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**DEALING WITH RESEARCH MISCONDUCT IN EGYPTIAN
PUBLIC ACADEMIC INSTITUTIONS**

A Dynamic Performance Governance Approach to Enhance Collaboration

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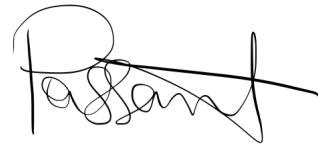
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Declaration

I, Pasant Elwy Ibrahim Moustafa Youssef, confirm through my signature that I am the sole author of this doctoral dissertation. This work represents my original research and is the submission I made to Palermo University in the year 2023.

Pasant Elwy Ibrahim Moustafa

A handwritten signature in black ink, appearing to read 'Pasant', with a large circular flourish above the first letter and a long horizontal stroke extending to the right.

Dedication

I dedicate my Ph.D. dissertation to the cherished land of Egypt, aiming to elevate higher education standards. With immense pride and deep respect, I offer this work, aspiring to contribute to the battle against research misconduct within Egypt's academic and research institutions.



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List of Acronyms

Abbreviation	Definition
ASRT	Egyptian Academy of Scientific Research and Technology
BA	Bibliotheca Alexandria
CLD	Causal Loop Diagram
DLU	Digital Libraries Unit
DPG	Dynamic Performance Governance
DPM	Dynamic Performance Management
E-JUST	Egypt-Japan University of Science and Technology
FFP	Fabrication, Falsification and Plagiarism
FTE	Full-time Equivalent
GERD	Gross Domestic Expenditure on Research and Development
GST	General Strain Theory
HE	Higher Education
IOM	Institute of Medicine
MENA	Middle East / North Africa
MOHESR	Ministry of Higher Education and Scientific Research
NAS	United States National Academy of Sciences
NPM	New Public Management
PSO	Public Sector Organizations
QS	Quacquarelli Symonds
RCR	Responsible Conduct of Research
RCT	Rational Choice Theory

R&D	Research and Development
RM	Research misconduct
SCPU	Supreme Council of Private Universities
SCTI	Supreme Council of Technical Institute
SCU	Supreme Council of Universities
SDG	Sustainable Development Goals
SDS	Sustainable Development Strategy
TWAS	The World Academy of Science
TWAS-ARO	The World Academy of Science Arab Regional Office

DEALING WITH RESEARCH MISCONDUCT IN EGYPTIAN PUBLIC ACADEMIC INSTITUTIONS

A Dynamic Performance Governance Approach to Enhance Collaboration

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Supervised by Professor Carmine Bianchi

ABSTRACT

Scientific research improves citizens' quality of life and is increasingly seen as a major catalyst and key indicator of national growth. To maintain research integrity, studies must be conducted in a manner that inspires confidence in both the employed methods and the produced results. Research misconduct is regarded as an exceptionally challenging issue due to its extensive invasion into the research culture and its potential to undermine the trustworthiness of scientific results. Despite the increasing occurrences of unethical research in Egypt, there is a lack of stringent regulations to penalize individuals who breach established research integrity standards. Furthermore, collaborative governance is undervalued in the higher education system in Egypt. In that sense, this instrumental research study has two objectives. First, explore the numerous causes of data fabrication, falsification, and plagiarism at Egypt's public academic and research institutes. Second, to demonstrate how collaborative governance could help Egypt develop practical research fraud prevention mechanisms. To achieve the above-mentioned objectives, semi-structured interviews were conducted with graduate researchers and faculty from diverse backgrounds and career stages in Egypt's public universities across various regions. Moreover, data were gathered by developing and disseminating a web-based questionnaire among a deliberate selection of Egyptian researchers from various governorates in Egypt. Subsequently, the dynamic performance governance framework was employed to evaluate how Egyptian universities and research institutes utilize shared strategic resources to reinforce research integrity. Following the depiction of the dynamic performance governance chart, causal loop diagrams were generated to visually represent the feedback system's structure. It demonstrated how these variables and contextual factors were used to construct a dynamic performance perspective of universities and research institutes in Egypt. The findings of this investigation demonstrated that Egypt's universities and research centers are currently struggling against a wicked issue known as research misconduct. The researcher noticed that research fraud is triggered by several intertwined factors that are roughly divided into five categories: individual, structural, organizational, cultural, and situational factors. Furthermore, this study showed that artificial intelligence has created new hurdles in maintaining research integrity. As a result, this research suggests that collaborative governance and dynamic performance management and governance be used together, both in theory and practice, to combat research fraud in Egypt. It also creates a platform for policymakers to establish effective strategies and long-term remedies to prevent research misconduct in Egypt.

Keywords: Research fraud; Data fabrication; Data falsification; Plagiarism; Egypt; Collaborative governance; Dynamic Performance Governance

CHAPTER 1 Research Misconduct as a Super Wicked Problem

“Falsification and fabrication of data constitute a form of lying and plagiarism a kind of stealing” (DuBois et al., 2013, p. 321).

This statement demonstrates that research fraud acts are comparable to deception or larceny because they erode confidence in scientific research and cause problems in the real world. To conduct research and infer the results, the field of research necessitates patience and hard work. We all, as researchers, expect to publish research publications on time in our profession in this small academic world, which is a source of stress for many early-career academics (Kalal et al., 2021). Researchers are expected to follow ethical, legal, and professional guidelines governing research (Haven et al., 2021). Ethics refers to the moral principles that must be followed when producing a research paper or article. Unethical research practices can be risky, threaten the authors' safety, and skew the study's results. Regrettably, these practices are endangering science as they are becoming ingrained in the research culture of scientists (Hyland, 2021). Research misconduct practices can be characterized as behaviors or questionable research procedures that fail to meet the ethical, research, and scholarly standards necessitated to maintain research integrity. It can potentially harm people and the environment, squander resources, erode the research record, and undermine research credibility (Gunsalus, 2019).

In addition to addressing and demonstrating the university's position in global rankings, the effectiveness of higher education institutions hinges on the presence or absence of a quality assurance system, the proficiency of their faculty and researchers, research contributions, consulting services, innovation, and more. Nevertheless, upholding integrity and accountability is the only more effective way to manage these aspects (Talib et al., 2013). Integrity, fairness, and reverence for the truth are counted as fundamental principles in scientific and medical research (Lüscher, 2019). It is worth noting that the public's interest in research misconduct has risen dramatically in recent years. While not everyone agrees on what constitutes research misconduct, there is considerable agreement on what has been referred to as research misconduct: fabrication, falsification, and plagiarism (FFP) (Steneck, 2006). This agreement is reflected in national and international codes of conduct (National Academies of Sciences, Affairs, Committee on Science, & Science, 2017; The updated Egyptian constitution, 2019). FFP are the most extreme types of research misconduct, yet they are also the most common among researchers (Eungoo & Hwang, 2020; Fanelli, 2009).

Biomedical sciences are notably known for having a greater frequency of Falsification, Fabrication, and Plagiarism (FFP) compared to fields such as physics, mathematics, and social sciences (Kumar, 2008). Fabrication and falsification contaminate research papers with incorrect information, wasting funds and putting patients in danger (DuBois et al., 2013). Conversely, plagiarism takes credit away from the original authors (Das & Panjabi, 2011). FFP taint the truthfulness and status of research organizations and the credibility of scientific studies (Okonta & Rossouw, 2013). Regarding falsification and fabrication, the motivations for preventing research misconduct differ somewhat from those for plagiarism. While falsification and fabrication undermine the creation of scientific knowledge, plagiarism, while not attributing knowledge to its rightful source, may not necessarily distort scientific data (Fanelli, 2009; Steneck, 2006).

Since scientific research improves residents' quality of life and is becoming more widely recognized as a critical catalyst and key indicator for national growth (Rospigliosi & Bourner, 2019), I focused my dissertation on FFB, which are counted as the most common research malpractices that threaten scientific research.

1.1. Higher education and economic advancement

Human capital is one of the most important aspects of an effective development model (Amira, 2017). Higher education (HE) is essential for preparing human capital to actively contribute to national development and economic advancement (Chankseliani et al., 2020). A country can go forward on the path of development only when an information and knowledge-based environment is built for the next generation and appropriate research and research resources are available at the higher education level (Singh & Qasim, 2021). Technological and scientific advances are vital for the prosperity and growth of any nation. In all cultures, scientific research is essential for creating prosperity, enhancing the quality of life, and genuine economic advancement and transformation (Sharma, 2020). Many evolving nations, including Egypt, have acknowledged the need to adapt to the swiftly changing environment by building a long-standing financial plan that includes a shift in emphasis to a more expanded knowledge-based economy. To achieve this, national planning must establish the correct setting for integrating the supply of knowledge generated by national investments in science, technology, and education with demand, and encourage both governments and companies to capitalize on the knowledge output and advance it up the commercial value chain (Gabriel, 2022).

1.2. Collaborative governance to support research integrity

The world around us is changing at an alarmingly fast rate. It has never seen such rapid change with such global implications. Universities are no different. They are experiencing fast and sometimes chaotic transformation (Abu-Tineh, 2006). Higher education occurs in the age of super-complexity, as Barnett (2000) described. Higher education is changing at a fast pace, and the future is unknown (Ryan & Fraser, 2010). Higher education institutions face an escalating demand due to society's constant changes, necessitating them to swiftly adapt their approaches to knowledge and innovation development and teaching (Zhang et al., 2020). It has been recognized that the success of higher education institutions in their three primary endeavors – teaching, research, and the transfer of knowledge from universities and research institutions to the broader society – greatly relies on the ability of academic and research institutions to establish enduring partnerships with external organizations (such as corporate and nonprofit entities, government agencies, and the general public) or to adopt a collaborative governance strategy (ibid.). Because information lies at the heart of knowledge, it is intangible. It is, likewise, cumulative, meaning that the current global stock and level of information are the direct outcome of previous generations' scientific achievements (Abramo & D'Angelo, 2018). The extant knowledge stock functions as the basis for creating new information and enables its regeneration. Existing knowledge becomes obsolete due to the constant accumulation of new information; therefore, the stock must be maintained regularly (ibid.).

Due to higher education's increasing complexity and unpredictability, it is evident that wicked problems cannot be resolved by a single entity acting alone (Kongolo, 2019). As a result, collaboration among various stakeholders is essential for resolving such complex problems (Himmelman, 2002). Collaborative governance encourages collaboration to attain a common goal through collective action (Forje et al., 2020). Through this approach, institutions that perceive opposing aspects of an issue can actively investigate their disagreements and seek remedies that extend beyond their limited view of feasibility (Sharifi et al., 2022). Collaborative governance, likewise, can promote communication among all concerned stakeholders, allowing them to gain a comprehensive knowledge of the issue at hand. It can also help balance many stakeholders' interests and minimize policy resistance (Bianchi, 2006). Among the most important components of collaboration are the process dynamics, the organizations engaged, the length of time of the collaboration, and shared accountability.

Collaborative approaches typically result in issue-solving, consented norms, and ultimately, the durability of the partnership (Leach, 2011). Furthermore, while being an effective technique for resolving wicked problems such as research misconduct, collaborative governance has gotten less attention in Egypt's higher education system. In light of this, the research study proposes implementing practical and enduring measures to support and strengthen the core principles of scientists within an ever-evolving and diverse research landscape. Most notably, the prevention of FFP requires a multifaceted approach involving detecting fraudulent research cases and establishing appropriate measures to enhance ethical behavior associated with such misconduct.

1.3. Egyptian higher education system

Throughout history, Egypt has been renowned as a "lighthouse" of scientific research and creativity in the Middle East and worldwide (Abdel-Fattah et al., 2013, p. 97). Egyptian scientists, researchers, and philosophers have made significant contributions to astronomy, mathematics, medicine, philosophy, and architecture for ages, with the pursuit of knowledge gaining a boost after the arrival of Islam in the 8th century (Khachab, 2021). Egypt has been "a major cultural and educational hub in the Middle East and Africa for decades and has been a pioneering nation in higher education on various fronts." Moreover, inhabitants have a constitutional right to free education at all levels (Nagib Abou-Zeid, 2016, p. 138). While each country's higher education expands, diversifies, and privatizes uniquely, Egyptian higher education shares many of the same characteristics as other developing countries (Varghese, 2006). Egypt's higher education is divided into three categories. There are two major groups: [1] universities, which provide academic degrees over the course of four to seven years; and [2] institutes, which are divided into two categories: upper-intermediate institutes, which offer technical degrees lasting two years, and higher institutes, which provide professional degrees lasting four or five years (Abdelkhalek & Langsten, 2019). There are two sectors inside each track: public and private. The following sections show how specific paths and areas of Egyptian higher education have advanced and developed.

According to Kamel (2014), Egypt's higher education system stretches back to the founding of Al-Azhar University in 365 A.H. (975 C.E). Egyptian National University began as a private institution in 1908; it became public in 1925, was renamed the State University, was then called King Fouad I, and finally became Cairo University following the 1952 revolution. In 1950, Egypt had three public, secular colleges: King Fouad I in Cairo, Farouk I

in Alexandria, and Ibrahim Pasha in Ain Shams (Abdelkhalek & Langsten, 2019). Additionally, there was the small, private American University in Cairo as well as the public Al-Azhar University, which had its own administrative structure (ibid.). The overall number of enrolled students was roughly 50,000 then, which has since grown to almost two million (Kamel, 2014). Egypt's public education system has undergone numerous modifications over the years, depending on the interests of the ruling administration (Amira, 2017). The Egyptian higher education system evolved swiftly after the 1952 revolution, with post-secondary institutes supplementing the developing university system (Abdelkhalek & Langsten, 2019). Throughout the three centuries of monarchy, the educational system was established to prioritise quality over accessibility. Education was only available to specific individuals, such as immigrants and upper-class citizens. Around 75% of the Egyptian population over the age of 10 was illiterate when the monarchy was overthrown in 1952.

In the 1950s, President Gamal Abdel Nasser, keen on national prosperity and social equality, initiated a variety of programs aimed at achieving economic, social, and educational improvement (Abdelkhalek & Langsten, 2019). In 1962, Nasser promised: [1] a universal secondary school leaving examination for admission to higher education; [2] the elimination of all direct higher education tuition costs; and [3] government employment for all higher education graduates - all initiatives aimed at increasing demand for higher education. The government offered all qualified high school graduates a place in a postsecondary program (Barsoum, 2014). Nasser felt that these initiatives would result in equal enrollment in higher education on their own (Abdelkhalek & Langsten, 2019).

Although the new system increased access to education, it did so at the expense of quality (ibid.). Many of the current difficulties in Egypt's education system, according to Annan (1987), may be traced back to policies formulated and executed by the 1952 Revolution government. Its three goals were to achieve socioeconomic equality, citizen loyalty to the new administration, and national security (ibid.). Indeed, when education was confined to a few, one of the most fundamental motives for making it open and free to all was social equality. "To realize social equality, the new government had to expand educational opportunities for all citizens by financially sponsoring preschool to universities and higher education levels, without considering the limited resources available to the country at the time" (Kandil, 2011, p.59).

Nassar's policies have largely been followed. Egypt's 1971 constitution guaranteed

Entirely free tuition at all levels of education, a promise reaffirmed in the 2014 constitution (Fahim & Sami, 2011). To this day, standardized secondary school exit exams are used. Faced with too many graduates for too few government employments, the promise that all college graduates would get jobs in the government system was taken back in the late 1980s (Kamel, 2014). Existing national universities established branches in Upper Egypt and the Nile Delta provinces. These branches expanded into their universities. In 2017, Egypt had 25 state universities serving approximately 2.2 million students (Abdelkhalek & Langsten, 2019). The immense geographical distribution of the university was intended to provide equal educational opportunities and reduce internal student migration (ibid.).

Egypt's private higher education sector stretches back to 1919, when the AUC¹ was founded as a private non-profit institution. In the early 1990s, legislation allowed for the establishment of private, for-profit institutions, and, in national universities, fee-based language sections and other special courses were introduced. These steps were prompted by the Economic Reform and Structural Adjustment Program, which sought to transfer the economic burden of higher education from the public sector to the private sector (World Bank, 2002). In 1996, four new private for-profit universities were launched in response to the 1990 directive. Private institutions and their student bodies have grown dramatically since their humble beginnings. In 2017, there were more than 138 thousand students enrolled at 22 private universities. Regardless of this growth, only approximately 6% of all university students attend private universities (Kamel, 2014).

The Ministry of Higher Education founded several higher industrial, agricultural, and commercial institutes in 1963. Higher education colleges grew fast as the need for professional education grew. After the enactment of law 1970/52, private institutions of higher education were permitted to offer courses in social services, management, administrative skills, and computer science. During the academic year 2014/2015, there were more than 66,000 graduates from both public and private institutions of higher education (Abdelkhalek & Langsten, 2019).

1.4. Current status of Egyptian higher education

¹ AUC is the only private non-profit institution in Egypt. AUC enrolls approximately 5% of all private university students in Egypt.

1.4.1. Key factors in higher education

The higher education environment is characterized by several distinct aspects essential to higher education and why it exists. (1) Organizational leadership and governance frameworks, (2) a wide range of stakeholders and constituents in higher education, and (3) organizational culture (Storberg-Walker & Torracco, 2004).

