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Identifying Practical Strategies for Achieving Scientific Authority in Science and Technology

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ABSTRACT

This study aimed to identify and analyze practical strategies for achieving scientific authority in the fields of science and technology through the perspectives of national experts. This research utilized a qualitative design grounded in an interpretive paradigm. Data were collected through semi-structured interviews with 13 purposefully selected participants based in Tehran, including university faculty, policymakers, and research administrators. The interviews were conducted until theoretical saturation was reached, ensuring the depth and completeness of data. All interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis with the assistance of NVivo software. The coding process involved open, axial, and selective coding, and data credibility was enhanced through member checking and peer debriefing. The analysis yielded four major themes: policy and governance structures, capacity building and human capital development, infrastructure and ecosystem readiness, and cultural and social foundations. Within these themes, several subthemes emerged, including strategic policy alignment, talent retention, research infrastructure, and scientific mindset promotion. The findings reveal that scientific authority is not a product of isolated interventions but results from systemic integration of governance, ethics, international collaboration, and societal support. Furthermore, the study underscores the importance of aligning national priorities with scientific capabilities and fostering a research culture rooted in inclusivity, transparency, and performance-based evaluation. Achieving scientific authority requires a multidimensional and coordinated approach encompassing strategic policy reform, investment in human and infrastructural resources, ethical integrity, and cultural transformation. The study provides actionable insights for science policymakers and institutional leaders aiming to strengthen national scientific legitimacy and global impact.

Keywords: Scientific authority, national research strategy, capacity building, research governance, qualitative study

Introduction

In the contemporary knowledge economy, the notion of *scientific authority* has evolved into a pivotal benchmark for national advancement and global influence. Scientific authority, defined as the recognized capability of a country or institution to generate, validate, and disseminate credible knowledge, plays a central role in guiding public policy, technological innovation, and socioeconomic development [1]. For nations seeking to assert their place in the global research landscape, achieving scientific authority is no longer a peripheral ambition but a strategic imperative.

Numerous scholars have emphasized the foundational role of research in enhancing institutional prestige and fostering societal progress. As noted by Ahmed, scientific research serves as the engine of academic excellence and societal resilience [2]. In this regard, universities and national research institutions are not merely centers of learning, but also critical incubators of innovation and legitimacy. Castellanos has argued that in higher education, embedding a strong research culture enables institutions to transition from knowledge consumers to knowledge producers, thereby reinforcing their epistemological sovereignty [3].

However, achieving scientific authority demands more than just knowledge production; it involves establishing a system that supports scientific credibility, ethics, and global engagement. As highlighted by Lawrence, scientific research must be ethically grounded to ensure that the pursuit of authority does not compromise integrity [4]. Similarly, Schwartz stresses that character development and moral reasoning among researchers are as critical as technical expertise [5]. These perspectives indicate that ethical and humanistic dimensions are fundamental to any legitimate scientific enterprise.

Institutional alignment is another essential element. Rautalin, in his analysis of the OECD, shows how international organizations construct their scientific legitimacy by embedding norms, producing policy advice, and utilizing networks of authority [6]. This underscores the significance of policy coherence and organizational trust as countries aspire to gain scientific leadership. A similar concern is raised by Rossinsky, who explored how centralized authority systems may either facilitate or hinder institutional credibility depending on the design of governance structures [7].

From a strategic management perspective, Căpraru highlights that the pursuit of scientific excellence requires intentional and sustained efforts in managing scientific resources, setting strategic priorities, and aligning institutional missions with national development goals [8]. This management-oriented approach is especially pertinent in developing countries, where resource constraints necessitate optimal utilization of available infrastructure and talent. Likewise, Krstić emphasizes the importance of systematic literature review in research planning, arguing that contextual understanding is vital to establishing novel contributions and avoiding redundancy [9].

