology services with business needs/ integration of design thinking/ focus on transparency	Majdalawieh and Khan, 2022
		Strategic networks/ perceived strategic value	Majdalawieh and Khan, 2022
		Embedding technology and data within the organization	Salehipour Bavarsad and

Dimensions	Components	Indicators	References
			Kazempourian 2021
		Changing multiple aspects of the media industry including business models, revenue reduction, content models, management, economics and public budget	Lugmier and Groyllbaver, 2016
		Increasing work speed	Chukwu et al., 2019
		Enhancing efficiency/ integrating job descriptions	Kerry, 2021
		Adaptation to innovative media technologies	Rosen et al., 2013
		Transitioning from a single entertainment and remote communication service provider to a simple facilitator	Oliver and Picard, 2022
		Transformation into a multi-product media organization	Oliver and Picard, 2022
	Content and Value Nature Change	Providing a very valuable, active, and dynamic form of value to customers/ customer sensory and facilitator methods/ generating entirely new value elements by strengthening, preserving, rearranging, reducing or eliminating existing elements/ altering the shape of value elements/ changing the content and nature of value/ changing expectations and perceptions of value	Piepponen et al., 2022
		Impact on company stakeholders' credibility	Li, 2020
		High-performance execution	Sidiropoulos et al., 2019
		Increased workforce productivity and time savings	Chukwu et al., 2019
		Enhanced employee productivity	Shams et al. 2018
		Reduction in human resource costs	Kerry, 2021
		Utilization of workforce motivation incentives	Shirazi et al., 2021
	Consumer Pattern Change	Increased expenditure on digital services and media products	Lugmier and Groyllbaver, 2016
		Speed of consumer consumption pattern changes	Uduak, 2021
		Improvement in product development lifestyle	Guinan et al., 2019
	Revenue and Cost Management	Profit and revenue management	Madichie et al., 2020
		Reproduction of existing revenue models	Zabel and Telkmann, 2021
		Impact on the financial market	Li, 2020
		Financial resource management and investment	Sanchez and Armengel, 2021
		Cost management	Madichie et al., 2020
	Improvement of Business Model Innovations	Facilitation of business model innovations/ Empowerment of business model innovations/ Access to various new business models	Li, 2020
		Managerial knowledge and motivations for finding alternatives	Khojaste Bagherzadeh and Faramarzi, 2012

Methodology

This study adopts a qualitative approach utilizing the fuzzy Delphi method. The selection of experts in this research comprised 15 individuals, chosen non-randomly and purposively from among academic faculty members with at least 5 years of educational, research or executive

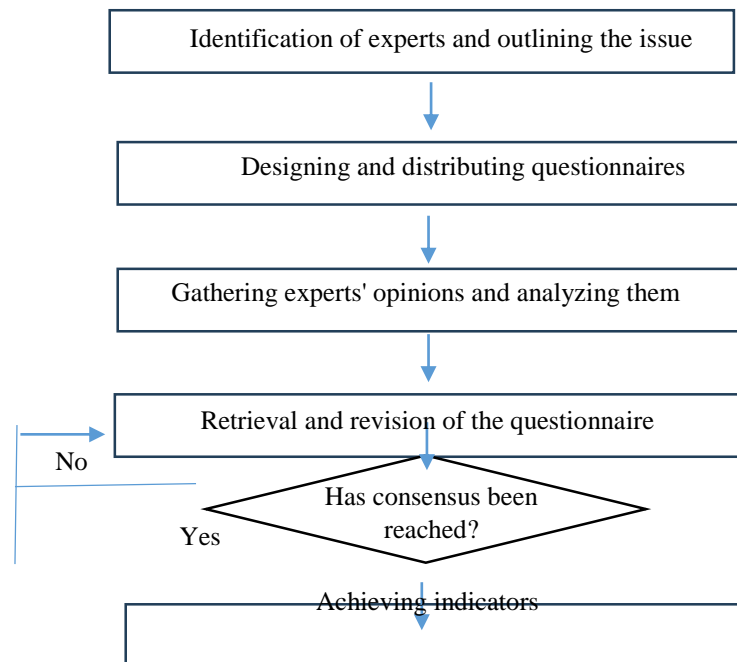experience in the field of media. The execution steps of the fuzzy Delphi method are illustrated in Figure 4.

Figure 2. *Implementation stages of the Fuzzy Delphi method*

Research Findings

Definition of Linguistic Variables

In this study, a triangular fuzzy number is employed, represented as M = (l, m, u), where 'u' represents the upper bound (maximum value) of the fuzzy number M, 'l' denotes the lower bound (minimum value) of the fuzzy number M and 'm' represents the most probable value.