Institutional governance and leadership: A group of lay trustees or regents run the institution and look out for the public interest. The faculty members are the experts in teaching and research, and the university administration is in charge of leading and running the institution. In a nutshell shared governance in higher education gives the administration leadership and management commitments, the faculty academic and scientific research responsibilities, and the governing board public responsibility and stewardship (Duderstadt & Womack Farris, 2004). From this perspective, it is clear that the leadership and governance structure of higher education will have a significant impact on any transformation process that begins with defining and attaining objectives. Organizational politics, coalition formation, and the power disparity between leaders and stakeholders play a much larger role in higher education organizations than in traditional business models (Storberg-Walker & Torracco, 2004).

Diverse stakeholders and constituencies in higher education: The dynamics of transition in higher education are continuously influenced by a wide range of internal and external stakeholders. Higher education institutions have a variety of internal constituencies, including students, faculty, staff, administrators, and governing boards. The general public and their elected officials in government, business, the press and other media, foundations, and other public and private institutions in the community are examples of external stakeholders. Managing the complex responsibilities and interactions between the institution and its numerous constituents, especially when these connections change quickly, is a crucial challenge for higher education executives responsible for transformation (Gabriel, 2022).

Organizational culture: It has been recognized in academic and practitioner journals that culture is an important factor in any planned change initiative (Bamldele, 2022). Notably, change approaches proved to be successful if they were culturally cohesive or fit with the social norms of the organization. Institutions that breached their culture throughout the transition process faced challenges (Gabriel, 2015). The change appears to be slow and difficult in higher

education. Higher education institutions have solid and strict cultures that fiercely defend the status quo (Abu-Tineh, 2006). These cultures are amongst society's most potent and tough, far exceeding those of industry, business, and government. Higher education institutions and their students have consciously or unconsciously chosen to resist or ignore the realities and consequences of change (ibid.).

1.4.2. Main higher education performance indicators adopted by the Egyptian government

Higher education and scientific research are the engines that power Egypt's human capital advancement, economic progress, and wealth (Amira, 2017). Egypt has a robust and comprehensive higher education system that may assist 30% of Egyptians (Karakus, 2020). Egypt's higher education system has expanded throughout the preceding 50 years, from a single public university (Cairo University) and a single private institution (American institution) to 11 more public universities by the late 1980s. There are presently 52 universities, comprising 26 public and 26 private institutions. Natural, engineering, medical, and agricultural sciences colleges make for 51.6 percent of all colleges in governmental institutions. In theory, schools (social sciences and humanities) account for 48.4% of all colleges (Ministry of Higher Education and Scientific Research, 2019). Public universities have 494 faculties, with a 26 percent increase between 2014 and 2021. There are also 188 programs in public universities, an increase of over 60% from 118 in 2014, while private institutions now have 264 faculty members, up from 132 in 2014 (Cairo Investment and Real State Development, 2021; Mohamed, 2019).

According to the Central Agency for Public Mobilization and Statistics (CAPMAS)², Egypt is one of the most populous countries in the Middle East, with a population that exceeds 103 million people (CAPMAS, 2022). Around 3 million and 339 thousand students are enrolled, with approximately 48.7 percent females and 51.3 percent males enrolled in public and private universities (ibid.). In terms of the scientific specializations of university students, the most common are social sciences (50 percent), followed by humanities (24.9), natural sciences (4.1 percent), medical and health sciences (11.1 percent), engineering sciences (6.3

² **The Central Agency for Public Mobilization and Statistics (CAPMAS)** is Egypt's official statistics agency, collecting, processing, analyzing, and disseminating statistical data as well as conducting the census.

percent), and agricultural and veterinary sciences (3.4 percent). Despite the fact that theoretical specializations have a large number of students, the percentage of students enrolled in scientific institutions is low (Ministry of Higher Education and Scientific Research, 2019). The results of studying the fields of graduates of public universities reflect the enrolled students, as graduates specialized in social sciences and humanities account for 50.2 percent and 24.9 percent, respectively. In comparison, medical sciences (11.1 percent), engineering sciences (6.3 percent), natural sciences (4.1 percent), and agricultural sciences account for the lowest percentage of graduates in science and technology colleges (3.4 percent) (ibid.). In 2020, the total number of graduates from government universities was 450,522, with approximately 42.67 percent males and 57.33 percent females (CAPMAS , 2020). On the other hand, the total number of graduates from private universities 30, 485 with approximately 49.37% males and 50.63% females (ibid.). Regarding research society, Egypt currently has approximately 138k trained researchers across all academic fields, spread throughout 26 government-affiliated labs and research centers nationwide (Enterprise, 2022). The number of students pursuing university degrees has risen at various rates in recent years. In the last three years, 83,306 students have earned a master's or doctoral degree, with 71.6 percent holding a master's degree and 28.4 percent holding a doctorate degree (Ministry of Higher Education and Scientific Research, 2019).

For their dedication to the UN Sustainable Development Goals (SDGs), 1,406 institutions from 106 countries or regions were included in the Times Higher Education Impact Rankings for 2022. Thirty-six Egyptian universities were among those listed. Cairo University, Ain Shams University, Alexandria University, and Aswan University are among the Egyptian universities on the list (State Information Service of Egypt, 2023). Based on the Quacquarelli Symonds (QS)³ world university ranking 2023, among 1,500 universities worldwide, Cairo University is ranked in the 551-560 band and the 12th in Arab region ranking. Over the years, Cairo University has effectively carried out its purpose of providing education, research, and cultural services. Among Egypt's newer universities, it is regarded as the mother university (The Quacquarelli Symonds, 2023). On the other hand, Ain Shams University is placed 14th in the Arab area and in the 801-1000 band among the world's 1,500 universities (ibid.). Among the world's 1,500 universities, Alexandria University is ranked number 21 in the Arab World

³ **The Quacquarelli Symonds (QS)** World University Rankings by Subject is a ranking of the world's best universities in 51 subject areas. In response to the high demand for subject-level comparisons, the rankings seek to aid prospective students in identifying the world's top institutions in their chosen discipline.

and the 1001-1200 band (ibid.).

As part of Egypt's 2030 strategy for sustainable development and in reaction to President Abdel Fattah al-Sisi's orders, the government is putting a lot of effort into setting up new international universities right now. This initiative aims at attracting world-distinguished international universities with highest global rankings to open branches in the New Administrative Capital (Egypt Independent, 2022). Based on that, Khaled Abdel-Ghaffar, Minister of Higher Education and Scientific Research, declared that six major international universities will open branches in the New Administrative Capital, aptly nicknamed "Sisi City," where studies have begun since the start of the academic year 2020-2021. (ibid.). The founding of these universities aims to raise the standard of higher education, equip graduates with marketable skills, offer international education in Egypt, increase diversity and competition among universities, reduce the cost of scholarships, draw foreign students to Egypt, and strengthen ties between Egypt's higher education system and those in developed countries (University World News, 2021a). Several famous international universities are located in the New Administrative Capital. Of course, all degrees conferred by these universities are certified by the Supreme Council of Universities. Among these institutions are the German International University of Applied Sciences (GIU), Hungarian University, University of Hertfordshire, the European University in Egypt, Swedish University, University of Liverpool, University of Prince Edward, American International University, British Coventry University, Japanese University, University of Canada in Egypt, and University of Sinai (Mohamed, 2019).

1.4.3. Research and development in the Egyptian public sector

The public sector consists of research institutes affiliated with multiple ministries. There are 25 research centers affiliated with various administrations and institutions of civil society involved in research and development (R&D). In addition, 11 research centers and institutions are associated with the Ministry of Scientific Research (CAPMAS, 2022). In 2018, the number of public sector researchers was 24,255, up from 21,843 in 2017, representing an increase of 11%. Researchers who are female make up 40.7 percent of the overall number of researchers (Ministry of Higher Education and Scientific Research, 2019). The number of full-time scientific researchers in Egypt is less than 50% of the overall number of researchers.

Through reviewing the Full-time Equivalent (FTE)⁴ to estimate the number of full-time researchers in research centers, the overall number of full-time researchers in research and development activities was 22,713.4 in 2018. Female researchers make up 41% of the overall number of researchers. Researchers with master's degrees make up 18% of full-time researchers, while those with only a bachelor's degree make up 7% of all full-time researchers. Most full-time researchers (75%) hold doctorates (ibid.). The higher education sector employs the most researchers, with a total of 108,675 in 2018. Compared to 2017, the percentage of higher education researchers increased by 2.4 percent. Female researchers account for 48% of all higher education researchers (CAPMAS, 2022). Although, over the last 10 years, Egypt has produced the most scientific researchers from a research society in the Middle East, on a national basis, there needs to be a better allocation of researchers about distinguished capacities (Ministry of Higher Education and Scientific Research, 2019).

1.4.4. Egypt's expenditure in scientific research

The Frascati Manual⁵ describes expenditure on research and experimental development as “all expenses of research and experimental development within a sector of the economy, which includes current spending (manpower costs such as wages, annual salaries, all costs of research papers, technicians and support staff, and other current costs” (Frascati Manual, 2015). Almost all expenses are estimated in the sector of various ministries (research centers). Research centers and institutes affiliated with multiple ministries have been established for research and development purposes, and all expenditure activities are restricted to research and development only. The estimation of universities' research and development expenditures differs from that of research centers because universities also engage in instruction and other activities in addition to research and development. Research and development expenses are calculated using the time faculty members spend engaged in research and development activities (Ministry of Higher Education and Scientific Research, 2019). Through researching the evolution of scientific research expenditure, it was found that Gross Domestic Expenditure on Research and Development (GERD)⁶ increased by 25.2% per year from 8.52 billion

⁴ **Full-time equivalent (FTE)** is the number of hours that are considered full-time.

⁵ **The Frascati Manual** is a document outlining the methodology for accumulating research and development statistics. The Organization for Economic Cooperation and Development (OECD) prepared and published the Manual.

⁶ **Gross domestic R&D expenditure (GERD)** covers research and development expenditures by businesses, higher education institutions, and government and private non-profit organizations.

Egyptian pounds in 2012 to 23.6 billion Egyptian pounds in 2018 (ibid.).

1.4.5. The institutional strategic framework for higher education in Egypt

The Ministry of Higher Education and Scientific Research⁷ founded a Sustainable Development Strategy (SDS): Egypt's Vision 2030⁸ runs through 2030. Its goals include promoting science, technology, and innovation within HE institutions and research centers, producing industry and market-ready graduates, increasing the HE sector's global competitiveness, increasing HE enrollment, decreasing unemployment, improving HE institution quality, and updating the HE admission system (Egypt's 2021 Voluntary National Review, 2022). The Ministry of Planning and International Cooperation⁹ (2012) declared similar goals for HE institutions in the "Strategic Framework for Economic and Social Development Plan Until Year 2022." (University World News, 2016).

1.4.6. Students ages

Based on the UNESCO Institute of Statistics¹⁰ (2022), the official entry age to tertiary education in Egypt is 18 years. Students are required to begin their postsecondary education in schools that provide a bachelor's degree or above upon reaching 18. However, the time it takes to graduate depends on the specifics of the higher education institution. After completing a bachelor's degree at the age of 22, students pursue master's level programs and various diploma programs. Doctoral studies typically begin when a person is 24 years old.

⁷ **The Egyptian government's Ministry of Higher Education and Scientific Research** is part of the cabinet. The main job of the ministry, which is based in Cairo, is to create, improve, and keep an eye on all policies connected to higher education. Both state and private colleges in Egypt are under the care of the ministry. This job is done by the ministry's three governing bodies: the Supreme Council of Universities, the Supreme Council of Private Universities, and the Supreme Council of Technical Institutions. The ministry is also in charge of the Arabic Language Academy and the National Committee of UNESCO. One of the ministry's foreign offices is in Washington, DC. It is called the Egyptian Cultural and Educational Bureau.

⁸ **Egypt Vision 2030 (Arabic: رؤية مصر ٢٠٣٠)** is an ambitious national plan proposed by Egyptian President Abdel-Fattah Al-Sisi in February 2016. The vision calls for the achievement of eight key national goals by 2030, all of which are in accordance with the United Nations Sustainable Development Goals (SDGs) and the Sustainable Development Strategy for Africa 2063.

⁹ **The Ministry of Planning and International Cooperation** leads sustainable development and impact-based policies by effectively planning, monitoring, and evaluating government performance to implement the sustainable development agenda and efficiently managing public investments towards a knowledge-based and competitive economy in partnership with the private sector and civil society by attracting and raising capabilities.

¹⁰ **The UNESCO Institute for Statistics** is UNESCO's statistical agency and the United Nations' central repository for internationally comparable statistics on education, science and technology, culture, and communication. In 1999, the UIS was established.

1.4.7. Higher education rankings hierarchy

Academic rankings in Egypt are similar to those in other international ranking systems. "Moa'ed" are teaching assistants or demonstrators who must have at least a bachelor's degree. Assistant lecturers, known as "Modaress Mosaed", should hold at least a master's degree. Lecturers must have a Ph.D. and are referred to as "Modaress". Associate professors must have at least five years of experience as assistant professors before applying for promotion, and they are referred to as "Ostath Mosaed." Professors are referred to as "Ostath". To be promoted to the rank of "Ostath", a person must have served as "Ostath Mosaed" for at least five years and have a certain number of publications. "Ostath Motafaregh" is the name of a retired professor (Karakus, 2020).

1.4.8. Egypt's official higher education organizing bodies

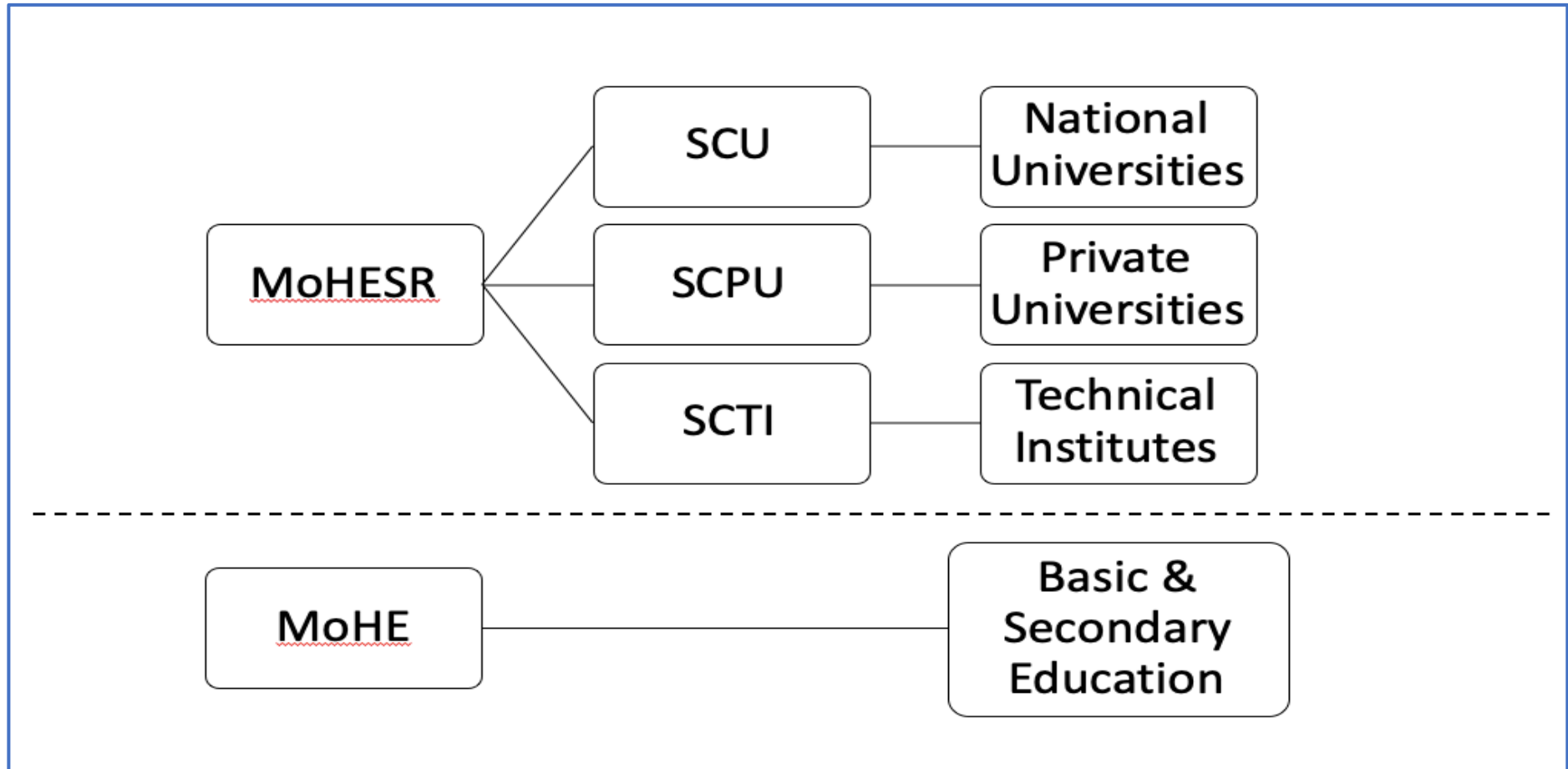
Egypt's Innovation, Science, and Technology System is highly centralized and dominated by the public sector, with the majority of research and development (R&D) occurring in state-run universities and research centers supervised by the Ministry of Higher Education and Scientific Research (MoHESR) (Abdelkhalek & Langsten, 2019). Based on Amira (2017), The Egyptian Ministry of Higher Education is in charge of setting policies, monitoring implementation, and supervising all tertiary education with the assistance of three supreme councils under its control: the Supreme Council of Universities (SCU)¹¹, the Supreme Council of Private Universities (SCPU), and the Supreme Council of Technical Institute (SCTI)¹² (*Figure 1*). To elaborate, Egypt's Ministry of Higher Education is the country's primary regulatory authority for higher education. The ministry develops policies, monitors their implementation, and governs and coordinates all aspects of tertiary education. Notably, the public university system is highly centralized, particularly in finance (Lai, Ahmad, & Da Wan, 2016). In addition, HE institutions have little say over curriculum, program development, staffing, and faculty deployment. On the other hand, universities are independent when it

¹¹ **The Supreme Council of Universities** is the governing entity with the greatest authority over public universities. It establishes the general higher education policy in Egypt and relates it to the country's requirements. In addition, it implements a university-wide coordination policy for attendance periods, the academic year, and examinations. It coordinates between equivalent faculties and departments at various universities, establishes foundations for the universities' and faculties' internal bylaws, and endorses them.