Equally important is the quality of scientific communication. Nayak stresses the value of precision and clarity in scientific writing, noting that poor communication hinders the impact and credibility of research findings [10]. This is further elaborated by Kovalenko, who critiques methodological flaws and the lack of standardization in emergent fields such as the Industrial Internet of Things (IIoT), suggesting that scientific authority must be rooted in methodological rigor [11].

Moreover, global visibility is indispensable in asserting scientific influence. As Hoti and Muka explain, international research standards serve as both benchmarks and mechanisms for global recognition [12]. The internationalization of research practices, therefore, becomes not just desirable but necessary. Serdar's study supports this, arguing that international collaboration enhances credibility, fosters innovation, and amplifies the global relevance of national research agendas [13]. Tahmooresnejad further reinforces this argument by emphasizing the role of collaborative networks in elevating Canada's research standing through shared expertise and resource pooling [14].

In addition to collaboration, disparities in research opportunity must be addressed. Montesinos draws attention to the unequal distribution of research infrastructure and funding, which limits the participation of certain communities and countries in global scientific discourse [15]. This concern is echoed by Santi, who highlights the underrepresentation of certain disciplines—such as Canon Law—in mainstream academic platforms, suggesting that diversity of scientific voice is integral to a pluralistic and authoritative research system [16].

Likewise, Combemale discusses the importance of research software engineering and scientific models in building reliable, reproducible, and scalable scientific outputs [17]. The incorporation of robust digital infrastructures and standardized tools enhances transparency and confidence in research, both of which are critical for scientific legitimacy. Krummel's work also notes that university life must prioritize scientific engagement to promote a vibrant academic community capable of generating relevant knowledge [18].

Parallel to this, Florio elaborates on various types of scientific research in education, arguing that each type contributes uniquely to evidence-based practice and policy [19]. In policing, for instance, Hamadi emphasizes that scientifically informed strategies result in more effective law enforcement and public trust, showcasing how the authority of science extends beyond academia to influence real-world institutions [20].

Despite these critical factors, several structural and cultural barriers continue to challenge the realization of scientific authority. Kajaman notes that in Libyan universities, for instance, limited funding, political instability, and weak research culture prevent the formation of robust research ecosystems [21]. Mustafa identifies similar challenges in pharmacognosy and medicinal plant research, where lack of institutional support undermines scientific progress and recognition [22].

Furthermore, Narimane argues that the cultivation of philosophical thinking skills among researchers is crucial for advancing science that is not only innovative but also critically reflective [1]. Scientific authority, therefore, is not solely about output volume but about the depth, coherence, and transformative capacity of the research. Davis adds a unique perspective by emphasizing the inclusion of underrepresented voices—such as fathers in pediatric research—which can lead to more comprehensive and impactful science [23].

In environments where scientific advancement is prioritized, investment in strategic infrastructure, intellectual capital, and policy innovation becomes central. As Haas illustrates through a historical lens, the consolidation of scientific authority in Enlightenment France was not accidental but the result of deliberate professionalization and institutional empowerment of science [24]. This historical insight resonates with current efforts by modern states aiming to replicate such trajectories in today's technologically-driven, competitive global order.

Zerem's exploration of science metrics in Bosnian academia raises critical questions about the overreliance on quantitative indicators for promotion and recognition [25]. While metrics are useful, they can distort research priorities and undermine intrinsic scientific values if not properly contextualized. This signals the need for balanced evaluation systems that appreciate both qualitative depth and quantitative performance.

Taken together, these perspectives underline the multidimensionality of scientific authority. It is not merely a matter of institutional ambition or technical capability, but a comprehensive construct involving ethical standards, methodological rigor, strategic alignment, global collaboration, and sociocultural responsiveness. For countries aspiring to achieve scientific authority—particularly in the Global South—this means designing integrated policies that simultaneously invest in people, platforms, and purpose.

The current study emerges within this intellectual context, aiming to identify practical strategies for achieving scientific authority in the realms of science and technology. Drawing upon semi-structured interviews with national experts, this research investigates the enabling conditions, institutional mechanisms, and cultural transformations necessary to build and sustain scientific legitimacy in the 21st century.