Questionnaires were designed based on the results of the research background to enable experts to specify the importance of each identified indicator using five linguistic variables: very low, low, moderate, high and very high. Table 2 depicts the relationship between linguistic expressions and fuzzy numbers.

Table 2.
Relationship between linguistic expressions and fuzzy numbers

Linguistic variable	Fuzzy number	I	m	n
Very low	0, 0, 0.25	0	0	0.25
Low	0, 0.25, 0.5	0	0.25	0.5
Moderate	0.25, 0.5, 0.75	0.25	0.5	0.75
Moderate	0.5, 0.75, 1	0.5	0.75	1
Very high	0.75, 1, 1	0.75	1	1

Fuzzy Delphi Stage One

In the initial phase of the fuzzy Delphi method, experts were tasked to determine the significance of each identified indicator using linguistic variables (very low, low, moderate, high and very high). To convert linguistic variables into fuzzy numbers, triangular fuzzy numbers were generated

based on each expert's input, following the relationship below:

$$\widetilde{A}^{(i)} = \left(a_1^{(i)}, a_2^{(i)}, a_3^{(i)}\right) \quad i = 1,2,3,\dots,n$$

Then, to transform all expert opinions on a given indicator into a fuzzy number, the average of fuzzy sets was calculated utilizing the following relationship:

$$\widetilde{A}_m = (a_{m1}, a_{m2}, a_{m3}) = (\frac{1}{n}\sum_{i=1}^{n} a_1^i, \frac{1}{n}\sum_{i=1}^{n} a_2^i, \frac{1}{n}\sum_{i=1}^{n} a_3^i)$$

Finally, using the simple method of fuzzy centroid, defuzzification of the values for each stage of the fuzzy Delphi was performed according to the following relationship:

$$S_j = \frac{u_j + m_j + l_j}{٣}$$

By completing the above steps, the first round of the fuzzy Delphi method was completed. An example of the outcomes from the initial phase of the fuzzy Delphi method is presented in Table 3.

Table 3.

Sample results from the first round of Fuzzy Delphi

Dimensions (components)	Indicators	Consensus of Experts Opinions			Defuzzified Value
		I	m	u	S1
Big Data Infrastructure in the Digital Transformation Space: Data Mining	Available data volumes	0.267	0.500	0.750	0.506
	Level of data mining accessibility	0.517	0.767	0.900	0.728
	Utilization of big data as a significant news source	0.500	0.750	0.917	0.722
	Related capabilities associated with big data	0.367	0.617	0.833	0.606

Fuzzy Delphi Stage Two

Following the completion of the first phase, selected experts, in addition to expressing their opinions on the selected indicators, added additional indicators for some components. The proposed indicators are presented in Table 4.

Table 4.

Additional proposed indicators by experts

Dimensions	Components	Indicators
Big Data Infrastructure in the Digital Transformation Space	Data mining	Prerequisites of data mining/integration of databases and implementation of data warehousing/access level to data mining results
	Data analysis	Data analysis culture/comprehensive map for data utilization/utilization of suitable human resources for data exploitation/utilization of development technology and data integration/data mining capability/support for data analysis at the highest levels/data-driven decision-making capability
	Content creation through data analysis	Social network analysis capability/machine learning and deep learning access/cognitive technology access
	Attainment of data governance	Big data hardware infrastructure/database technologies, audience rights formulation and execution/laws and regulations for audiences
Digital Literacy of Managers and Employees	Digital literacy of new media managers and employees	Access level to media/consumption level of media/ability to analyze and evaluate media messages/ability to create and disseminate media messages/relevant academic disciplines
	Acceptance and utilization of new media technologies	Connection to digital ecosystems and networks
	Formation of digital culture	Digital work environment/organization of relevant conferences and seminars/digital technological facilities and equipment
Innovation in Technologies and Digital Content	Focus on technological innovation	Connection to scientific and academic centers/existence of specialized clusters/financial resource provision/level of intellectual property protection
	Focus on content innovation	Employees' experience in innovation utilization/employee participation in innovation creation

Dimensions	Components	Indicators
	Development of innovation culture	Institutional policymaking/support services/organic organizational structure/ambiguity acceptance/impractical issue tolerance
	Collaboration in innovation (open innovation)	Collaboration with customers and suppliers/use of external knowledge resources/networking with external resources
	Research and development	Knowledge management system/organizational culture/organizational intelligence/allocating credits for research/learning through research and development
	Formation of creative and innovative audience-centric teams	Creative human resources/positive attitude toward employees/participatory leadership/diversity of employee and team expertise
Technological Capabilities of New Media	Digital journalism	Generation of companion analytical content (especially for mobile phones)/use of social messaging apps/convergent, platform-based and integrated newsroom
	Employees' utilization of new media technologies	Multi-skilling of journalists
	Organizational utilization of new media technologies	Production of interactive content
Audience Engagement	Media owners' communication with audiences	Engagement of audience on news media platforms
Technology-based Business Strategies	Institutional environment	Policies and regulations governing the digital domain
	Revenue and cost management	Minimizing the total cost/ market diversity