¹² **The Supreme Council of the Institute of Technology** establishes the institutes' general policy in consideration of the overall planning of higher education.

comes to management rules, research, and service to the community. Egypt's public education is free at all levels, but universities are now able to offer programs that cost money (World Bank, 2010).

Figure 1: Egypt Higher Education Sector



Source: Designed by the researcher. Her conceptualization is based on the official website Egyptian Ministry of Higher Education

1.5. Main higher education problems in Egypt

1.5.1. Governance problems in Egyptian higher education system

Egypt's higher education system needs to meet the country's current needs. Because of the large population, there is a high level of HE demands. As a result, there is an urgent need to improve system governance, efficiency, and quality in the higher education sector. Despite significant efforts by the Egyptian government to address these issues, some problems in the HE sector remain unresolved (Karakus, 2020). For instance, Egypt's academic community must begin to focus on factors other than the number of publications produced, such as journal quality and a focus on community and economic development (University World News, 2021b). Scientific research plans, policies, and activities should prioritize higher-quality publications. In addition to quantitative research productivity, Egyptian universities must focus on quality, the economic impact of research, and achieving sustainable development goals (SDGs). Community development and solving country and industry problems, as well as raising publications to international standards, should be the goals of research (ibid.).

1.5.2. Research misconduct as a wicked problem threatening Egyptian higher education

Wicked Problems are thought to be impossible to tackle using today's problem-solving paradigm (Grint, 2022). They are complex and messy, with solutions tailored to the circumstance (Yawson, 2015). Failure to solve these complex challenges is attributed to the problem's interwoven aspects, and identifying a single cause or solution is impossible (Grewatsch et al., 2021). As digital technology and the mobility of people and things make the world more linked and complex, the frequency and intensity of wicked challenges are increasing. Furthermore, unresolved wicked problems further strain the system, catalyzing further wicked problems in an ongoing loop that disrupts the economy and society (Stavros, 2022). "Wicked problems." This phrase captures the essence. Persistent socioeconomic problems such as poverty, food insecurity, climate change, drug addiction, pollution, and so on—appear to be appropriately labeled wicked. But what makes them wicked, and what can we do about it? The concept of wicked problems as more than a generic description dates back to the late 1960s. In a seminar, Professor Horst Rittel of the University of California, Berkeley's Architecture Department came up with the term to describe a category of societal issues that are poorly defined, characterized by perplexing information, involving numerous stakeholders and decision-makers with conflicting values, and leading to intricate consequences throughout

the entire system. (Churchman, 1967). The author, likewise, developed his well-known list of ten peculiar properties of wicked problems, which are (*Figure 2*): **(1)** there is no definitive articulation of a wicked problem; **(2)** wicked problems have no bounds; **(3)** solutions of wicked problems are not right or wrong but either good or bad; **(4)** there is no instant and no definitive test of a solution to a wicked problem; **(5)** Every solution to a wicked problem is a "one-shot operation"; because there is no possibility for trial-and-error learning, every attempt is significant; **(6)** wicked problems do not have an enumerable (or exhaustively desirable) set of feasible solutions, nor do they have a well-defined set of proper procedures that can be incorporated into the plan; **(7)** every heinous wicked problem is fundamentally unique; **(8)** every wicked problem is a symptom of another problem; **(9)** A disparity expressing a wicked problem can be explained in a variety of ways. The nature of the problem's resolution is determined by the explanation chosen, and **(10)** the planner has no right to be mistaken (ibid).

Figure 2: Ten characteristics of a “wicked problem”



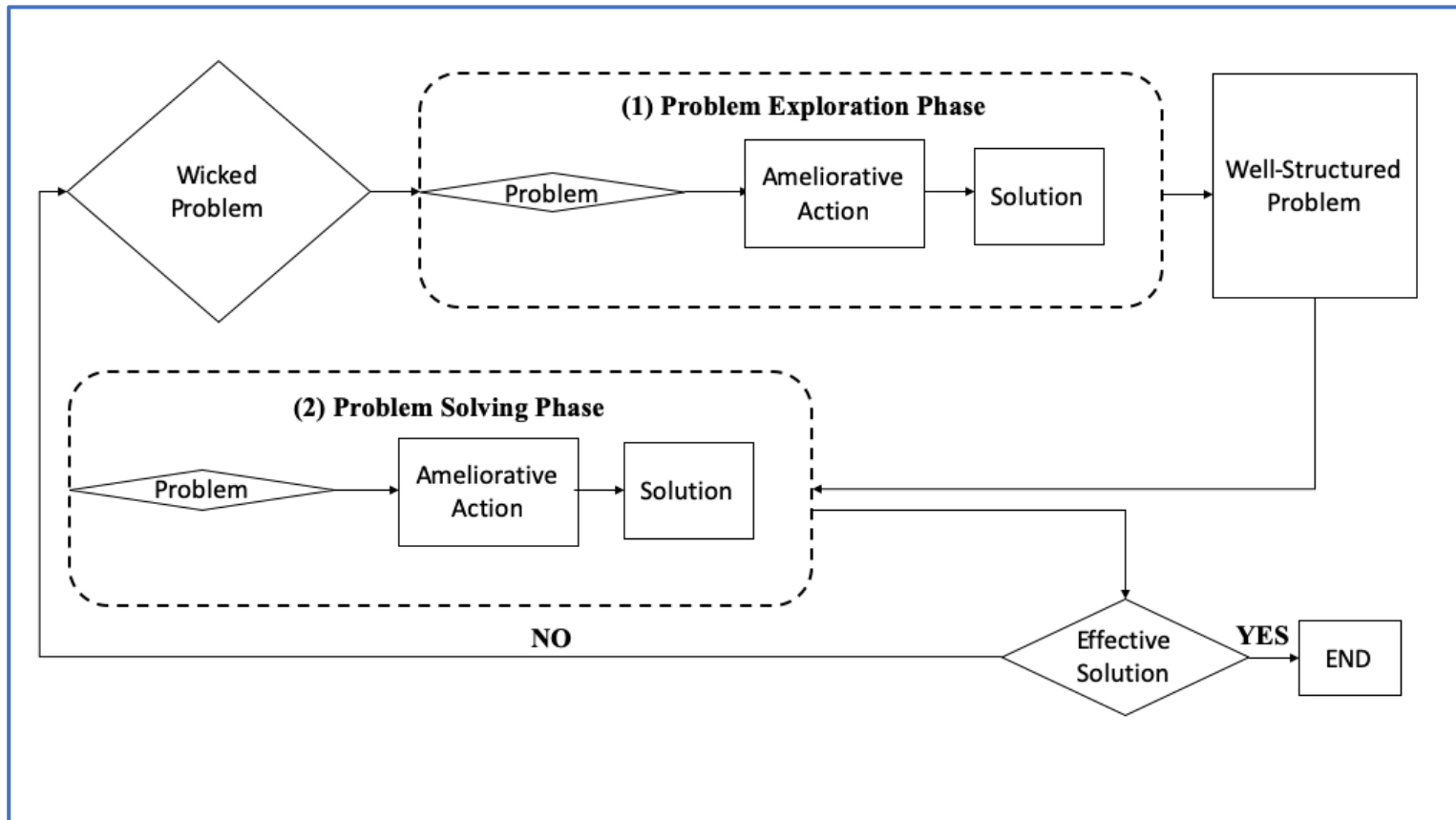
Source: Designed by the researcher. Her conceptualization is based on the literature review.

One myth about problem-solving is that all problems can be solved (Grint, 2022). This is a false assumption. In reality, issues are either solved, resolved, dissolved, or absolved (Grewatsch et al., 2021), with only the first three genuinely resolving the issue. The word 'solve' is used to signify solved, resolved, or dissolved, when 'remedy' is a better phrase. There are four approaches to solving a problem:

- 1- **Solving the problem:** occurs when the decision maker selects the control variable values that maximize the value of the outcome (optimal solution).
- 2- **Resolving the problem:** occurs when the decision maker chooses control variable values that do not maximize the value of the outcome but generate a good enough or acceptable outcome (satisfies the need) (acceptable solution).
- 3- **Dissolving the problem** occurs when the decision maker reformulates the problem so that the original problem is irrelevant. Solving the problem usually results in creative solutions.
- 4- **Absolving the problem:** occurs when the decision maker ignores the problem or believes it will go away independently. Problems may be deliberately ignored because they are too expensive to solve or because the technological or social capability required to give a solution is unknown, prohibitive, or unavailable (Kasser & Zhao, 2016).

Inconsistent policy design and unsustainable policy execution are frequently related to an excessively narrow, static, and non-systemic viewpoint that is insufficiently robust for the dynamic complexity of today's "wicked" social problems (Bianchi, 2006). Therefore, wicked Problems can be solved by (1) changing the paradigm from Wicked Problems to Wicked Situations, (2) assuming numerous causes of undesirable behavior in the Wicked Situation, and (3) employing the Multiple-Iteration Problem-Solving Process (Grint, 2022). The Wicked problem-solving approach can be mapped into a multiple-iteration problem-solving Process depicted in *Figure 3*, where the first research process produces a product concept or prototype. The first process concludes at a stage gate, which assesses whether the product meets the user's needs and whether the product should progress to the second process, which in this case is the production process (Kasser & Zhao, 2016). It is made up of two successive problem-solving procedures that are intertwined in an iterative loop. The initial process transforms complex problems into well-structured ones. The second problem-solving approach is tailored to tackle particular challenges since a one-size-fits-all solution isn't suitable for every problem (ibid).

Figure 3: The two-part multiple-iteration wicked problem-solving process



Source: Designed by researcher. Her conceptualization is based on Kasser & Zhao (2016).

Research misconduct can be categorized as a wicked problem according to Cosenz (2022) explanation of a wicked problem in his book. The difficulty in recognizing and controlling this issue stems from its relationship with social pluralism, institutional complexity, and scientific ambiguity. The plurality of stakeholders' interests and values is referred to as social pluralism, whereas institutional complexity refers to the setting of inter-organizational collaboration and multilevel governance. Scientific uncertainty is characterized by knowledge fragmentation and gaps. These elements add to the problem's complexity, making it difficult to solve. This is known as a "wicked problem," necessitating a different approach than traditional scientific and technological procedures. Furthermore, wicked problems, such as research misconduct, are complex policy concerns with a high degree of threat and ambiguity and a high degree of interdependence among all of the factors that impact them. "Wicked problems" can't be grouped together inside the confines of a single organization or assigned to particular executive or ministerial tiers. Dynamic complexity, encompassing multi-level, multi-actor, and multi-sectoral difficulties, distinguishes them (Bianchi, 2016). These issues are typically embedded in important societal challenges of modern life, each with its own interpretation based on the value viewpoints embraced. To understand and address them, more than just finding additional information is required. This suggests that there isn't a clear-cut (i.e., true or false) solution to them; instead, there may be a "good" or "bad" way to frame them and to represent one or more reliable (or unreliable) alternative choice sets (Alford & O'Flynn, 2009). Wicked problems necessitate a large number of stakeholders. Because of the disparities in interests, mindsets, or cultures among policymakers who may be affected by a wicked problem, choices must be made based on a strategic learning approach focusing on conflict resolution and conversation among the actors (Bianchi, 2016). Because of their complexity, many wicked problems are not adequately addressed by traditional public management paradigms that strongly emphasize the function of formal organizations. Traditionally, public administration has struggled to address such issues, particularly regarding its capacity to support planning, formulation of policies, making decisions, results measurement, analyzing policy outcomes, managing decision makers, and keeping them responsible for achieving goals. Hierarchical organizational and control systems centered on input monitoring or process compliance are examples of such issues, resulting in significant disconnects between different institutions and agencies (ibid.). As a result, ideas like network governance are being researched more and more (Bianchi, 2020).

Based on University World News (2022), Egypt's poor reputation in terms of research misconduct has taken another hit. In terms of the number of retracted journal articles, the

country now ranks first in North Africa, ahead of Tunisia, Morocco, Algeria, and Sudan. A University World News search of the Retraction Watch database from 1 January 2020 to 31 March 2022 showed that 39 Egyptian articles were retracted, six Tunisian, four Moroccan, two Algerian, and one Sudanese. The most common reasons for retracting the articles were concerns regarding results, fabrication, and falsification of data, and plagiarism. Retractions are necessary to alert the reader to severe problems identified with a published article and maintain the integrity of scientific literature. This includes handling data, authorship, copyright infringement, unethical research, journal issues, and conflict of interest concerns (Sheth & Thaker, 2014). Concerning the reasons for Egypt's top ranking in North Africa, Professor Ahmed El-Gohary, the president of the Egypt-Japan University of Science and Technology (E-JUST), pointed out that historically, incidents of research misconduct were often treated as individual errors by higher education institutions. They were typically perceived as having minimal accountability and negligible impact on the institution's values. Another concern he raised was a lack of enthusiasm in supervising graduate students and a deficiency of awareness regarding research ethics and methodologies among university graduates who hadn't engaged in substantial research during their initial university studies. El-Gohary also advocated for introducing dedicated courses in Egypt aimed at highlighting the dangers of research misconduct, including the publication of retracted research, as a means to combat this problem. (University World News, 2022). In addition, Professor Mahmoud Sakr, the Egyptian Academy of Scientific Research and Technology (ASRT) president, stated that Egypt has the highest plagiarism rates (Al-Adawi et al., 2016). Similarly, Professor Theresa Rossouw, who works at the University of Pretoria in South Africa and is the principal author of a 2020 study that ranks Egypt first among African countries with the most retracted papers from 2014 to 2018, stated that, "Egypt is a research-intensive country". Such a competitive environment can easily lead to irresponsible publication practices if the necessary checks and balances are not in place. She, also mentioned that "Our research points to plagiarism and duplication of research outputs as the most significant concerns in Egypt, in line with international experience" (ibid.).

Based on Campos-Varela & Ruano-Raviña research study, from 2013 to 2016, Egypt ranked second among the countries with the highest frequency of retracted publications. The most prevalent cause of retractions was research malpractices (65.3 percent), with plagiarism, data management, and review process compromise coming in second and third. Iran had the greatest percentage of retracted papers (15.52 per 10,000), followed by Egypt and China (11.75 and 8.26 per 10,000). Another research study recently ranked Egypt the first among Arab

countries in research misconduct cases from 1900 to 2019 (Hafez, 2021). Relatedly, based on a comprehensive analysis conducted in February 2022, Egypt ranks among the top ten nations in the world with the most retracted papers in veterinary medicine and animal health from 1993 to 2019 (Christopher, 2022). Likewise, in 2008, an article on Daily News Egypt brought attention to the ease with which numerous Egyptian university professors and researchers could submit a research paper. It was as simple as entering a keyword into an internet search engine, appropriating a previously published paper, and presenting it as their own work. One of the most well-known cases of plagiarism happened when a professor at Alexandria University sent seven research papers to the World Health Organization's Eastern Mediterranean Journal in 2004 as part of the work he needed to do to get his degree. The journal's editor informed the university's vice chairman that seven of the papers submitted were already published in other international journals. In 2006, the same professor gave a list of eight research papers, four of which were copies of research that had already been published. The other four proved to be scientifically deficient. Similarly, the scientific committee of the French language section of the faculty of arts at Mansoura University revealed that five studies submitted by a professor were plagiarized extensively. A comprehensive report was drafted and submitted to the Higher Council of Universities, disregarding it and granting the professor the desired degree (Daily News Egypt, 2008). Another professor announced a new service: research paper preparation for masters and Ph.D. students. Depending on the topic, the former costs LE 20,000-40,000, whereas the latter costs LE 40,000-60,000. Typically, these professors oversee centers staffed by youthful researchers who produce papers that are subsequently sold in Egypt and Gulf states. A professor at Helwan University, who wished to remain anonymous, told Daily News Egypt about a colleague who failed his degree twice and then chose to take credit for the work of one of his students. He, likewise, alluded that “When junior staff uncovers an incident of plagiarism by a more powerful professor, they are afraid to report it because they can be penalized and prevented from getting their degrees.” The professor also mentioned that university officials disregarded the students' complaints, and a scientific committee granted the professor the degree (ibid.). Besides, Dr. Metwally El Sayed, head of the research department at Cairo University, stated: “Plagiarism is a very serious problem. Unfortunately, it can't be solved in Egyptian universities because it depends on the personnel working there. Punishment laws are weak and aren't punitive enough (...) The worst thing that can happen is to ban the professor from giving lectures for one year and the accused professor is kept on the payroll in the meantime” (ibid.). In addition, one research department employee, who requested anonymity, mentioned: “Sometimes researchers plagiarize from themselves by re-using old

research papers to earn more degrees" (ibid.). Based on the research mentioned above misconduct cases, malpractices in research are a quiet killer that plague the field of scientific research (Al-Adawi et al., 2016). Furthermore, the majority of research misconduct has been studied and addressed in developed countries such as the United States, Canada, and Western Europe (Fanelli, 2009). Despite having a much greater prevalence of research violation instances than in advanced nations, research malpractice studies are still relatively new in developing countries (Felaefel, 2015). Furthermore, most developing nations do not have governmental or institutional mechanisms to fight research misconduct (ibid.). In Egypt, for example, many public universities and research centers lack defined norms and procedures to guarantee that responsible conduct of research (RCR) principles are used at all phases of scientific research (ibid.).