Methods and Materials

Study Design and Participants

This research employed a qualitative design with the aim of exploring and identifying practical strategies for realizing scientific authority in the fields of science and technology. The study was grounded in an interpretive paradigm to deeply investigate the experiences and perspectives of individuals with relevant expertise. The participants consisted of 13 key informants selected using purposive sampling, ensuring they possessed substantial knowledge and experience related to national scientific development policies. All participants were based in Tehran and included university faculty members, policymakers, and senior experts in science and technology development sectors. Sampling continued until theoretical saturation was reached, at which point no new conceptual insights emerged from the data.

Data Collection

Data were collected through semi-structured, in-depth interviews conducted in face-to-face settings. The interview protocol was developed based on a preliminary literature review and expert consultation, with open-ended questions designed to encourage detailed responses while allowing flexibility to probe deeper based on participants' answers. Each interview lasted between 45 and 75 minutes and was audio recorded with the consent of the participants. Transcriptions were produced verbatim to ensure data integrity and facilitate rigorous analysis.

Data analysis

Data analysis followed a thematic approach using NVivo software (version 12) to systematically code and categorize the interview data. The analysis began with open coding to identify initial concepts and patterns. These codes were then organized into broader axial categories, which were further refined through selective coding to develop overarching themes that captured the essence of participants' experiences and viewpoints. Constant comparison was applied throughout the coding process to ensure consistency and conceptual clarity. The reliability and credibility of the findings were enhanced through member checking and peer debriefing, ensuring the results accurately reflected the participants' intended meanings.

Findings and Results

The participants in this study consisted of 13 experts selected through purposive sampling, all of whom were based in Tehran and actively involved in the domains of science and technology policy, research, or academic governance. Among them, 9 were male (69%) and 4 were female (31%). In terms of age distribution, 5 participants (38%) were between 40 and 49 years old, 6 participants (46%) were between 50 and 59, and 2 participants (15%) were aged 60 or above. Regarding academic background, 10 participants (77%) held doctoral degrees in fields such as engineering, natural sciences, or management, while 3 participants (23%) held master's degrees with significant experience in policymaking or institutional leadership. Professionally, 6 participants (46%) were university faculty members, 4 (31%) were senior policymakers in governmental science and technology organizations, and 3 (23%) were directors or managers of national research institutes. This distribution ensured a comprehensive representation of perspectives from both academic and policy-making sectors.

Table 1

Main Themes, Subthemes, and Open Codes (Concepts) for Achieving Scientific Authority in Science and Technology