Then, another questionnaire along with the previous opinions of each expert and the extent of their disagreement with the panel's average opinion, along with the new indicators, was provided to them. A sample of the results from the second phase of Fuzzy Delphi is displayed in Table 5.

After this stage, to examine the consensus among the experts, the absolute difference in the average opinions of the experts in the first and second rounds was calculated employing the following formula:

$$\left(a_{m1} - a_1^{(i)}, a_{m2} - a_2^{(i)}, a_{m3} - a_3^{(i)}\right) = \left(\frac{1}{n}\sum_{i=1}^{n} a_1^{(i)} - a_1^{(i)}, \frac{1}{n}\sum_{i=1}^{n} a_2^{(i)} - a_2^{(i)}, \frac{1}{n}\sum_{i=1}^{n} a_3^{(i)} - a_3^{(i)}\right)$$

The Delphi process continues until the absolute difference in the average opinions of the experts between the two-rounds survey reaches less than 0.2 and in this case the survey process stops. Table 5 show the value

of this difference is as an example. In this table, indicators for which the value of S1 is not specified are indicators added by the experts during the first-round survey.

Table 5.
Sample results from the second round of Fuzzy Delphi

Dimensions	Components	Indicators	Consensus of Experts Opinions			Defuzzified Value		
			I	m	u	S2	S1	S2-S1
Big Data Infrastructure in the Digital Transformation Space	Data Mining	Volume of available data	0.483	0.733	0.933	0.717	0.506	0.211
		Level of access to data mining	0.400	0.650	0.867	0.639	0.728	0.089
		Utilization of big data as a significant news source	0.500	0.750	0.933	0.728	0.722	0.006

Related capabilities of big data	0.350	0.600	0.833	0.594	0.606	0.011
Prerequisites of data mining	0.483	0.733	0.933	0.717		0.717
Integration of databases and implementation of data warehouses	0.517	0.767	0.900	0.728		0.728
Level of access to data mining results	0.500	0.750	0.917	0.722		0.722

Fuzzy Delphi Stage Three

Given that the absolute difference in the means of experts' opinions for all indicators has not yet reached less than 2.0 after the completion of the second round of Fuzzy Delphi, the Delphi survey in the third round must continue. In this stage, the Delphi survey was conducted only for the indicators with differences between the first and second rounds exceeding 2.0. Table 6 presents sample results of the Delphi survey in the third round. Subsequently, to assess the consensus among experts, the absolute difference in the mean opinions of experts in the second and third rounds was calculated with the values presented in Table 6 as examples. Based on the findings, the difference in mean expert opinions for all indicators is less than 2.0 which indicates that a consensus was reached through the survey.

Table 6.
Sample results from the third round of Fuzzy Delphi

Dimensions	Components	Indicators	Consensus of Experts Opinions			Defuzzified Value		
			I	m	u	S3	S2	S2-S3
Big Data Infrastructure in the Digital Transformation Space	Data Mining	Volume of available data	0.517	0.767	0.950	0.744	0.717	0.027
		Prerequisites of data mining	0.550	0.800	0.950	0.767	0.717	0.050
		Integration of databases and implementation of data warehouses	0.550	0.800	0.950	0.767	0.728	0.039
		Level of access to data mining results	0.567	0.817	0.967	0.783	0.722	0.061

Table 7 displays the final results of the three rounds of Delphi accompanied by expert consensus. In the indicator screening stage, any indicator below the predetermined threshold value is eliminated while the remaining indicators are recognized as effective. Some researchers (e.g., Kosmidou, 2017) have introduced 0.7 as the threshold boundary, i.e., the indicator acceptance criterion. If the non-fuzzy value of an indicator in the final round equals or exceeds 0.7, it is accepted; otherwise, it is deemed rejected and removed. Considering that some indicators in this study are below the threshold, they have been eliminated. These indicators are highlighted in darker color in the table.