1.5.3. Lack of research misconduct policies in Egypt

Even though the number of incidents of research misconduct in Egypt is increasing, there are no effective punitive regulations in place that ban any breach of the standard codes of scholarly conduct and ethical behavior in scientific research (Ali, 2021; El-Shinawi et al., 2016). Besides, there is a lack of a regulatory mechanism, both at the national and institutional levels, that prevents this wicked problem, directs the research process and ensures that Egyptian researchers adhere to good ethical and scientific standards (Moustafa, 2019). In addition, there is no mandatory RCR training or an international publishing unit on each public academic and research institution to raise faculty members' awareness regarding the main principles of responsible science (University World News, 2022). Even though FPP are the most widespread research misconduct practices among Egyptian researchers, the Egyptian government has concentrated only on eliminating plagiarism by establishing policies at the institutional level that could reduce plagiarism among Egyptian researchers (Moustafa, 2019; Eungoo & Hwang, 2020). According to the terms of the Supreme Council of Universities' Scientific Committees for faculty promotion (SCU) in Egypt, **Article (28)** of the Promotion Rules states that receiving a plagiarism report certified by the Digital Libraries Unit (DLU) at SCU is required for faculty promotion. This report will employ iThenticate¹³ software to estimate plagiarism rates. Even if these automatic checks are not (and likely will not be in the near future) perfect, getting away with plagiarism needs talent and comprehensive knowledge of the entire chain of scientific knowledge generation. These knowledge production chains are

¹³ **iThenticate** is a service that detects plagiarism. The service was established in 2004 and is based in Oakland, California. It targets "publishers, news organisations, corporations, law firms, and government institutions."

discipline- and practice-specific (Valkenburg et al., 2021). In addition, the DLU is implementing a plagiarism training program to assist faculty members in preventing plagiarism (Ali, 2021). However, there are no institutional regulations to handle commitment fabrication and falsification in Egyptian public academic or research organizations, nor clear laws at the national level to address the commitment of FFP among Egyptian researchers (Moustafa, 2019; University World News, 2022).

1.5.4. Initiatives for promotion of research integrity

In recent years, increased efforts have been directed toward promoting appropriate practices of responsible scientific conduct in Egypt. Working with scientists and scientific organizations in the Middle East/North Africa (MENA) and South and Southeast Asia, the National Academy of Sciences (NAS) of the United States has successfully changed a model that was originally made to change how biology is taught in U.S. colleges and universities to help scientists and students learn about scientific integrity and RCR in a more complete way (NAS, 2013). The National Academy of Sciences carried out several initiatives, and I was fortunate to be a part of the majority of them, including “**(1)** the International Capacity Building Institute for Teaching Responsible Science in the MENA Region, which was carried out in collaboration between the National Academy of Sciences (NAS)¹⁴, Bibliotheca Alexandria (BA)¹⁵, and The World Academy of Science (TWAS)¹⁶ in 2012 and **(2&3)** the First and Second Egyptian Institutes for Teaching Responsible Science in Egypt, a joint US-Egypt training program in 2015. These initiatives aimed at creating a network of Egyptian faculty members who are knowledgeable about responsible science and can educate others through active didactic methods (ibid.). Following that, NAS established the Leadership Institute in Egypt as a follow-up effort to the two Educational Institutes on Responsible Science in Egypt that were established in 2017, with the goal of integrating responsible science education into the Egyptian

¹⁴ **The National Academy of Sciences** is a non-profit, non-government group in the United States. Along with the National Academy of Engineering and the National Academy of Medicine, NAS is a part of the National Academies of Sciences, Engineering, and Medicine.

¹⁵ **Bibliotheca Alexandria (BA)** is a large library and cultural center in the Egyptian city of Alexandria. It is right on the shore of the Mediterranean Sea.

¹⁶ **The World school of Science (TWAS)**, which is based in Trieste, Italy, is a global science school that works to improve science and engineering in the developing world so that it can be more prosperous in the long run. Its goal is to support scientific achievement and scientific ability in emerging countries to help them build a better future based on science.

higher education system” (ibid.). Most participants, myself included, applied the knowledge they gained about RCR principles within their respective institutions. They aimed to enhance awareness of the three categories of research misconduct among researchers and professors in various Egyptian institutions, universities, and research centers. These hands-on workshops showed that Egyptian researchers need to comprehend more about FFP and that all graduate students need to learn the basics of RCR at the start of their research careers (ibid.). Furthermore, the TWAS Arab Regional Office (TWAS-ARO)¹⁷ held a young researcher's round table conversation on ethics in life sciences to bring together famous scientists, policymakers, and Arab scientists to talk about important issues related to the "big three" forms of research misconduct and how to create a system that makes sure research is carried out honestly (Yacout et al., 2018).

1.6. Research misconduct's impact on reputation in Egyptian academia

Super wicked challenges have emerged as hot and challenging themes in public policy frontier research as societal complexity and uncertainty have risen (Hou et al., 2022). Particularly, wicked issues are challenging to solve and must be addressed continuously (Grint, 2022). There is no doubt that the world is facing increasingly wicked problems. However, the capacity to tackle such "wicked problems" is constrained by the complexity of societal problems and a lack of scientific or professional expertise (Head & Alford, 2015). Generally, identifying and resolving the problem are two essential steps in dealing with wicked problems. Nonetheless, one of the unique characteristics of wicked situations is the difficulty in precisely defining the problem due to the enormous knowledge gap between different disciplines (Grint, 2022). A mono-cognitive disciplinary perspective is confined. It frequently emphasizes the professional knowledge system, approaches, views, and facts within a single discipline while ignoring knowledge from other fields. Furthermore, the disagreement over the problem's definition stems from divergent worldviews and preferences (Hou et al., 2022). Creating a mono-discipline resulted in compartmentalizing scientific and professional knowledge and a lack of effective collaboration among scientists, professionals, and policymakers, resulting in an inability to cope with wicked problems (Stavros, 2022).

The scientific community is known for engaging with complex and challenging issues, sometimes called "wicked problems," due to the dynamic nature of scientific research. The

¹⁷ The TWAS Arab Regional Office (TWAS-ARO) is run out of the Bibliotheca Alexandria through one of its academic study centers, the Centre for Special Studies and Programs.

natural world serves as a source of inspiration for scientists in various ways, including reading about earlier scientific endeavors or having firsthand experiences. Numerous research techniques are used, leading to a variety of findings. Furthermore, the scientific approach exhibits flexibility and needs to be adjusted in accordance with the unique situation (Dal-Ré et al., 2020). Over the last few decades, research fraud committed by researchers threatens the scientific community and the general public (Othman, Ludin, et al., 2022). Indeed, scientific research improves the quality of life for residents and is increasingly seen as a critical catalyst and key indicator for national growth (Rospigliosi & Bourner, 2019). Because FFP has become embedded in the research culture, it is regarded as a super wicked problem undermining the integrity of scientific research (Ali, 2021). Although Egypt has many great universities that are highly respected and well-known in academic and research communities, they lag behind due to increased incidences of research misconduct (Ali, 2021). Egypt has a poor standing in terms of research misconduct. At both the national and institutional levels, there is an absence of a regulatory framework to prevent fabrication, plagiarism, and other unethical practices, oversee the research process, and ensure that Egyptian researchers uphold high ethical and scientific standards (Ali, 2021; El-Shinawi et al., 2016; Moustafa, 2019).

1.7. Research strategy and objectives

The objectives of this instrumental research study are twofold. First, investigate the interconnected factors that may contribute to the occurrence of FFP in public academic and research institutions in Egypt. Second, to shed some light on how collaborative governance could contribute to creating practical measures for preventing research fraud in Egyptian institutions.

To reach the above objectives, semi-structured interviews were done with graduate students who were in the middle of their graduate studies at Egyptian public universities, graduates who had finished their graduate studies at Egyptian public universities, and academic faculty members working at different Egyptian public universities who came from different backgrounds and were in different stages of their careers. Furthermore, data were collected by creating and distributing an online survey shared with a purposive sample of Egyptian researchers in different governorates in Egypt. The online survey was emailed to researchers in several Egyptian governorates and included questions derived from the main topics and concerns highlighted in the examined literature. The questionnaires were analyzed to determine which questions fit the study's goals. The surveys were conducted using a web-based survey

tool (<http://www.survey-monkey.com>). All respondents were reminded three times and asked to complete the survey. They were also informed that survey participation is entirely voluntary and that their responses will remain confidential.

This study additionally adopted a dynamic performance governance (DPG) approach to figure out the main cause-and-effect relationships aimed at enhancing policies for counteracting research misconduct in Egypt.

1.8. Main research question addressed in this study

The core research questions central to this research study, built upon the previously stated objectives, are as follows:

- 1- How does research misconduct affect the quality of scientific publications?
- 2- What are the drivers of FFP practices in the Egyptian research community?
- 3- How can the application of collaborative governance help in the fight against FFP within Egyptian public institutions?
- 4- To what extent are Egyptian researchers aware of FFP practices of research misconduct?

The research questions mentioned earlier revolve around examining how research fraud influences the quality of scientific research. They highlight the principal factors contributing to the widespread occurrence of FFP practices within academic and research institutions in Egypt. Furthermore, these inquiries gauge the extent of awareness among Egyptian researchers regarding RCR principles and the existing policies within Egypt designed to address this issue. Through these questions, the author also provides insights into how collaborative governance could potentially yield practical strategies for mitigating the impact of FFP research misconduct on scientific research.

1.9. Significance of the research study

The significance of this study was evaluated from many perspectives, with the initial aspect being identifying the factors contributing to research malpractices. Such malpractices are a critical issue that poses a significant danger to higher education in Egypt. Furthermore, this study aims to conduct a comprehensive literature analysis on the prevalent risk factors that might contribute to the involvement of Egyptian researchers in fraudulent and unethical research practices, specifically focusing on the notion of collaborative governance. Thirdly,

this study proposes a conceptual framework that outlines how decision-makers may effectively utilize the ideas and practices of collaborative governance. The objective of this framework is to develop sustainable policies that aim to eliminate FFP at Egyptian public universities and research centers. In conclusion, it is imperative to propose a set of policy proposals to effectively mitigate the issue of FFP inside Egyptian public universities and research institutes.

This investigation has implications for formulating and implementing anti-FFP policies in Egyptian government institutions. Notably, the majority of high-income nations have regulations, ethical guidance, professional requirements, journal regulations, research ethics education, and oversight by national organizations and research institutions to combat research misconduct (Resnik et al., 2015). However, clear national laws and guidelines aiming at curbing FFP, as the most common research malpractices in Egyptian public institutions, are still uncommon in underdeveloped nations, particularly Egypt, despite having a significantly higher rate of research violation cases than wealthier countries (University World News, 2021b). FFP can rapidly ruin an institution's reputation: an unscrupulous researcher fabricates the data of experiments funded by a specific funding agency. When the data is released, and the truth is exposed, the institution is held accountable and must pay back millions of Egyptian pounds. Therefore, this research study sheds light on the fact that the government needs to pay much attention to combat this wicked problem in public academic and research institutions. In addition, a clear path has been established for public academic and research institutions to develop strategies and long-term, sustainable solutions to reduce FFP in Egypt.

This study also shows how the DPG methodological framework can analyze the causal link impacting the research misconduct problem in Egypt, therefore assisting all key stakeholders in collaborating to reach a common objective through collective action. Through this concept, the Egyptian public academic and research institutions that recognize different perspectives on research malpractices problem can actively investigate their differences and look for sustainable solutions that go beyond their limited understanding of what is practicable. Similarly, collaborative governance can foster dialogue among all interested parties, enabling them to develop a comprehensive grasp of the issue at hand. Additionally, it can lessen policy resistance and balance the interests of various stakeholders. Among the most crucial elements of collaboration are the process dynamics, the organizations engaged, the duration of the collaboration, and the shared accountability. The typical results of collaborative approaches are resolved problems, shared norms achieved, and ultimately the survival of the partnership.

1.10. Main research outcomes

The preceding analysis aids in the identification of the main outcomes of this study. This research aims to provide an overview of the magnitude of research fraud and its potential implications on the integrity and reliability of scientific research conducted in Egypt. Next, this investigation discusses the primary factors contributing to implementing FFP at public academic and research institutions in Egypt. Thirdly, it offers a scholarly perspective on the potential benefits of collaborative governance in formulating sustainable methods to address the issue of fraudulent and unethical research practices inside Egyptian academic institutions. Ultimately, this study demonstrates the degree to which Egyptian researchers are acquainted with the practices of scientific investigation with integrity.

The current research focused mainly on Egyptian public academic and research institutions in different governorates in Egypt. Semi-structured interviews were conducted with a sample of graduate students currently enrolled in graduate programs at public universities in Egypt, graduates who have already completed their graduate programs at these institutions, and academic faculty members from diverse backgrounds and career stages within Egyptian public universities. Additionally, information has been gathered by developing and distributing an online survey that will be shared with a purposive sample of Egyptian researchers in various governorates of Egypt. Following that, the DPG framework was utilized to comprehend how universities and research institutes in Egypt use shared strategic resources, thereby fostering the integrity of their research. Later, after depicting the DPG diagram, Causal Loop Diagrams (CLD) were outlined to illustrate the feedback system's structure. It demonstrated how these variables and contextual factors were used to construct a dynamic performance perspective of Egyptian universities and research institutions.

1.11. Research Outline

The current research study is organized into five sections. The subsequent parts of this work are as follows:

- In chapter two, an extensive literature review is presented, exploring various potential causes of research misconduct and identifying key risk factors contributing to such misconduct within academic and research institutions in Egypt. Additionally, this chapter underscores the importance of employing collaborative governance as a strategic approach for research management in public and academic institutions within

the Egyptian context. It also highlights the significance of the DPG as a vital framework for addressing FFP within Egyptian public institutions.

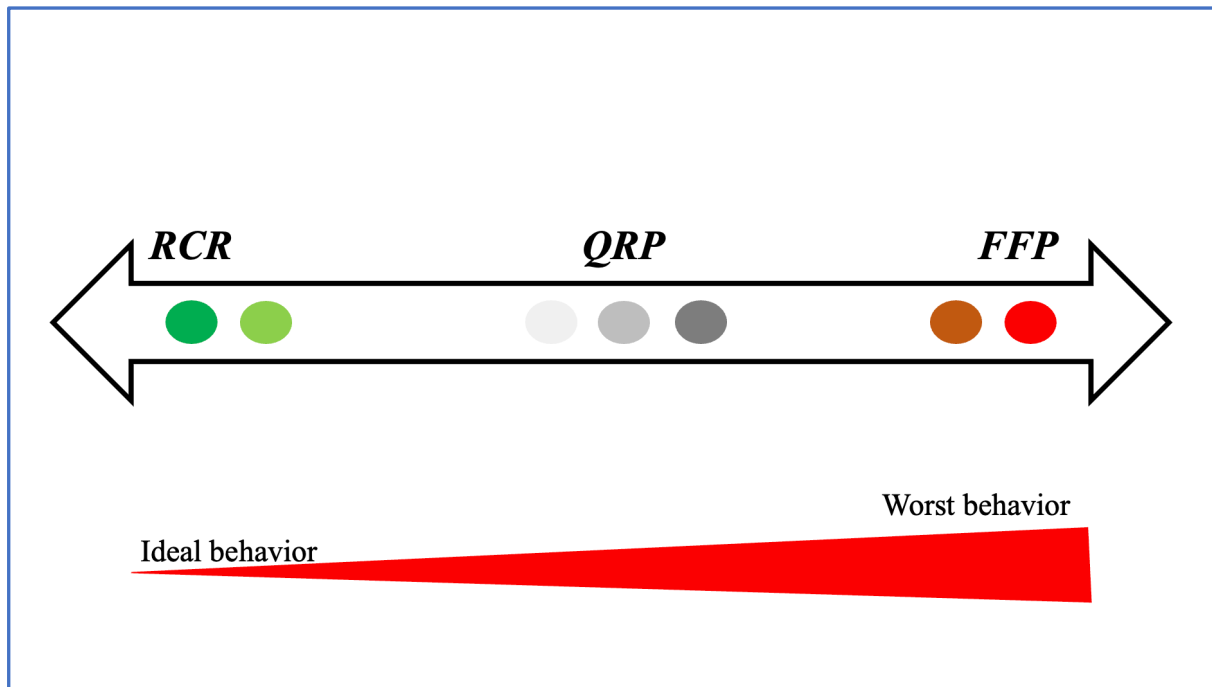
- Chapter three outlines the conceptual framework and research methodologies utilized in this study.
- Chapter four involves the analysis of the gathered data, the application of the DPG framework and CLD diagram, and a comprehensive explanation of the primary findings.
- Finally, in the fifth chapter, a comprehensive summary of the findings is presented, along with recommendations aimed at reducing instances of research misconduct within Egyptian public academic and research organizations.