Category (Main Theme)	Subcategory	Concepts (Open Codes)
1. Policy and Governance Structures	Strategic Policy Alignment	National roadmap, long-term vision, prioritizing R&D, science diplomacy, coherence between institutions
	Regulatory Reform	Simplification of procedures, science-friendly regulations, reducing bureaucratic barriers
	Resource Allocation Mechanisms	Budget transparency, stable funding, performance-based funding, independent grant councils
	Institutional Coordination	Inter-agency collaboration, national committees, shared databases, centralized planning
	Legal Framework for Innovation	Intellectual property laws, startup legislation, academic freedom, research commercialization laws
	Evaluation and Monitoring Systems	Outcome-based indicators, regular review cycles, third-party evaluations, KPI dashboards
2. Capacity Building and Human Capital Development	Advanced Training Programs	Postdoc fellowships, specialized technical training, visiting scholar schemes, mentoring programs
	Talent Retention Strategies	Incentives for scientists, diaspora engagement, competitive salaries, research grants
	Educational System Reform	Interdisciplinary curricula, critical thinking, industry-academia integration, STEM promotion
	Leadership and Management Capacity	Research management courses, academic leadership development, strategic thinking training
	Youth Empowerment Initiatives	Student research competitions, innovation clubs, internships in R&D, entrepreneurship education
	Inclusion and Gender Equality	Women's participation in STEM, inclusive policies, anti-discrimination training, leadership roles for minorities
	International Mobility Support	Bilateral exchange programs, visa facilitation, international travel grants, foreign language training
3. Infrastructure and Ecosystem Readiness	Research Infrastructure Expansion	National labs, high-tech facilities, research equipment, digital platforms
	Access to Scientific Databases	Subscription to journals, open-access policies, national repositories, digital libraries
	Science and Technology Parks	University-linked parks, innovation zones, incubation centers, regional clusters
	Public-Private R&D Collaboration	Joint research labs, industrial PhDs, tech-transfer units, venture capital networks
	Technology Transfer Mechanisms	Patent offices, spin-off facilitation, licensing models, innovation brokers
	Digital Transformation	Big data infrastructure, AI-based tools, e-research platforms, digital monitoring systems
4. Cultural and Social Foundations	Scientific Mindset Promotion	Public awareness campaigns, media outreach, science literacy programs, documentaries
	National Pride in Science	Celebrating scientific achievements, awards for researchers, science festivals, popular science writing
	Collaboration and Team Science Culture	Team-based grants, multidisciplinary research, co-authorship incentives, lab culture transformation
	Ethics and Integrity in Research	Research misconduct policies, training in ethics, transparent peer review, whistleblower protections
	Role of Religious and Cultural Values	Harmonizing science with local values, Islamic science discourse, cultural legitimation of science

1. Policy and Governance Structures

Strategic Policy Alignment: Participants emphasized the importance of aligning national strategies with scientific and technological priorities. Interviewees frequently cited the need for a unified vision: *“We have scattered initiatives; we need a national roadmap that consolidates efforts toward scientific leadership”* (Participant 4). The alignment of long-term vision with R&D goals, coherent inter-institutional strategies, and science diplomacy were repeatedly stressed.

Regulatory Reform: Bureaucratic rigidity was identified as a critical barrier. Participants advocated for the simplification of procedures and updating of regulations to match the pace of scientific progress. One expert stated: *“Our researchers spend more time navigating red tape than conducting actual research”* (Participant 9). The lack of agile and innovation-friendly regulation was mentioned as a significant inhibitor.

Resource Allocation Mechanisms: Fair and strategic distribution of financial resources was considered central to achieving scientific authority. Many participants noted the inefficiency in current funding systems: *“Funding is not based on scientific* *merit but on connections"* (Participant 2). Suggestions included transparent budgeting, stable and performance-based funding, and independent grant management structures.

Institutional Coordination: Disjointed efforts among research bodies were highlighted as problematic. Participants called for stronger coordination mechanisms across ministries, research centers, and universities. As one participant explained: *"We lack an integrated system where research priorities are shared and synchronized across institutions"* (Participant 5).

Legal Framework for Innovation: The absence of robust legal structures to support innovation was commonly mentioned. Weak intellectual property protections and insufficient legal facilitation for startups were recurring concerns. A researcher noted: *"Startups struggle to protect their ideas. This discourages innovation"* (Participant 6).

Evaluation and Monitoring Systems: Participants criticized the inefficacy of current evaluation systems, which are often input-based rather than outcome-based. There was consensus on the need for periodic performance reviews and key performance indicators (KPIs). As stated by one participant: *"We don't measure what matters—real impact is ignored in favor of quantity"* (Participant 11).

2. Capacity Building and Human Capital Development

Advanced Training Programs: High-quality training opportunities, particularly postdoctoral and technical fellowships, were seen as vital. One participant mentioned: *"We need continuous professional development, not just degrees"* (Participant 8). Mentorship and specialized training were highlighted as essential for sustainable scientific advancement.

Talent Retention Strategies: The brain drain phenomenon was cited as a pressing issue. Participants stressed the need to create attractive working conditions for scientists. A policymaker stated: *"Without incentives, our best minds will continue to leave"* (Participant 1). Engagement with the scientific diaspora was also seen as a potential asset.