Table 7.
Sample final results of Fuzzy Delphi

Dimensions	Components	Indicators	Consensus of Experts Opinions	Defuzzified Value

		I	m	u	S
Big Data Infrastructure in the Digital Transformation Space	Data Mining				
		Volume of available data — 0.517	0.767	0.950	0.744

		I	m	u	S
Big Data Infrastructure in the Digital Transformation Space	Data Mining	Volume of available data	0.517	0.767	0.950	0.744
		Level of access to data mining	0.400	0.650	0.867	0.639
		Utilization of big data as a significant news source	0.500	0.750	0.933	0.728
		Related capabilities of big data	0.350	0.600	0.833	0.594
		Prerequisites of data mining	0.550	0.800	0.950	0.767
		Integration of databases and implementation of data warehouses	0.550	0.800	0.950	0.767
		Level of access to data mining results	0.567	0.817	0.967	0.783

The indicators that were eliminated based on expert opinions are as follows:

1- Convergent, platform-based and integrated newsroom
2- Communication with networks and digital ecosystems
3- Collaboration with scientific and academic centers
4- Utilization of external knowledge resources
5- Digital technological facilities and equipment
6- Organization of relevant conferences and seminars
7- Deployment of suitable human resources for data utilization
8- Utilization of development technology and data integration
9- Acceptance of ambiguity
10- Prerequisites of data mining
11- Financial resource provision
12- Employees' experience in innovation exploitation
13- Impractical issue tolerance
14- Allocation of funds for research
15- Market diversity
16- Diversity of employees' expertise and teams
17- Ability to analyze social networks
18- Ability to analyze and evaluate media messages
19- Data-driven decision-making capability
20- Ability to create and disseminate media messages
21- Text mining capability
22- Machine learning and deep learning capability
23- Production of accompanying analytical content (especially for mobile phones)
24- Production of interactive content
25- Multi-skilling of journalists
26- Minimizing total cost
27- Support for data analysis at the highest levels
28- Support services
29- Engagement of audience in news media platforms
30- Access to cognitive technologies
31- Relevant academic disciplines
32- Participatory leadership
33- Big data hardware infrastructure
34- Organic structure
35- Level of access to data mining results
36- Policies and regulations governing the digital space
37- Knowledge management system
38- Institutional policy-making
39- Networking with external resources
40- Data analysis culture
41- Organizational culture
42- Database technologies, drafting and implementation of audience rights
43- Audience laws and regulations
44- Digital work environment
45- Employee participation in innovation creation
46- Level of social media messaging usage
47- Level of intellectual property protection
48- Media access level
49- Media consumption level
50- Comprehensive map for data utilization
51- Positive attitude towards employees
52- Creative human resources
53- Existence of specialized clusters
54- Collaboration with customers and suppliers
55- Organizational intelligence

56- Learning through research and development

57- Integration of databases and implementation of data warehouses

Conclusion and Recommendations

The primary aim of this research was to address the fundamental question: "What are the strategic factors for implementing new technologies in the media industry?". To achieve this goal, dimensions, components and indicators of the initial qualitative model were extracted from library resources and relevant studies, comprising 42 papers. Subsequently, to localization of obtained indicators, the opinions of 15 experts in the media field, each with over 5 years of experience in educational, research or executive roles, were collected employing the fuzzy Delphi method and a semi-structured questionnaire developed from the identified components and indicators. For this purpose, following the conduct of three rounds of the fuzzy Delphi method, necessary agreements were reached. Eventually, 51 indicators were excluded according to experts' opinions and 57 proposed indicators were unanimously approved, resulting in a total of 166 agreed-upon localized indicators.

The dimensions, components and indicators obtained in this study exhibit alignment with concepts identified in other research endeavors. Specifically, the concept of big data infrastructure in the digital transformation space resonates with the findings of Özkent (2022) and Guinan et al. (2019). However, the concept of data mining was introduced for the first time in this study. Regarding the factors of digital literacy among managers and employees, there is consistency with the variables in the studies of Panagiotidis and Veglis (2020), Shirazi et al. (2021), Sidiropoulos et al. (2019), Workman (2014), Garcia-Perdomo and Magana (2020) and Shams et al. (2018). Furthermore, the dimension of innovation in technologies and digital content aligns with the findings of Sharifi and Khatami (2019), Abbas and Singh (2014), Guinan et al.

(2019), Sanasi et al. (2021) and Ekdale et al. (2015). Within this dimension, the concept of audience-centeredness in forming creative and audience-centric teams alongside research and development in the media industry are components that were not emphasized in previous research and represent innovations of this study.

The concept of technological capabilities in new media aligns with the findings of Moon and Hadley (2014), Sidiropoulos et al. (2019), Panagiotidis and Veglis (2020), Knight (2016), Qi (2022), Roshandel-Arbatani et al. (2018), Torrents (2018), Guo (2021) and Atkin et al. (2015). However, the concept of digital journalism is considered an innovation in this study.