CHAPTER TWO LITERATURE REVIEW

Academic research is a step-by-step process that includes key elements of research studies. All aspects of any research study include study design, data collection, and analysis process (Eungoo & Hwang, 2020). All stages of a research study and the researcher's experience should be governed by specific ethical codes of conduct (ibid.) Sadly, numerous researchers have been found guilty of different types of research malpractices (Lüscher, 2019). Particularly, responsible science (AKA "responsible conduct of research" (RCR)) is the optimal standard that institutions and individuals strive to achieve (Palla & Singson, 2022). On the other hand, fabrication, falsification, and plagiarism (FFP) encompass practices everyone agrees should be avoided. Furthermore, questionable research practices (QRP), also known as "sloppy science," such as misinterpretation, inaccuracy, and bias, fall in between. Thus, QRPs are important in the continuum between RCR and FFP (Bouter et al., 2016) (*Figure 4*). Although QRP is troubling, they are not severe enough to require government intervention and do not directly compromise the objectivity and honesty of the research process (Ali, 2021).

Egypt has a comprehensive and well-developed higher education system, from which 30 percent of Egyptians can benefit (Karakus, 2020). Numerous Egyptian public universities and research centers are facing difficulties as a result of an increase in research misconduct cases. These instances of research misconduct typically involve FFP. Information about research misconduct is scarce in moderately or poorly developed countries (L. M. Bouter et al., 2016). In Egypt, FFP have become part of the research culture, endangering the integrity of scientific research. Furthermore, there has been a lack of focus on understanding how young Egyptian researchers perceive research integrity and research misconduct despite mounting evidence of a problem (University World News, 2021a). Furthermore, although considerable academic literature has been produced about the risk factors for the primary three practices of research misconduct, there is a large information gap in Egyptian public universities and research centers regarding the key risk factors contributing to this problem. Therefore, the researcher focuses her research study on deliberate research misconduct behaviors, including FFP, because ignoring these practices results in a commitment to research fraud, endangering the validity of scientific knowledge, harming scientific collaboration among scientists, and, if reported in the media, jeopardizing public trust in science. (Roje et al., 2022).

Figure 4: Current framework for defining research behavior representing good science versus research misconduct behaviors



Source: Designed by the researcher.

As a result, there are four main themes in the review of current literature:

- (1) First, the different possible explanations for research misconduct (especially FFP). The researcher suggested that to understand research misconduct, she should consider three factors: **(a) Factor I:** the beliefs and desires of the misconductor, which means their motivating reasons; **(b) Factor II:** contextual affordances, meaning the opportunities presented by the context for the wrongdoer, and **(c) Factor III:** unconscious biases or influences. The researcher drew on three distinct narratives for committing of research misconduct (individual, institutional, and scientific system). Individuals are the starting point for four theories: Rational Choice Theory, Bad Apple Theory, General Strain Theory, and Prospect Theory. Organizational Justice Theory focuses on institutional factors, whereas New Public Management focuses on the scientific system. The researcher illustrated the types of facts that must be known for explanations based on them. Finally, she investigated how the various possible explanations of FFP interrelate.
- (2) Second, the intertwined risk factors of the three most common forms of research misconduct (FFP). This theme addresses the most prevalent causes of research misconduct in research and educational organizations in Egypt. These factors can be roughly

categorized as structural, organizational, situational, and individual. Each level of description has logical appeal and some basis in the literature.

- (3) Third, collaborative governance approach to tackle FFP. Complexity and unpredictability are on the rise in higher education, highlighting the fact that wicked problems cannot be resolved by a single organization acting alone. To address FFP a collaborative governance as an approach is proposed here. This way of thinking has become common, from designing and delivering public services to building infrastructure and protecting the environment (Bianchi, 2020). Although higher education is just as important as the other areas mentioned, less attention has been paid to collaborative governance in this field in the Egyptian context.
- (4) Fourth, applying dynamic performance governance (DPG) perspective to help the Egyptian public institutions to limit the commitment FFP among researchers. This viewpoint advocates identifying the causes influencing the desired objects by following the chain of end results, performance drivers, and strategic resources. This instrumental viewpoint begins by framing the overall organization's critical performance factors. Alternative methods of improving performance can then be made explicit. Following the identification of both end results and their respective drivers, each responsibility area must develop, maintain, and deploy a proper endowment of strategic resources that are systemically linked to one another (Bianchi, 2020).

2.1. Theories Explaining Research Misconduct

In a useful research study, Sovacool (2008) distinguishes three different possibilities for the occurrence of scientific misconduct: the first possibility is "individual impurity" promoted by those who want to see science self-regulate; the second possibility is "institutional impropriety" promoted by those who want more external control over science; and the third possibility is "structural crisis" among those who are critical of the entire research process itself (p.271). These categories of potential scenarios for the occurrence of research misconduct are valuable for two reasons:

- (a) This categorization can provide understanding. Even if there is no explanation for a researcher's fraudulent behavior, it does shed light on the situation if the evidence shows that there is simply one bad apple in the bunch, the institute where he worked was ineffective in critical ways, or the scientific community as a whole is corrupt (Sovacool, 2008).

(b) For instance, the assertion that a case of research fraud is the result of an impure individual (as opposed to a failing research facility or anything similar to the corruptive structure of science as such) fails to clarify in detail why a researcher committed in the violation she or he committed, however, if accurate, the assertion does highlight what is required for such an explanation: an understanding of the nature of her or his particular impurity in order to understand how it contributed to the misbehavior that earned him notoriety. Similarly, the claim that a failing research institute caused the misconduct does not explain a researcher's behavior; however, if true, it does indicate where to look for an explanation: to the institute's operational policies and procedures, perhaps, to its "culture" or "climate" (there was an atmosphere of terror) (Sovacool, 2008, p.275).

2.1.1. Theories relating to individual factors affecting research misconduct

The first narrative sees misconduct in science as primarily an individual issue. Most scientists are viewed as belonging to an institution that supports a set of norms and principles that serve as a guide for them (Lüscher, 2019). In this viewpoint, culture is viewed as structural or functional. Scientists are not simply puppets of a social system; rather, they behave in accordance with their own goals and ideals while acting within a range of perceived constraints (T. Haven & van Woudenberg, 2021). According to this view, the issue of scientific misbehavior is a sign of a much deeper problem: no one is flawless, and there will always be "bad apples" in social settings. The primary difference between science and other fields is that scientists are taught rules that make unethical behavior uncommon. Scoundrels exist among researchers just as in every other career or aspect of society (Hibel & Penn, 2020). According to the first narrative, there is almost nothing that has to be done to stop it; we must accept the inevitable presence of a tiny number of abuses that are the result of a few terrible people (Sovacool, 2008).

2.1.1.1. Rational choice theory

The economics discipline served as the foundation for this theory. Besides, Rational choice theory (RCT) has been used within many fields, such as economics, psychology, and philosophy. Adam Smith, a political economist and philosopher, is credited with originating RCT theory in the eighteenth century (Sato, 2013). According to this theory, people use their self-interest to make decisions that benefit them the most. People analyze their options and select the option they believe will best serve them. The notion starts with a person represented

as logically weighing up several answers to a specific issue. When an individual actor faces a risky outcome, she or he chooses the precise behavioral action that maximizes the anticipated rewards, where the utility of his activity is weighted by the probability of it occurring. Absolute benefits and costs make up the utility function's domain. The person considers the costs and benefits associated with each choice before performing the computation that will serve as the foundation for her or his decision (T. Haven & van Woudenberg, 2021). RCT is counted as one of the social and behavioral sciences' most well-known methods for studying human behavior (Herfeld, 2022). It can be explained easily as a way to study social phenomena based on a restricted set of key methodological perspectives (Lovett, 2006). Three fundamental presumptions are as follows: **(a)** what might be referred to as a discrete deliberate actor assumption exists. This presumption asserts that there are distinct entities with the capacity for intentional action inside the context of social processes. At least from a common-sense perspective, humans are clear-cut examples of separate, deliberate actors. In other words, humans are distinct beings capable of considering a variety of alternative actions and consciously choosing and executing (or attempting to execute) one or more of them (T. Haven & van Woudenberg, 2021); **(b & C)** The utility theory assumption and the rationality assumption are the corresponding second and third assumptions of rational choice theory, respectively. It has been demonstrated that, under some extremely generic conditions, an agent's choices or actions can be represented as an attempt to optimize a mathematical function, regardless of what they are attempting to do. According to the assumption of utility theory, we can frequently anticipate that the choices or decisions of discrete, deliberate individuals would adhere to these conditions. When this is the case, we can assign each discrete, intentional actor a "utility function" that provides a mathematical description of the choices or decisions we anticipate them to make. The rationality assumption has a close relationship with utility theory. Roughly speaking, it states that we can anticipate discrete, deliberate individuals to maximize their utility functions, despite any constraints they may face (Lovett, 2006). In the literature on research integrity, Wible (1992), as well as Lactera & Zirulia (2011), make reference to this theory, which only discusses type I components: the beliefs and desires of the misconductor.

Based on this approach, we could think of any irresponsible researcher who does research misconduct as a rational agent weighing the utility, or costs and benefits, of doing research misconduct versus playing fair (i.e., following the rules and principles that we now find in the many Codes of RCR). The benefits of (undetected) plagiarism are likely to include a greater number of publications (or more publications with extraordinary results), which could

lead to greater honor, improve the likelihood of getting more research funds, and mean gaining greater visibility, influence, and power (Xie et al., 2021). The costs of research fraud, however, unquestionably include loss of self-respect, failure to further the great cause of science, fear of being exposed, and the consequences that follow, such as retractions of articles, reductions in research funding, loss of prestige, loss of jobs and more. Playing by the rules has several benefits, such as acting morally and responsibly (virtue, as the saying goes, is its own reward), increasing the likelihood that your research will produce results that are genuine contributions to science, and increasing the likelihood that you will be recognized for your accomplishments based on merit. However, the downsides of being honest include a decreased chance of having one's research published, a smaller pool of potential funding, and a smaller chance of making an impact (Haven et al., 2021). As stated in the preceding section, there must be contextual affordances (i.e., type II factors), in this case, institutions and systems that allow the commitment of FFP. And, like unconscious biases or influences (type III factors), these affordances are outside the ambit of rational choice theory.

2.1.1.2. Bad apple theory

Organizations are increasingly using the work-team approach to increase productivity and value. All teams, however, are not created equal, and as the research develops, we are starting to comprehend how and why these variances arise. In this regard, studies have shown that although some teams manage to foster member cohesion, a mutually supportive ethos, and high levels of collective efficacy, other teams display conflict, divisiveness, and the propensity to "burn themselves up" (Felps et al., 2006). This theory, like the RCT, has its origins in economics. Here, the individual is portrayed as having a morally flawed character. Subsequently, this faulty character is causally connected to corrupt acts (T. Haven & van Woudenberg, 2021). The metaphor of "bad apples" arose as a caution against the corrupting impact of a single corrupt or immoral individual on a group: "One bad apple can spoil the barrel." Over time, the phrase has come to be used to describe the opposite situation, in which "a few rotten apples" should not be seen as representative of the group. The metaphor of bad apples derives from the saying "A rotten apple swiftly infects its neighbor," first documented in English in 1340. Benjamin Franklin, a multi-talented American who worked as a printer, publisher, statesman, diplomat, scientist, and political philosopher, rephrased the adage in Poor Richard's Almanack in 1736 as "the bad fruit destroys his friend." The expression was popularized throughout the 19th century by sermons that asserted, "As one bad apple ruins the others, so you must show no mercy to sin or sinners." A frequent variation of the proverb is

"One bad apple ruins the bunch, which conveys the key idea that bad people have a detrimental and asymmetrical impact on others (Felps et al., 2006). Sometimes, greed is considered to be a characteristic of a faulty character. Literature has labeled the Machiavellian personality¹⁸ type as an example of a fundamentally flawed character, as it believes that the prestige connected with a certain objective justifies any measures to achieve it, even if they are unethical (Hibel & Penn, 2020). Hren et al. (2006) investigated Machiavellianism in relation to moral thinking, and Tjldink et al. (2016) connected personality traits such a Machiavellian character to study research misbehavior.

There is a lot of good proof right now that shows how people act in a social dilemma is affected by what they expect and what they see others do. As Bornstein & Ben-Yossef (1994) suggested, not only is bad stronger than good, but a single bad model may be enough to cause the rest of the group to behave badly. Wetlaufer (1994) describes "team destroyers" in a Harvard Business Review article, assuming that persistently bad behavior might significantly negatively impact group functioning. In the same manner, Andrews (2004) portrays how "egregious employee behavior can cripple employee morale" (P.43). In a similar vein, Tyler (2004) suggests in his article about training that "before the whole bunch spoils, train managers to deal with weak performers," describing these "bad apples" as "like a cancer that spreads throughout the entire company" (P. 77).

Bad apple theories only talk about type I factors, which are things that make some characters act in certain ways (Lorber, 1994). If we apply this theory to a researcher who engages in FFP and ask what should be the case in order for bad apple theories to adequately explain his misconduct, it is evident that she or he must have, or must have had, a flawed moral character at the time—she or he must have, for example, a Machiavellian personality type, or some other flawed moral character. However, it appears obvious that bad apple ideas, even if they are true, cannot give us a full explanation why irresponsible researchers commit FFP. Because contextual affordances must exist for morally deficient individuals to engage in misconduct and these affordances are necessary for a fuller explanation of the current misconducts (Haven & van Woudenberg, 2021).

¹⁸ **Machiavellianism** is a psychological characteristic that signifies cunning, the ability to manipulate, and a desire to obtain power by any means necessary.

2.1.1.3. General strain theory

The General Strain hypothesis (henceforth: GST), which was developed by criminal sociology researcher Agnew (1992), is a different theory that may be categorized as an individual narrative. Robert Agnew's general strain theory is regarded as a robust theory that has acquired substantial empirical data and broadened its main scope by providing explanations for phenomena other than criminal behavior. This theory is referred to as a micro-level theory because it focuses on a single person at a time rather than the entire community (Haven & van Woudenberg, 2021). In a nutshell, GST assumes three things: [1] several strains or stressors (blocking positively valued goals, losing positively valued stimuli, and being exposed to negatively valued or aversive stimuli) are proposed to affect people in ways that increase the likelihood of engaging in illicit behavior; [2] these strains or stressors generate negative affect in the person—states like anger and resentment but also potentially anxiety, depression, or fear; and [3] people try to cope with these negative feelings by engaging in illicit behavior (Jang & Agnew, 2015). Besides, GST argues that strains or stressors make negative feelings like anger and frustration more likely. These feelings pressure people to do something about them, and crime is one reasonable solution (*ibid.*). Crime can be a way to relieve stress (like by stealing the money you want), get revenge, or get rid of bad feelings (e.g., through illicit drug use) (Moon et al., 2008). However, a variety of factors influence the response to strains. When people lack the ability to function legally, are predisposed to crime, and the costs and advantages of crime are low, a criminal response is more likely (Bolden, 2014). Among the many ways in which GST goes beyond what preceded it is in its identification of new strain categories, such as the loss of positive stimuli (like a love partner or a friend), the occurrence of negative stimuli (like a physical attack or a verbal insult), and new types of goal blockage (like not being able to reach your justice goals). (Jang & Agnew, 2015). Additionally, GST contends that certain people are more likely than others to act negatively in response to stressors and are more quickly provoked than others. The potential significance of moderator variables, such as excessive intrinsic drive or "over-commitment" to work, is suggested by this concept. Additionally, stresses themselves may have detrimental impacts on other conditioning variables, such as lowering social control, providing people with a way to rationalize their undesired behavior, and promoting ideas that encourage deviant behavior (Agnew, 2006).

This theory was first proposed by Martinson et al. (2010) as a way to explain research misconduct. It is mentioned in the Institute of Medicine's report *Fostering Integrity in Research*

(National Academies of Sciences, 2017), and it was recently brought up in a study by Holtfreter (2019), in which US scientists were asked what they thought contributed to research misconduct. If this idea is to provide an explanation, we need to know if researchers who committed FFP had protracted stressful conditions that lasted long enough to leave them in a persistently negative state (Haven, 2021). GST considers research misconduct to be the result of stress or pressure. These states of stress and pressure cause the researcher to experience negative emotional states such as rage, despair, or depression all of which are type I factors. GST proposes, as a third step, that the behavioral tactics used by researchers to cope with these negative moods varied, and that these strategies may include deviant behavior (in our case: research misconduct) (Haven & van Woudenberg, 2021). For instance, Diederik Stapel is a professor of cognitive and social psychology. Stapel admitted to engaging in fabrication and falsification after being accused of data falsification by three whistleblowers from Tilburg University, where he worked in 2011, the year the case was made public. In total, three committees investigated whether Stapel's work at the Universities of Amsterdam, Groningen, and lastly Tilburg was fraudulent. The committees determined that, while the experiments were meticulously planned in collaboration with collaborators, Stapel fabricated the data sets from scratch. In another variant, he also altered data after being provided to him by a student assistant. In his book, Stapel discusses a continual state of stress. He stated: "Nothing relaxes me any more (...) but I feel stressed and restless" (Stapel, 2014, P. 131). In the same manner, GST theory implies that behavioral options for coping with negative emotional states vary. As a result, while his coworkers who faced similar challenges found alternative methods to cope, Stapel turned to aberrant behavior. But there is a catch: What prompted Stapel to employ unconventional tactics? Perhaps his surroundings were fundamentally different in some manner, which spurred his desire to produce extraordinary results. Therefore, GST can therefore, at best, be a partial explanation.