Educational System Reform: Participants criticized the traditional educational system for lacking critical thinking and interdisciplinary integration. One academic said: *"We are still teaching 20th-century science in a 21st-century world"* (Participant 10). There was broad agreement on the need to reform curricula to include problem-solving and research-based learning.

Leadership and Management Capacity: Several interviewees noted a shortage of capable research managers and academic leaders. Leadership development programs were seen as necessary to equip individuals with strategic planning and organizational skills. *"Not every good scientist makes a good manager,"* remarked one senior academic (Participant 7).

Youth Empowerment Initiatives: Participants highlighted the importance of early engagement in scientific activities. Programs such as student research competitions and innovation clubs were recommended. One participant noted: *"We should train our future scientists from school age, not after university"* (Participant 12).

Inclusion and Gender Equality: Structural barriers to female and minority participation in science were frequently discussed. *"Women are underrepresented in senior scientific roles,"* said one respondent (Participant 3). Inclusive policies, anti-discrimination training, and leadership opportunities for underrepresented groups were advocated.

International Mobility Support: Facilitating international exchanges and mobility was seen as essential for exposure to global best practices. Participants pointed to bureaucratic hurdles and visa issues as major limitations. *"Even top researchers are often denied the chance to attend conferences abroad,"* noted Participant 13.

3. Infrastructure and Ecosystem Readiness

Research Infrastructure Expansion: Participants cited insufficient access to high-tech laboratories and equipment as a major constraint. *"Some of our PhD students conduct advanced experiments on outdated tools,"* commented one academic (Participant 5). National investment in shared facilities was strongly recommended.

Access to Scientific Databases: Limited access to international journals and digital repositories was frequently mentioned. *"We are scientifically isolated when we lack access to global knowledge,"* said Participant 2. Participants proposed national subscriptions and open-access initiatives.

Science and Technology Parks: University-linked science parks and innovation clusters were seen as enablers of academic-industrial collaboration. One participant stated: *"Without real innovation zones, universities remain islands"* (Participant 4). Expansion and better integration of these parks were suggested.

Public-Private R&D Collaboration: Interviewees noted that industry-academia collaboration remains weak. *"Companies don't trust research institutions—and vice versa,"* explained Participant 8. Suggestions included joint research projects, co-funded PhDs, and tech transfer offices within universities.

Technology Transfer Mechanisms: Participants pointed to inadequate systems for commercializing scientific output. *"We generate patents, but most never reach the market,"* noted Participant 6. They recommended establishing innovation brokers and licensing platforms.

Digital Transformation: The need for digital infrastructure—such as AI tools and data platforms—was frequently mentioned. *"Digital transformation isn't just a luxury; it's the future of science,"* said one researcher (Participant 9). Participants called for strategic investment in digital research ecosystems.

4. Cultural and Social Foundations

Scientific Mindset Promotion: Participants argued that promoting a scientific culture requires public engagement. *"The public must understand and value scientific reasoning,"* remarked Participant 10. Media campaigns, science education, and outreach were seen as key tools.

National Pride in Science: Fostering pride in local scientific achievements was suggested to boost morale and motivation. One expert noted: *"We celebrate football, not science. That must change"* (Participant 7). Public events and science awards were suggested strategies.

Collaboration and Team Science Culture: Several participants highlighted the need to move from individual to collaborative science. *"We reward solo performance, but science today is a team sport,"* said Participant 11. Team-based grants and co-authorship incentives were discussed.

Ethics and Integrity in Research: Concerns about research misconduct were widely shared. *"Without ethical grounding, our scientific authority will crumble,"* warned Participant 13. Ethical training, misconduct policies, and peer review reform were recommended.

Role of Religious and Cultural Values: Participants emphasized the need to harmonize scientific progress with cultural and religious values. *"Science must be seen as aligned with our identity, not a foreign intrusion,"* commented Participant 3. Culturally legitimate discourse around science was seen as essential for public acceptance.