In the dimension of media communication management, consistency is observed with the findings of Torrents (2018), Westlund et al. (2021) and Guinan et al. (2019). The concept of media communication between media owners' and audiences has been highlighted in this study. Furthermore, this study introduces the novel concept of the semantic dimension within the new media industry, although related components have been mentioned in the findings of Søren and Gunhild (2018) and Panagiotidis and Veglis (2020). Additionally, the dimension of audience engagement corresponds with conclusions drawn by Rosen et al. (2013), while the dimension of technology-based business strategy resonates with the findings of Madichie et al. (2020), Majdalawieh and Khan (2022), Piepponen et al. (2022), Chukwu et al. (2019), Uduak (2021) and Li (2020).

An essential point underscored in the findings of this study lies within the realm of big data. Big data has a pivotal role in content creation and dissemination across social media platforms and therefore enhancing the efficiency of the media industry. One of the critical aspects in the adoption and implementation of digital technologies in the media industry is the provision of suitable infrastructure for big data. Proper data analysis, media sources, data governance, data security and the commercial value of big

data all fall under the purview of ensuring appropriate infrastructure for big data.

In the realm of ICT, researchers in media technology believe that new theoretical perspectives are striving to strengthen media dissemination theory. Within this domain, two primary imperatives exist. One revolves around the unique technical capabilities related to new digital technologies while the other pertains to the shifting political landscape in contemporary societies. Both play significant roles in the implementation of digital technology within media. In this research, two related components within this theoretical approach have been examined as the technological capabilities of new media and media communication management. For instance, media convergence, ease of access and information dissemination, user participation discourse (as derived components) and Porter's five forces in industry structure (the threat of new entrants, bargaining power of suppliers, bargaining power of buyers, competition among existing players and the threat of substitute products and services) each play a pivotal role in the success of the media industry.

To achieve organizational performance improvement, it is imperative to acknowledge the need for a satisfactory level of technological capability. One way to attain technological capability is through implementing technological management processes within the organization. Additionally, by adopting an integrated management approach to technology, the concept of integrated technology management emerges which include normative, strategic and operational levels. Operationally, organizations consist of various subsystems that transform inputs into valuable outputs through their processes, thereby enabling organization's viability. Technology management system is one of those systems that support organizational decisions regarding current and new technologies. Given the significance of technology and technology management in technologically advanced organizations, it's essential to implement a technology management system within the organization. Therefore, it is need to outline its processes and identify the necessary activities for each of these processes. These processes include identifying the most suitable technology, selecting the most up-to-date technology, choosing the most competitive technology, identifying and acquiring the most appropriate technology, leveraging technology effectively, protecting the technology in use and learning to use technology correctly. The processes of identifying and selecting technology are of utmost importance within an organization. This is likely because identifying or selecting low-level and inappropriate technologies can reduce the costs associated with wrong technology decisions. Moreover, the process of leveraging technology holds the third position in terms of superiority among technology management processes due to its crucial role in achieving the final product and meeting customer needs. Finally, the processes of learning, acquisition and support of technologies are in subsequent positions in terms of importance. The lower importance of these three processes in the organization stems from insufficient attention to technology learning and support as well as support for knowledgeable technical staff which has led to increased dissatisfaction within the organization. Regarding the technology acquisition process, it should be noted that selecting the appropriate technology acquisition method is not of significant importance due to the organization's adherence to previous approaches in technology procurement.

The subject of this research broadly focuses on the media industry; however, future studies could delve into specific branches of the media industry such as film, music, news organizations or social networks in general or specific social networks like Instagram or Bale and so on. For future research, each of the components identified in this study has the potential to be examined as an independent topic. For instance, exploring the role of new technologies in the media industry with a focus on digital

transformation and how far advancements have been made in this regard. And or, investigating concerns such as forming audience-centric creative teams by focusing on users of social networks and social media in the country could provide insight into how users operate on domestic social networks. Future studies could shed light on the phenomenon of new semiotics in the media industry and investigate the use of meaning in the media industry with a focus on digital transformation. Considering that one of the results of this research and a part of its innovation is attention to semiotics in the media industry and its relationship with digital transformation, it is essential to explore how digitalization has influenced the evolution of semiotics in the media industry. One of the consequences of semiotics in the media industry is the phenomenon of artificial intelligence which has created a significant transformation in the media industry in 2023, leading media giants worldwide to adopt this technology and transform their industries. This approach can also form the future research directions in the country's media space with focusing on the application of technologies under the influence of digital transformation.

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