2.1.1.4. Prospect theory

Prospect theory is frequently referred to as loss-aversion theory. Two psychologists, Daniel Kahneman and Amos Tversky, proposed the theory in 1979 to describe how humans make judgments when faced with several options (T. Haven & van Woudenberg, 2021). This theory was cited in Kahneman's selection for the 2002 Nobel Memorial Prize in Economics (Sovacool, 2008). Prospect theory is a branch of psychology that explains how people make choices when risk, probability, and doubt are involved. According to this theory, people make decisions based on perceived losses or gains. Given equal probability, most people would

prefer to keep their current wealth rather than risk the opportunity to expand their current fortune. People are usually afraid of losing, so they would rather prevent a loss than take a risk in order to obtain an equivalent gain (Hameleers, 2021). In their study of risky choice, Kahneman and Tversky found that people are more motivated by the fear of loss than by the possibility of gain. They tend to avoid risk when there is a chance of making money but take risks when there is a chance of losing money (Kahneman & Tversky, 1979; Sovacool, 2008). Furthermore, Prospect theory has been employed in a variety of areas since its development. It is used in international relations to assess several facets of political decision-making (Passarelli & Alessandro Del Ponte, 2020).

Prospect theory suggests that researchers who are at risk of losing their jobs, tenure, or other meaningful resources are more likely to engage in research misconduct than their peers who are not at risk. This is due to the fact that the individual researcher's reference point matters, regardless of whether he or she faces prospective losses or gains (Haven & van Woudenberg, 2021). This theory can, therefore, at best, be a partial explanation as it refers to factor I and factor II. For this theory to work for a researcher who does FFP, we need to know if she or he was worried about losing her or his job, promotion, or other important resources at the time she or he falsified or made-up data. Also, it would be interesting to know if the opposite happened—if she or he had a chance to gain something, like having his study published in a high-impact journal, but chose not to pursue it (*ibid.*).

2.1.2. Theories relating to institutional factors affecting research misconduct; organizational justice theory

A second narrative, with a more moderate tone, argues that institutions that support scientists have an impact on their work. This narrative is supported by those who call for stronger external control of science. These theories are based on organizational psychology. They are united in their conviction that an organization's culture and structure shape the way its employees act and behave. One premise of these hypotheses is that an individual's mental state and behavior are influenced in some way by the culture in which they work (Haven & van Woudenberg, 2021). Besides, these theories argue that universities follow their own research pedagogies, which vary widely between disciplines and laboratories. (Sovacool, 2008). The costly nature of research activities tends to depersonalize the research process while decreasing accountability among researchers, causing individuals to spend less time supervising and analyzing research findings (Davis et al., 2007). The National Academies of

Sciences (NAS) produced a paper in 2002 that hypothesized that the materializing institutional culture that oversees scientific research does not effectively support ideas of integrity or honesty in the research environment. They came to the conclusion that there are no defined methods for determining integrity in the scientific research environment and that present policies and protocols are insufficient to ensure RCR. NAS also stated that education is likely to be of limited use because it is frequently delivered in a non-creative and ineffective manner (National Academy of Sciences, 2002). As a result, conflicting interests have helped to deter scientists from adhering to policies and codes of conduct governing responsible research practices at particular organizations. The institutional failure story holds that neither institutions nor scientists can be trusted to prevent FFP. Conflicts of interest exist at various levels: universities often employ both the accuser and the accused; they are government financed and have a barrier to reporting findings; they depend on the reputation of their active research and training programs to attract students and maintain high regional rankings; and they are governed by firm internal structures of power (ibid.). According to the second narrative, reform is required, but only institutional reform is required. We should strive to create more incentives for whistleblowers and potentially impose harsher punishments for wrongdoing, ensuring that the costs for wrongdoing outweigh any institutional advantages (Sovacool, 2008).

The impact of justice on worker happiness and the effective operation of organizations have long captured the interest of many scholars. This is because employees' motivation, productivity, sense of autonomy, and citizenship at work are all correlated with how fairly they are treated in the workplace (T. Haven & van Woudenberg, 2021; Levy & Norris-Watts, 2004; Sovacool, 2008). Organizational justice theory describes how individuals perceive fairness in organizational settings. Jerry Greenberg coined this theory in the 1980s to express individuals' interest and concern in fairness-related actions occurring in various organizations, such as the workplace (Przęczek et al., 2021). Organizational justice can be considered as a class of motivated action influenced by many human and contextual factors. The perceptions of organizational fairness elicit cognitive and emotive responses that influence subsequent behavior (Levy & Norris-Watts, 2004). In this regard, James asserts that a common definition of organizational justice is “the individual’s and the group’s perception of the fairness of treatment received from an organization and their behavioral reaction to such perception” (James, 1993, p. 269). There are three forms of organizational justice, according to research by Kim and Jeong: distributive justice, procedural justice, and interactional justice (Kim &

Jeong, 2021). Distributive justice is the term used to describe the fairness of outcomes, such as income, compensation, and promotion. People usually assess distributive fairness by comparing their own outcome ratio to that of their peers (ibid.). The notion of procedural justice is concerned with fair processes and how people's perceptions of fairness are significantly influenced by the caliber of their experiences, not only by the outcomes of these experiences. The criminal justice system, educational settings, and supervisor-employee relationships inside organizations are just a few of the contexts where the procedural justice idea has been used (Greenberg & Tyler, 1987). According to empirical studies of procedural fairness, fair procedures can mitigate the negative effects of inadequate compensation. Leventhal observed that if the distribution procedure appears fair, it may be deemed fair, even if the ultimate decision results in a disadvantageous distribution (Leventhal, 1980). The concept of interactional justice is concerned with how an individual is treated when decisions are made; people believe they are being treated fairly when employers explain decisions and treat employees with dignity, respect, and sensitivity (Kim & Jeong, 2021). In other words, the manner in which one is treated by others should be regarded a significant aspect of one's perspective of justice (ibid.).

Notably, research integrity is an overarching concept that includes a set of traits that researchers and research institutions must have to make sure that research produces valid and reliable scientific knowledge in a way that society wants and that puts scientists in the right place in society (Valkenburg et al., 2021). Careful consideration should be given to building both organizational culture and structure such that integrity is protected regardless of the actions of individual persons (Kaiser, 2014). Based on that, research institutes are supposed to establish policies and procedures governing integrity and responsible conduct. They are usually required to have committees and boards that investigate claims of misbehavior (Jordan, 2013). On the other hand, when organizational culture and structure are considered to be unfair, people are more inclined to participate in behaviors that compensate for the perceived injustice, such as falsifying or fabricating data (T. Haven & van Woudenberg, 2021). Martinson and colleagues have conducted research to test this notion, and they posit that researchers who felt that they were being treated unfairly were more likely to commit FFP (Martinson, Anderson, & de Vries, 2005; Martinson et al., 2010b). The organization has several potential avenues for influencing researchers' actions, and it is not immune to external factors either. In its study *Integrity in Scientific Research: Creating an Environment that Promotes Responsible Conduct*, the Institute of Medicine (IOM) used the research center as a model of an open system. Policies

and procedures within the organizational structure have an impact on researchers, and the IOM report strongly emphasizes the function of leadership and supervision inside organizational processes (Institute of Medicine., 2002). Another idea is that the dynamics of the organization itself might change to the point where everyone starts engaging in dubious behavior. The frequency of this unethical behavior could then increase to the point where it gradually replaces ethical research practices. The authors stated that if we apply this theory to irresponsible researchers who commit research misconduct and ask what should be the case in order for it to explain their violation fully, we must claim that the culture and structure of the organizations they were employed by, in some way, influenced their conduct (Sovacool, 2008). Either there should be evidence that their organizations mistreated them, or there should be proof that their workplace was completely corrupt (ibid.). As a result, based on Haven & van Woudenberg, (2021), the explanation of organizational culture can, at best, be a partial one. Since any research organization might have both responsible researchers who commit acts of fabrication and falsification as well as violators who do not respect the codes of research ethics. Because of this, it is possible to consider both culture and organizational structure as contextual affordances that neither encourage nor discourage wrongdoing but rather provide the necessary conditions for it to occur (ibid.).

2.1.3. (Bad Science Systems) affecting research misconduct, ethos of public administration

Another possibility is that scientific misconduct is a sign of a bigger problem that goes beyond the person or organization and affects the way modern science is done as a whole (Sovacool, 2008). According to this narrative, Scientific misbehavior is a symptom of a broader, pathological situation involving the values that modern science promotes (Valkenburg et al., 2021). In addition, the narrative of structural crises draws attention to many structural shifts in the actual practice of scientific research that may encourage unethical behavior (Huistra & Paul, 2022). First, publication and citation are given an excessive amount of weight at universities. During the last three decades, there has been a significant rise in the amount of pressure placed on academics to publish their work and obtain substantial research funds (Sovacool, 2008). Since promotion is frequently dependent on the size of funds and quantity of publications (rather than discovery or the pursuit of knowledge), scientists feel compelled to produce results (Sengupta et al., 2014). Second, competition has taken the role of cooperation. Many areas of science are shrouded in secrecy and competition: the peer review

process, manuscript refereeing, examination of research grant proposals, and nomination of individuals for prizes and awards are all highly competitive (Huistra & Paul, 2022). Third, alienating subordinates during the production process is a common occurrence. In scientific research, many other researchers' effort is often done without being acknowledged. People who aren't doing "real science" shouldn't be recognized, such as partners, graduate students, typists, staff members, librarians, and laboratory technicians. As research increasingly involves large groups of people, anonymity among researchers has become a major issue (T. Haven & van Woudenberg, 2021). Fourth, research no longer conforms to its image. Scientists portray research as though it has been meticulously thought out, planned, and carried out systematically and rigorously. It is nearly impossible to escape this depiction in the scientific literature, as journals rarely offer a more realistic description of what occurred. No scientist ever publishes all of his or her raw data. Before publication, such information must be treated, smoothed, massaged, restructured, and filtered (Sovacool, 2008). As a result, scientific misconduct will be inevitable as long as the underlying ideals of research favor publishing, exploitation, and competitiveness over discovery, complete recognition, and cooperation. According to this narrative, the remedy is to increase transparency in research, recognize the tension between publication and discovery, competitiveness and cooperation, and educate the general public about the interests and values that drive scientific research (T. Haven & van Woudenberg, 2021).

When applied to research misconduct, the ethos of public administration theories—often referred to as Taylorism or New Public Management (NPM) theories—fall within Sovacool's third category of narrative (T. Haven & van Woudenberg, 2021; Sovacool, 2008). These theories are based on a tangled collection of ideas and principles, which include specialization, command, unity, efficiency, and atomism¹⁹. The NPM is an intellectual approach that was developed with the purpose of enhancing the performance of organizations. NPM can also be viewed as a means of transforming public sector organizations (PSOs) into organizations that are considered to be "appropriate" or "complete." Based on Fredriksson &

Atomism is a concept. ('Atomistic' can refer to atomistic concepts or items). In its widest sense, the phrase refers to any hypothesis that a discipline's subject matter is separated into a set of non-divisible pieces that make it up. A paradigm that allows more unit divisibility but believes that all larger units are merely aggregates of smaller ones is also called the term. Atomistic ideologies frequently claim that systems or aggregates do not "really exist" beyond the "parts," therefore until the process of division and subdivision ends at some ultimate unit, there is nothing genuine to examine. The practical obstacles of discovering and identifying genuine "atoms" and showing that real structures and their behavior can be properly explained in terms of them have put doubt on atomism, not its theoretical shortcomings.

Pallas (2018) research paper, in order for PSOs to reach completeness, they will need to be remodeled such that they can produce and preserve a sense of uniqueness, demonstrate and apply rationality and logic, and establish hierarchical organizational structures. These characteristics are thought to enable organizations to exert control over important areas of their operations. These traits are seen as essential constituents of what is referred to as a "real" organization, and they have substituted the logic that underlies the conventional bureaucratic methods of governance that are applied in the public sector (Xanthopoulou & Plimakis, 2021). Reforms brought about by the NPM place an emphasis on the requirement that public organizations become more business-like. The NPM argues that public organizations have evolved into entities that compete with those in the private sector, and as a result, there is a requirement for the adoption of a business model. By departing from the conventional paradigm of administration, the NPM implements crucial components essential to improving efficiency. Cutting through bureaucratic red tape, creating an economy that focuses on people, putting customers' needs first in business, and analyzing the level of competition in the market are some of the important aspects, elements, and characteristics of NPM (Khatun, 2021). These ideas are connected by the notions that, first, individuals are inherently separate from one another and that only an organization, by means of a hierarchy of command and a shared sense of purpose, is capable of bringing individuals together into a single, rational, and effective unit of labor. The second argument is that people have a propensity toward slothfulness, selfishness, and a lack of interest in any societal good that goes beyond their own personal benefit, and that as a result, organizational unity and discipline must continually be maintained (Simonet, 2011).

The negative effects of NPM or Taylorism on the research system was explained in a number of ways by Halfman & Radder (2015) in their research article "The Academic Manifesto: from Occupied to a Public University". The authors described "measurability for accountability", which means that universities are managed by a system obsessed with accountability via measurement, increasing competitiveness, efficiency, excellence, and misguided economic salvation. They stated that in the management profession, scientists are judged against one another with "endlessly changing yardsticks" (p.167). Notably, the research field is quickly evolving with the creation of new output quantifiers, parameters, and normative data, but its application in the health sciences is still in its development stage (Choudhri et al., 2015). These output quantifiers include a total number of publications, impact factors, metrics, publishing indices, citation, and co-authorship counts. Because jobs and the existence of whole departments rest on these measures, everyone works to improve

their scores. The problem isn't that a certain indicator isn't good enough from a technical standpoint. Instead, the problem is the system of indicator fetishism itself. The system doesn't really care about high-quality results, which it can't judge. Instead, it cares about "performance: the tactically well thought-out and cleverly buffed-up illusion of excellence" (p.167). These indications have changed science in a fundamental way (Hamidreza, 2013). They don't care about the different kinds of knowledge and practices in different fields of study and destroy them (Halffman & Radder, 2015).

These measurements result in "permanent competition under the pretext of quality", where researchers compete with one another for funding, universities compete for students, and institutions are rated against other institutions. This results in an ongoing climate of hostility between all parties, shattering the university's social fabric (Halffman & Radder, 2015, p.168). This strong emphasis on effectiveness and performance can result in the ignoring of ethical issues and result in the corruption of some researchers (T. Haven & van Woudenberg, 2021). Besides, Overman (2016) alluded that "academic misconduct is considered to be the logical behavioral consequence of output-oriented management practices, based on performance incentives." (p.1140). If this theory is going to explain why researchers do research misconduct practices, it should be because they worked for a company that put a lot of emphasis on performance and output, which makes it hard to focus on values and recognize them. Maybe they always wanted to do good research from the start. But the more performance indicators were used to judge the quality of their work and the more the focus was on how well it worked, the more this intrinsic motivation was replaced by a desire to do good based on these performance indicators to be effective and publish a lot of papers. Also, the focus on these performance incentives took the attention away from RCR (T. Haven & van Woudenberg, 2021). Therefore, it is very important to improve scientific transparency and acknowledge the tension between publishing and discovery, competition and collaboration (Sovacool, 2008). Consequently, the ethos of public administration or NPM, even if it is an appropriate explanation for wrongdoing, should be viewed as a partial explanation at best (ibid.).

The existence of at least three profoundly dissimilar accounts of scientific malfeasance suggests that it will continue to be a source of conflict and debate for many years. Each narrative describes a unique cause and remedy for confronting scientific misconduct (Table 1) (Sovacool, 2008). Based on the first narrative, almost nothing must be done to stop it; we must accept the inevitability of a limited number of abuses caused by a few terrible people (Roy,

2018). According to the second narrative, reform is necessary, but only institutional reform is required. We should aim to provide additional incentives for whistleblowers and possibly impose stronger penalties for misbehavior, ensuring that the penalties for misconduct outweigh any institutional rewards (T. Haven & van Woudenberg, 2021). The third narrative, however, asserts that it is crucial to increase transparency in research and acknowledge the conflict between publication and discovery, competitiveness and cooperation (Choudhri et al., 2015).