Discussion and Conclusion

The present study identified four overarching themes and several sub-themes that together illuminate the multidimensional strategies necessary to establish scientific authority in the domains of science and technology. These include policy and governance structures, capacity building and human capital development, infrastructure and ecosystem readiness, and cultural and social foundations. The integration of these elements was revealed through qualitative analysis as a holistic framework essential for national and institutional progress toward scientific legitimacy. The findings of this study are well-aligned with and supported by prior scholarly work that addresses the theoretical, operational, and strategic dimensions of research excellence.

A central finding of this study was the need for strategic policy alignment and regulatory reform to ensure that national agendas are synchronized with the evolving demands of science and technology. Participants emphasized that without an overarching and coherent roadmap, fragmented efforts across institutions can hinder progress. This is echoed in the work of Rautalin et al., who documented how international organizations like the OECD derive their scientific legitimacy through structured policy advice and alignment with global governance frameworks [6]. Similarly, Rossinsky's emphasis on the systematization of executive authority in public administration underscores the importance of unified national leadership to support scientific development [7]. The notion that regulatory reforms are necessary to streamline scientific procedures also resonates with the argument made by Kovalenko, who criticized methodological inconsistency and structural inefficiencies in emerging scientific domains like the Industrial Internet of Things [11].

The study also highlighted the significance of resource allocation mechanisms, institutional coordination, and monitoring systems. Participants stressed the inadequacy of traditional funding models and called for performance-based funding and transparency. These concerns are reflected in Căpraru's perspective that strategic management of research requires optimized resource distribution and institutional accountability to foster sustained growth [8]. Moreover, the critique of metric-driven academic promotion systems in the work of Zerem et al. supports the participants' call for outcome-based evaluations rather than quantitative indicators alone [25]. This convergence suggests that the legitimacy of scientific institutions is closely tied to their governance practices and commitment to meaningful evaluation.

Equally important in the pursuit of scientific authority is capacity building, particularly in terms of advanced training, talent retention, and educational reform. The present study found that without mechanisms to develop and sustain high-quality human capital, scientific leadership remains unattainable. Ahmed asserted that research must be embedded in all levels of education to cultivate analytical and innovative capabilities from an early stage [2]. This is aligned with Castellanos' position that higher education institutions serve as pivotal hubs for transforming societies through scientific production [3]. In addition, Narimane's work emphasizes the importance of fostering philosophical thinking skills to develop reflective and critical researchers who can contribute meaningfully to scientific discourse [1]. Furthermore, Nayak pointed out that scientific authority is inextricably linked to writing proficiency, as the ability to disseminate knowledge effectively is a prerequisite for global impact [10].

The relevance of youth empowerment, gender inclusion, and leadership development emerged strongly in the present data. These aspects are essential to constructing a resilient and diverse scientific workforce. Schwartz and Yap emphasized the developmental aspects of scientific identity, including character formation and ethical competence, as indispensable elements of credible research communities [5]. Their observations resonate with our findings, especially in relation to fostering inclusivity and intellectual integrity in science. Similarly, Davis underscored the importance of including underrepresented groups in research processes, suggesting that scientific authority must be inclusive to be legitimate [23]. These alignments further validate the argument that developing human capital is as much a cultural endeavor as it is a technical one.

The third main theme of the study—infrastructure and ecosystem readiness—underscores the necessity of modern, interconnected, and functional research ecosystems. The availability of high-tech laboratories, access to scientific databases, and the establishment of science parks were viewed by participants as fundamental enablers. This reflects Combemale's advocacy for standardized scientific models and robust research software infrastructure to ensure quality and reproducibility in modern scientific work [17]. Likewise, Krummel stressed that a vibrant university environment must provide both the physical and intellectual infrastructure to support inquiry [18]. In parallel, Mustafa's study on pharmacognosy pointed out that research in specialized fields is severely limited without institutional investment in infrastructure and resources [22]. The emphasis on public-private partnerships and digital transformation in our data further aligns with Florio's call for diversified research models that integrate various educational and technological paradigms [19].