Table 1: The Three narratives of research misconduct

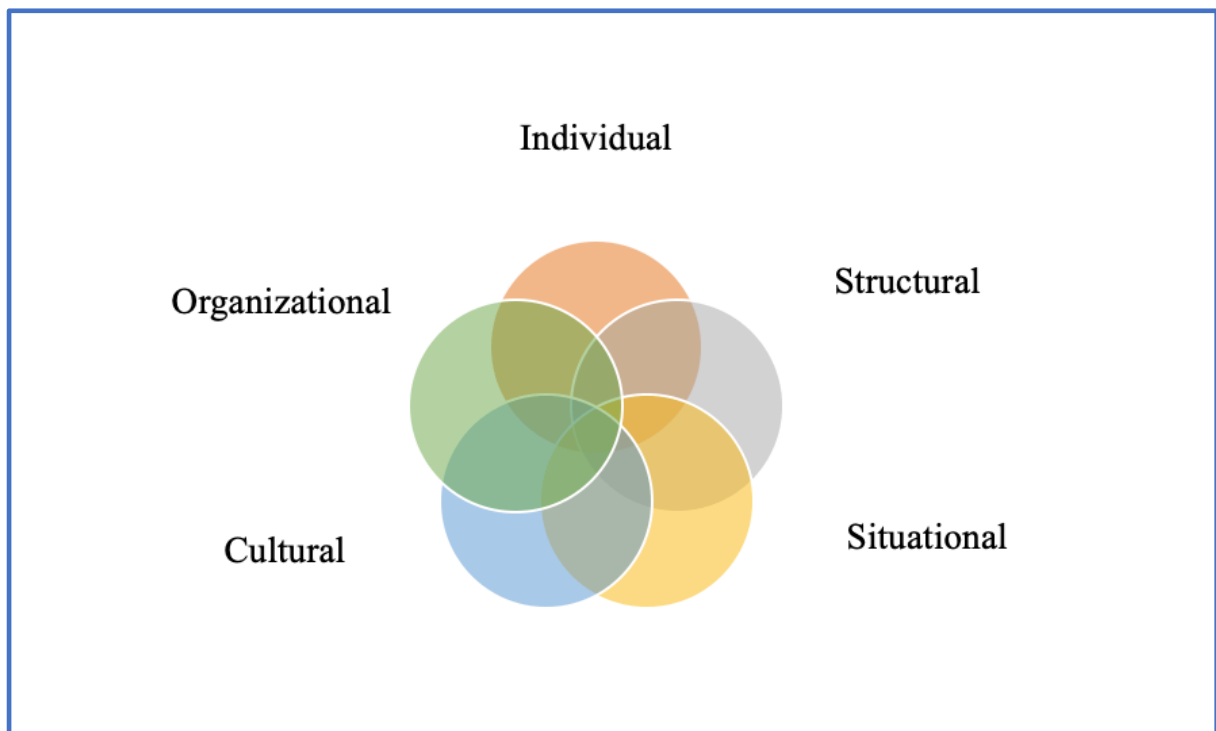
Narrative	Description	Remedy
Narrative One: Researcher impurity	In the scientific community, research misconduct is typically the consequence of a few bad individuals.	Self-control of science by the scientific community.
Narrative Two: Institutional deterioration	Scientific misconduct is an organizational issue that is compounded by certain research institutions that unwittingly encourage it.	Whistleblower protections and harsher consequences for misbehavior are examples of institutional change.
Narrative Three: Bad Science systems	Misconduct in science is a sign of a larger, pathological problem affecting the ideals that contemporary science supports.	By recognizing the conflicts between publishing and discovery, competition and collaboration, research transparency may be improved.

Source: created by the author. Her conceptualization is based on Haven & van Woudenberg (2021) & Sovacool (2008).

2.2. The imputed root causes of research misconduct

Research misconduct, which includes fabrication, falsification, and plagiarism, is a pervasive issue plaguing the scientific community in the modern era. This issue has the potential to damage science, the scientific community, and the general public. Misconduct in research is one of the challenges that the modern research community is involved in, and in order to propose remedies, it is necessary first to identify the root causes of the problem (Mardani et al., 2020). There has been a significant amount of speculation regarding the reasons behind unethical behavior in research. Though, there are several potential explanations in the literature. These can be roughly classified into five categories: individual, structural, organizational, cultural, and situational factors (*Figure 5*). The discursive literature offers at least some support for each level of explanation, as well as intuitive appeal (Davis, Riske-Morris, & Diaz, 2007).

Figure 5: Possible intertwined factors of research misconduct



Source: Designed by the researcher. Her conceptualization is based on Davis et al. (2007).

2.2.1. Individual factors:

According to Rebecca Dresser, “Researchers who deviate from fundamental scientific norms with the awareness that they are doing so are deemed most responsible for their behavior and thus most deserving of condemnation” (Dresser, 1993, p.5). Regardless of any other factors that may be wholly or partially responsible for research misconduct, the individual who is charged is the one who is accountable for the inappropriate conduct of research in actual situations (Davis et al., 2007b). Notably, personality has an effect on research behavior and should be considered when promoting RCR (Ternes et al., 2019). Therefore, this type focuses on specific researchers and the unique aspects of their personalities. It is important to point out that there is a lack of understanding regarding researchers' psychological attitudes and personalities. We like to believe that scientists are approachable, willing to collaborate, self-assured, curious, and creative in their work. However, there is evidence from personal experience to suggest that this is not always the case. To achieve success in the scientific community, one must acquire research grants and publish in journals with high-impact factors, all while working in an extremely competitive environment. This may cause scientists to feel the need to rush their work into publication, take shortcuts, embellish their conclusions, and misrepresent the significance of their investigation (Curtis et al., 2022).

It has been discovered that the so-called "*Dark Triad of Personality*", which refers to a cluster of three related yet different personality traits: sub-clinical psychopathy, narcissism and Machiavellianism (Azizli et al., 2016). Psychopathy is a set of traits that include a lack of emotion, a lack of care for others, and a lack of empathy. Narcissism is marked by a sense of superiority, vanity, and a sense of being owed something. Lastly, Machiavellianism is summed up by emotional coldness and using people to get what you want (Ternes et al., 2019). It is worth noting that lying, the act of making a statement that is known to be false with the purpose of misleading another person, can take place in one of two ways (Azizli et al., 2016). First, dishonesty that does not require taking any risks is an example of low-stakes falsehoods. This type of dishonesty is ubiquitous in everyday social interactions. On the other hand, the second way is telling lies with high stakes is putting yourself in a position where you could either gain or lose something of significant importance. For instance, telling a lie about plagiarizing someone else's work and fabricating or falsifying research data are considered a lie with high risks (Davis et al., 2007a). Therefore, it is obvious that people would be interested in the behavioral repercussions of the “Dark Triad of Personality” given that these traits are characterized by socially destructive inclinations. Specifically, it appears important to

investigate whether or not these dark features are connected to similarly suspicious behaviors and more specifically, whether or not they are predictive of actual misconduct and a propensity to engage in high-stakes fraud such as FFP (Furnham, Richards, & Paulhus, 2013). Given the super wicked nature of the “Dark Triad of personality” features, previous study has linked each of these three variables separately to lying and dishonesty (Jonason et al., 2012). Machiavellianism has been demonstrated to be a major predictor of self-serving lies, and Machiavellian individuals have been found to be more skilled liars. Furthermore, manipulativeness, a characteristic of Machiavellianism, has been linked to low- and high-stakes deception (Azizli et al., 2016). In a similar way, high scores on the narcissism scale have been associated with academic and research dishonesty, which is an indicator of high-stakes deception (Azizli et al., 2016). When compared to people who were less concerned about socially desirable self-enhancement, it was discovered that people who prioritized the management of their impressions were more prone to lie about other aspects of their lives. Given that people with narcissistic personality disorder tend to try to keep up an extravagant image and consequently engage in high stakes deception (Rogoza, 2018). In addition, within the realms of academia and research, there is significant evidence that points to a correlation between sub-clinical psychopathy and dishonesty (Curtis et al., 2022). In addition, research has indicated that people who score high on psychopathy tests are more likely to participate in high-stakes lying behaviors like plagiarizing, conning, or defrauding for their own personal gain (Azizli et al., 2016). In the same manner, Tjebk et al. (2016) highlighted that some researchers are more likely to engage in FFP than others. In particular, they postulated that Machiavellianism, narcissistic traits, and psychopathic traits are associated with research misconduct practices. In addition, the authors stated that more significant personality traits may also increase the likelihood that a person holds a higher academic rank, which may be associated with a greater propensity for misbehavior.

2.2.2. Structural factors:

To minimize FFP, it is essential to tackle the underlying factors within academic institutions and the wider scientific framework (Labib et al., 2021). People who speculate on the origins of research misbehavior tend to blame current scientific methodology heavily. Some aspects of the scientific effort in the scientific context are believed to encourage deviating from accepted scientific practices (Davis et al., 2007a). The feared pressure to “Publish or Perish” is one of the most recognized of these, which faculty researchers have to work under (Al-Adawi et al., 2016). It is typical practice in research institutes to evaluate tenure-track faculty members

based on the number and quality of papers and abstracts that they have published. Those who are unable to meet this expectation frequently have their chances of being offered a permanent position eliminated. If they don't publish their findings, it can hurt their chances of getting financial support for their research. This places a significant pressure on researchers, particularly younger researchers who do not yet have tenure, to publish the results of their research as soon as possible (Davis et al., 2007). It is difficult to trace the current state of academic research to any one institution despite the fact that universities and other research organizations include these structural aspects in their formal and informal expectations for tenure and promotion (Curtis et al., 2022). The same holds true for the requirement that researchers look for outside financial support. Publications result in greater reputation and advancement, both of which lead to increased opportunities for financial gain (Al-Adawi et al., 2016). Research of a significant scale necessitates significant resources and academic researchers rapidly become aware of the need to secure funding for their work (ibid.).

2.2.2.1 Pandemic threat of "publish or perish"

It is a common saying in the academic world that one must "publish or perish." This relates to the notion that in order to advance in one's professional life, one must generate a certain number of publications. Common metrics used to evaluate a researcher's quality as a scientist and their suitability for prestigious teaching positions or recruitment include the number of publications they have produced, the number of citations that have been made to those publications, and the impact factor of the journal in which their work has been published (Byrne et al., 2022). This concept is commonly used in higher education institutions worldwide. It helps to keep researchers regularly engaged with relevant knowledge works in the fields in which they specialize. According to this point of view, the number of research papers an academic or an administrator has is the most crucial element in determining whether or not they will be hired, promoted, recognized, or retained in their positions (Gopalakrishna et al., 2022). It's important to remember that writing may be important for an academic job. This can lead to competition and the "Publish or Perish" syndrome, which can cause stress, rushed research, and less time between doing research and reporting on it (Ambrosino & Pacini, 2022). For example, the Coronavirus disease 2019 (COVID-19) pandemic has been linked to a flood of information from all media ("infodemic") and an excessive amount of paper submissions ("paperdemic"), both of which have resulted in a high number of retractions (ibid.). Researchers are being encouraged, on the one hand, to raise their H-Index, which is an index that quantifies an individual's contribution to scientific research (the greater it is, the

better), and, on the other hand, journal editors are obsessed on boosting the impact factor of their respective journals (IF) (Herndon, 2016). However, the quality of the researchers does not necessarily increase proportionally with the H-Index or IF score. Consider this: if Albert Einstein had just written one essay on relativity theory, his H-Index would have been one point. This would be the case regardless of how many billion citations his finding has received or how significant it is for humanity (Gopalakrishna et al., 2022).

Additionally, studies have revealed that employing the "Publish or Perish" strategy in research has certain negative effects (Neill, 2008). This application translates into a publication culture that researchers are not seeing in an especially good way (Herndon, 2016). However, in today's society, there is an expectation placed on researchers to not only publish high-quality publications but also to show honesty that cannot be compromised. As a direct consequence of this change, the era of "Publish or Perish" has given way to the era of "Publish and be Ethical," which places researchers in the position of having to decide whether they should publish or be ethical (Paruzel-Czachura et al., 2021). Therefore, publication pressure and misconduct in research can be subjectively perceived "psychological tension that is related to the requirement for a particular number of publications in a specified timeframe, which attests to one's academic development, and is a condition of maintaining one's position or even retaining one's job" (Paruzel-Czachura et al., 2021, p.3). This kind of pressure has been referred to as "point-mania"²⁰, "impacto-phrenia"²¹, and "pointosis"²² in various published research articles (Kulczycki, 2017), in which the quantity of publications is given more weight than the quality of the research study produced. Based on previous published studies, this phenomena is one of the potential reasons of research unethical behavior (Deshmukh et al., 2017; Gopalakrishna et al., 2022; Herndon, 2016). Some psychologists view publication pressure as a type of psychological stress that can impair moral judgement and encourage dangerous behavior such scientific misconduct (Deshmukh et al., 2017). Even though connections between publication pressure and unethical behavior in the scientific community have not been thoroughly researched, the existence of such connections is shown in some studies. For instance, DuBois et al. (2013) discovered that 33 % of instances of unethical behavior were connected with a feeling of pressure brought on by the necessity to publish work

²⁰ **Point-mania** another name for manic syndrome, is a mental and behavioral disease characterized by excessively high levels of alertness, emotion, and energy.

²¹ **Impacto-Phrenia** is a combining form used in the names of mental disorders.

²² **Pointosis** is a cultural value that holds that publishing and collecting points for scientific publications are important goals of academic work.

promptly or to acquire a grant. In the same manner, Al-Adawi et al. (2016) claimed that in developing countries such as Egypt, higher research output can be associated with exponential growth in unethical behavior in research. In addition, Moustafa (2019) clarified that FFP could sneak in if the end purpose of the researchers is to publish a large number of scientific journals rather than to concentrate on making scientific discoveries. Besides, Bouter et al. (2016) stated that 72% of biomedical researchers rated the amount of pressure to publish as "very high," and 61% of those surveyed said that they believed in the following statement: "Publication pressure leads to serious worldwide doubts about the validity of research results" (p.4). Correspondingly, Sengupta et al. (2014) pinpointed that the enormous amount of pressure placed on researchers to produce a large number of publications results in the generation of more fraudsters than pioneers. In other words, given that publications are used to determine promotions and reputation, reckless researchers are expected to take shortcuts and may engage in FFP in order to advance their careers. Therefore, significant publishing pressure has been associated with pessimistic views of the current publication climate, researcher burnout, and skepticism in published research, all of which have had a deleterious effect on the quality of research and the researchers themselves (Paruzel-Czachura et al., 2021).

2.2.2.2. Aggressive competing environment for research funding

Rising competition for funding, publication, and advancement possibilities characterizes today's research climate (Fink et al., 2022). Many researchers who study research integrity believe that the increasingly competitive scientific environment, particularly the demand for high-impact publications and research funding, is the primary motivator for individual researchers to engage in questionable research practices such as FFP (Meirmans, 2022). The intense pressure to succeed encourages the risk of committing FFP, which is very difficult to control (Labib et al., 2021; Mejlgard et al., 2020). In the same manner, Meirmans (2022) alluded that some irresponsible scientists believe that "cheaters" may be a bit too strong because those individuals can adopt "strategic behavior" and thus do things too sloppy in order to optimize the output of research study. Besides, Al-Adawi et al. (2016) pointed out that the bitter competition for financial support has a drastic impact on the way scientific research is conducted. Some of these impacts are beneficial, but the vast majority of them are seen as detrimental such as engaging in FFP. In addition, Fink et al. (2022) stated that the research environment is defined by the pressure to publish in highly rated journals, secure research funding, and the substantial rewards available to successful researchers. Based on that, Meirmans (2022) stated that to address "the dark side of contemporary science's hyper-

competitive climate" the research community, the general public, and legislators have called for research governance²³. These requests resulted in the establishment of new external regulations. Codes of conduct, ethical assessment procedures, and the development of authorities to oversee conformity to those standards are examples of external regulations.

2.2.3. Research organizational factors

It is abundantly obvious that the structural factors and the organizational factors overlap one another. The issues at the meso level are those that concern the functions of organizations and the actions and programs that are necessary for them to carry out their responsibilities. At this stage, an organizational structure is in place, and work is being done to build both the organizational framework and the operational procedures for research (Dopfer et al., 2004). In point of fact, at this level, research policies arise from within an actual program that may be run. As a result of its transitional nature, there is a significant possibility that the objectives of the research policy will be misunderstood or misinterpreted. The institutions that operate at the meso level, such as universities and research centers, are considered to be intermediary players. These institutions maintain direct communication with researchers and make available to them a variety of fields and resources. Some of the primary tasks conducted at this level for promoting research integrity include research financing and support, training human resources for research, research observing, establishing an acceptable atmosphere for research, and providing capacity for research publication (Mardani et al., 2020). A university has a lot of flexibility in terms of the administrative personnel it employs and trains, the processes and regulations that govern its research centers and laboratories, and the relative priority these structural aspects are given (Davis et al., 2007). In this part of the literature review, I focus on the role that the working environment plays, specifically the organizational factors that contribute to unethical research practices. Notably, organizations are made up of groups of individuals that work together toward a common goal; the research organizations are made up of researchers and managers, in general. Researchers are considered professionals because they have a significant amount of creative control of their work; nonetheless, they are not immune to the effects of organizational systems and the environments in which they perform their jobs (Fuster & Gutwirth, 2016). The workplace perspective involves some key themes that might lead to research misconduct such as the [a] unethical work environment, [b] the lack of organizational policies and regulations on research misconduct, [c] ineffective supervision, and

²³ **Research governance** is the vast spectrum of laws, values, and ethical guidelines that support and promote high caliber research.