Technology transfer and commercialization were also significant in the responses of participants, who felt that many innovations never reach the market due to structural disconnects. Hamadi's work in the field of policing suggests that scientifically-informed practice only becomes authoritative when it is effectively implemented in real-world settings [20]. This affirms the notion that scientific authority is realized not just in laboratories but through translational efforts that impact policy, industry, and society.

The final theme, cultural and social foundations, provides critical insight into the societal conditions necessary for scientific advancement. Promoting a scientific mindset, fostering national pride in science, and harmonizing scientific goals with cultural values were identified as key priorities. Montesinos emphasized the danger of overlooking systemic disparities, noting that scientific progress must be inclusive to be impactful [15]. Santi's analysis of Canon Law research reinforced the need to support niche disciplines that reflect diverse intellectual traditions and ethical frameworks [16]. Furthermore, Haas' historical examination of Enlightenment France demonstrated how scientific authority was cultivated through the institutionalization of ethical practices and public credibility [24]. These historical and contemporary accounts validate the participants' emphasis on nurturing a culture of science that is respected, celebrated, and sustained by the public.

Additionally, the role of international collaboration was frequently cited by participants and aligns closely with the literature. Serdar argued that partnerships across borders enhance credibility, diversify perspectives, and generate higher quality research outputs [13]. The role of networks in elevating scientific status is also echoed by Tahmooresnejad, who emphasized the structural advantage conferred by collaborative ecosystems in Canada [14]. These findings confirm that national scientific authority is amplified through global interconnectedness, mutual trust, and shared values.

In sum, the present study's findings align well with prior literature, affirming the multifaceted nature of scientific authority. The results reinforce the view that no single dimension—be it policy, infrastructure, or ethics—can independently sustain scientific leadership. Rather, authority is cultivated at the intersection of governance, capability, access, and culture. This comprehensive understanding provides a foundation for targeted policy design and institutional reform aimed at achieving long-term scientific sovereignty.

Despite the depth of insight generated, this study is subject to several limitations. First, the sample size was limited to 13 participants based in Tehran, which may not capture the full diversity of perspectives from other regions or institutional settings. Second, the study focused exclusively on experts in science and technology; thus, viewpoints from adjacent sectors such as humanities or civil society may be underrepresented. Third, while NVivo software was employed for systematic analysis, the inherently interpretive nature of qualitative coding means that researcher bias, while minimized, cannot be entirely excluded. Lastly, the reliance on self-reported data through interviews may lead to socially desirable responses, particularly on topics such as ethics and policy alignment.

Future studies could broaden the participant pool to include policymakers, practitioners, and scientists from a wider range of disciplines and geographic locations. Comparative case studies between countries at different stages of scientific development may yield insights into context-specific strategies for building scientific authority. Longitudinal research could also track the impact of implemented policies and strategies over time, providing empirical evidence for their efficacy. Moreover, quantitative validation of the qualitative themes identified here—such as through Delphi methods or survey-based modeling—could enhance the generalizability and policy relevance of the findings. Finally, further exploration into the digital dimensions of scientific authority, including the role of AI and open science, would enrich the discourse on future-ready research systems.

To practically advance scientific authority, national science councils and ministries should invest in comprehensive policy frameworks that integrate funding, regulation, and evaluation. Universities and research institutions should develop internal mechanisms for leadership development, interdisciplinary research, and research ethics training. Enhanced collaboration between academia and industry should be institutionalized through joint funding schemes and innovation hubs. Cultural strategies that promote public trust in science—such as national science festivals, media partnerships, and inclusive education—should be mainstreamed. Finally, all efforts must be guided by a commitment to equity, transparency, and global cooperation to ensure that scientific authority becomes not only a national asset but a shared global good.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Written consent was obtained from all participants in the study.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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