[d] insufficient training about RCR (Huistra & Paul, 2022). In developed nations, a number of procedures have been implemented in an effort to safeguard the validity of research. These include institutional mechanisms to address research misconduct, routine training in research ethics and responsible conduct of research, and the creation of national organizations that handle research misconduct, such as the Office of Research Integrity (ORI) in the United States of America (Okonta & Rossouw, 2013). However, it is unknown how much these initiatives have contributed to a decrease in FFP cases (Talib et al., 2013).

2.2.3.1. Unethical work environment

A typical scientific system comprises organizations, individuals, and a set of activities whose main objective is to provide high-quality information to enhance and protect community health (Mardani et al., 2020). The ability of affected organizations to provide quality services to their stakeholders is severely hindered when employees engage in unethical behavior in the workplace. This behavior not only jeopardizes the reputation of the organizations but also has a disastrous effect on their capacity to provide top-notch services (Singh & Twalo, 2015). It is well acknowledged that working in an unethical atmosphere is one of the primary contributors to unethical behavior in research (Davis et al., 2007). The practice of science has transformed into a highly competitive field. In a perfect scenario, the scientists would be truthful and independent in their work, maintain positive relationships with their peers, and be loyal to the organization for which they work. However, because scientific performance is evaluated based on the number of publications, and there is ongoing pressure to secure funds for research, the environment in which scientists work provides the potential for the development of immoral behaviors, such as FFP (Buljan et al., 2018).

Based on their research study, Hofmann & Holm (2019) alluded that there is a correlation between the research environment integrity factors and the behaviors and attitudes of PhD researchers that engage in FFP. According to the findings of this study, even after completing a doctoral program in biomedicine, many researchers still maintain perspectives that are inconsistent with the broad moral norms that are prevalent in the scientific community. A substantial number of researchers stated that their research environment encourages attitudes and behaviors that are inconsistent with research integrity. If this is the case, then initiatives to promote research integrity ought to focus equally on environments and people (Davis et al., 2007). In the same manner, Krstić (2015) pointed out that researchers typically work at institutions, which means they are always surrounded by other people. They gain insight into

what actions to do in order to accomplish their objectives by studying the actions of others and learning from those observations. If some of their coworkers behave unethically and are not punished for it, it is possible that they will begin to feel frustrated and less motivated for their work ethically and commit FFP. Besides, Al-Adawi et al. (2016) stated that researchers who take part in fraudulent practices such as FFP may not experience shame for the harm they do. In addition, researchers may act unethically if they are not appropriately taught on the consequences of engaging in unethical conduct during research, which may generate an unethical research environment in academic and research organizations. (Felaefel, 2015). Furthermore, Mardani et al. (2020) alluded that one of the most important factors that lead researchers to commit FFP is the research work environment. The authors stated that professors and departments can impose research topics that are beyond the capabilities of graduate students and have extensive and time-consuming research objectives; this might lead to students fabricating data. In addition, the authors alluded that researchers believe that authorities do not utilize the findings of their studies in decision-making and organizational actions. Therefore, they are neglectful in conducting research responsibly and collecting reliable data. Correspondingly, DuBois et al. (2013) stated that environments lacking research ethics can harm researchers by encouraging them to engage in unethical procedures or by shaping their views about the many types of research misconduct. Therefore, these environmental factors that create opportunities for unethical behavior in research warrant a deeper look (ibid.).

2.2.3.2. Lack of institutional research integrity policies

Since research is conducted all around the world, unethical behavior in the research community, including FFP, has also expanded globally. However, the severity of the problem in developing countries and low- and middle-income countries (LMICs) needed to be addressed adequately because of a lack of available data about research misconduct cases as well as sustainable policies (Ana et al., 2013). Since the creation and execution of policies and procedures for the ethical and professional conduct of research are necessary for maintaining research integrity, it is evident that the majority of high-income countries (HICs) have well-established policies, initiatives, and substantial prevention measures against misconduct, which indicate researchers' knowledge of the detrimental research misconduct practices (Mohammed & Abdel Salam, 2022). Each nation typically employs a patchwork of tools to govern research integrity, including national policies, central governing bodies, state/provincial standards, global norms, journal guidelines, professional instructions, institutional regulations, and

supervision (Resnik et al., 2015). At the state level, several countries have made a wide range of policy tools and governance methods to keep research honest and keep an eye on it. Policies can be drafted in the form of legislation and regulations, guidelines, or professional standards, and they can be supervised by an entity that is either governmental or non-governmental and possesses a wide range of oversight functions (ibid). Despite the fact that national policies have the capacity to play a substantial role in the process of monitoring research integrity, research institutions have the primary duty of supervision (Ana et al., 2013).

It is important to mention that research organizations must empower researchers to follow appropriate research practices (Bouter, 2020). To attain and uphold research integrity, all academic and research institutions should be prepared to use their resources to their fullest extent. They may maintain research integrity by defining the best benchmarking methodologies, creating a research compliance infrastructure, and implementing a quality assurance plan (Robishaw et al., 2020). Universities and research organizations are equally accountable for handling misconduct allegations, shielding witnesses from retaliation, creating and disseminating guidelines for research integrity, establishing standards for reward and recognition, and educating all the researchers about research misconduct and RCR (Al-Adawi et al., 2016). In the same manner, Khan & Sherin (2019) alluded that institutions need to develop systems that can guarantee adherence to research ethics standards, adoption of robust study designs, solid data management, honest and accurate publication of study results, and processes to deal with accusations of research misconduct through a transparent process. Therefore, it is clear that even though national policies and agencies are able to provide support for institutional efforts, they are unable to take the place of strong institutional procedures and dedicated leadership (Felaefel, 2015). As a result, most national policies emphasize the significance of institutional supervision and responsibility (T. Haven & van Woudenberg, 2021). However, another opinion was revealed by Mohammed & Abdel Salam (2022) as they affirmed that while universities and research centers are best placed to deal with wrongdoing within their authority, they may have conflicts of interest (COIs) when it comes to investigating and reporting misconduct because they may want to avoid a loss of money or harms to their reputation. Therefore, synchronicity and collaboration between national bodies free of COIs and academic and research institutions are necessary to promote research integrity (Robishaw et al., 2020).

2.2.3.3. Insufficient mentoring/supervision of junior researchers

The goal of research supervision, whether it be for a master's thesis, a doctoral dissertation, or instructional courses, is to assist students in developing their analytical, creative, and research-based thinking skills, as well as to contribute to the body of knowledge that already exists (Anderson et al., 2007). Supervisors must possess a wide range of skills. The quality of the work produced is, in other words, partially dependent on the quality of the supervision, which includes aspects such as supervisory style and the learning needs and patterns of the students. Scholars and supervisors who are committed to their work avoid thwarting the progress of those they are responsible for supervising by encouraging students to engage in critical thinking. Additionally, giving negative comments is unethical and inhibits students' creativity (Muthanna & Alduais, 2021). Additionally, treating students unfairly for unidentified reasons is against the law in terms of education, as mentioned in the following quotations:

" Every citizen has the right to education with the aim of building the Egyptian character, maintaining national identity, planting the roots of scientific thinking, developing talents, promoting innovation and establishing civilizational and spiritual values and the concepts of citizenship, tolerance and non-discrimination. The state commits to uphold its aims in education curricula and methods, and to provide education in accordance with global quality criteria".

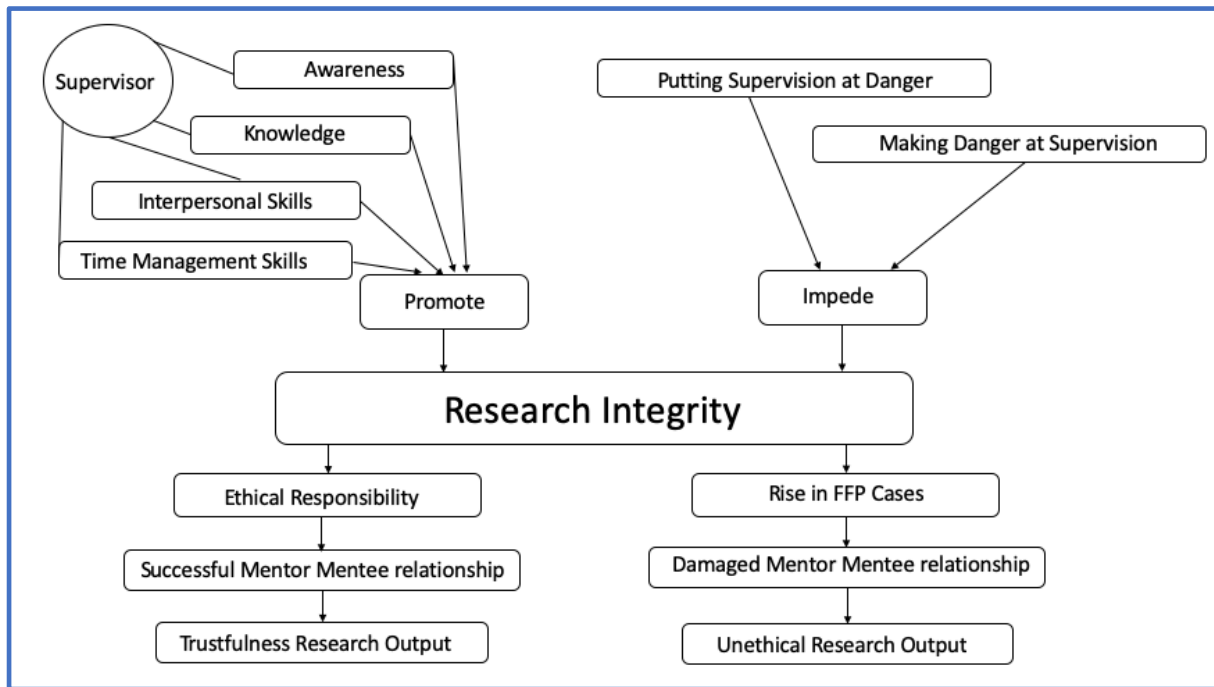
(Constitution of The Arab Republic of Egypt, 2014, p.9).

All educational supervisors have an ethical obligation to care for their supervisees' growth of knowledge and behavior, which includes providing proper supervision (Löfström & Pyhältö, 2017). Promoting ethical conduct among students improves their sincerity in general and their ability to carry out research in particular. Conscientious feedback from supervisors encourages students to successfully complete the tasks and keeps the research process moving forward (Muthanna & Alduais, 2021). There is no denying that many research supervisors are very dedicated to giving their supervisees the finest supervision possible. They strategically approach the task, taking into account the cultural backgrounds and expectations of the supervisees (e.g., functioning as an emancipator, functionalist, assessor, motivator, or integrating such techniques). They are completely aware of accomplishing the primary objective of research supervision, which includes helping supervisees develop their critical, imaginative, and research abilities (A. Lee, 2018). The development of research and critical

thinking abilities helps supervisees to carry out a scientific study that adds to the body of knowledge and stays away from any research misconduct, intentional plagiarism in particular (Al-Adawi et al., 2016).

It is vital to note that the degree of intimacy between a supervisor and their subordinate is crucial in preventing research misconduct (Davis et al., 2007). Issues in such a relationship could manifest as insufficient guidance and mentorship of inexperienced researchers, particularly graduate students (Hansen & Hansen, 1995). Notably, PhD students are under a lot of strain, not the least of which is the need to contribute something new or important to knowledge. Some students, when confronted with challenging research processes, may resort to using methods that violate norms generally rejected by the academic community. These unethical behaviors pose a problem for the supervisor-student relationship at the doctoral level and have consequences for the student, the supervisory group, the university, the granting body, and the research community at large (Mitchell & Carroll, 2008). Regrettably, as the number of students pursuing a PhD rises, there is a greater likelihood that academic and research misconduct, particularly those at the doctoral level, will become more common. This will place a greater demand on supervisors to provide the needed time as well as the appropriate level of mentoring (Felaefel, 2015). In addition, Choupani et al. (2018) alluded that lack of weak supervision and lack of knowledge of supervisors regarding FFP could affect the integrity of the research process. Therefore, research supervisors must equip themselves with all the information essential to carry out the supervision task expertly; otherwise, research supervision will be in danger. Numerous examples demonstrate the risk to the research supervision. For instance, research supervision is in danger when supervisors lack research expertise, interpersonal skills, and flexibility with several operational tasks (Muthanna & Alduais, 2021). Moreover, danger at research supervision can occur because of the supervisors' negligence in applying research ethics. In fact, it encourages students to disregard following research ethics principles. Additionally, accepting to supervise numerous students without making suitable arrangements, allocating enough time, or treating supervisees unfairly are acts that point to danger at the research supervision (*Figure 6*) (A. Lee, 2018). Besides, Al-Adawi et al. (2016) focused on the fact that preserving the integrity of research is everyone's responsibility, and that additional responsibility rests on the shoulders of instructors and supervisors who have the obligation to conduct research supervision in an ethical manner in order to preserve further the truthfulness of the whole research process.

Figure 6: A Conceptual diagram of research integrity and research supervision in jeopardy



Source: Created by the researcher.

2.2.3.4. Substandard training about responsible conduct of research

One of the primary responsibilities of research organizations is to increase researchers' awareness of the importance of maintaining research integrity through the provision of education and training, the management and sanctions of unethical research behavior, and the cultivation of an ethical culture within the organization through the promotion of open communication and dialogue, inclusiveness, support, and a fair incentives system (Roje et al., 2022). Completing research integrity education and training is viewed as a good element or at least the initial step in persuading researchers to adhere to research integrity norms. Education on research integrity is seen as beneficial to researchers because it enables them to gain a deeper understanding of research integrity and research misconduct, how to respond to challenging research integrity situations, and the significance of research integrity for the advancement of science (Othman et al., 2022). In the same manner, Felaefel et al. (2018) proved in their research study that RCR training dramatically changed attitudes by causing participants to acknowledge engaging in research misconduct and reporting it to themselves. Because of this, training in ethics may improve one's knowledge, understanding, and attitude about research integrity. On the other side, Abdi et al. (2021) affirmed that the lack of knowledge and training regarding research integrity is viewed as a problem that impedes the

promotion and implementation of research integrity. A culture that positively influences researchers' conduct can be fostered when an organization prioritizes and invests in RCR training with the goal of creating a culture in which research honesty is respected and encouraged and instances of research fraud are dealt with properly (DuBois & Antes, 2018; Haven et al., 2019). In contrast, when an organization is more focused on competitiveness and rankings rather than increasing researchers' awareness of FFP to protect their reputation, a toxic research climate is developed in which researchers may be more likely to disregard rules and best practices (Olesen, Amin, Mahadi, & Ibrahim, 2019).

According to the findings of studies that evaluated interventions for research integrity, education about research integrity is a crucial component of promoting and implementing research integrity among researchers (Haven & van Woudenberg, 2021; Othman, et al., 2022; Roje et al., 2022). However, according to the findings of the studies, the education that is now available might be better in terms of giving the full benefits of research integrity training. Furthermore, the studies advised improvements in the training's content as well as its delivery. In light of the findings, there are a number of suggestions and considerations that can be made to improve RCR education interventions. In the first place, unconventional methods of educating researchers on research integrity, such as sensemaking or role-playing scenarios, appear to give a better solution for education because they seem to interest researchers more than traditional theoretical teachings do (Institute of Medicine., 2002). Therefore, education programs on RCR ought to take into consideration doing more interactive, dynamic, and engaging activities. These should involve the creation of role-play scenarios, cases, and metacognitive reasoning processes. Recent studies have shown that despite the availability of a large number of educational resources on research integrity, the majority of these still assume a passive rather than an active role on the part of users (Pizzolato & Dierickx, 2021). Second, RCR training should consider the fact that there is not a single approach that is optimal for everyone. Future training initiatives should strive to be tailored to the needs of trainees, taking into consideration their disciplinary field or research methods needs. This could have a positive effect on how researchers perceive training, and it could also help researchers internalize and apply the information they learn (Roje et al., 2022). In addition, the idea of using a virtue-based approach to education on research integrity standards was investigated as a potential method for attaining the goal of internalizing research integrity standards. It is possible that greater adherence to the criteria of research integrity could result from placing more emphasis on the personalities, virtues, and values of the individual researchers (Tomić et al., 2022). The third

recommendation suggests that education only received for a short period is insufficient to ensure the positive benefits of training over the long run. Therefore, education on research integrity that would be held over a given amount of time or at different stages in the researcher's career could be a preferable method for guaranteeing that the training has the desired results in reducing FFP (Haven & van Woudenberg, 2021). Therefore, the next step is for organizations to seek enhancements for RCR training programs, as these are likely to result in efficient and lasting benefits to foster a culture of research integrity among researchers (Roje et al., 2022).

2.2.4. Cultural factors

The effect that organizational culture and environment may have in unethical research practices is rarely discussed despite the fact that culture may substantially impact an individual's life (Davis et al., 2007). In the field of organizational research, Schneider and colleagues (2013) provide a historical review of both terms climate and culture, defining climate as "the meanings people attach to interrelated bundles of experiences they have at work" and culture as "the basic assumptions about the world and the values that guide life in organizations" (p.361). Nowadays, the two have less distinction, and the names are frequently used interchangeably. Similarly, Valkenburg et al. (2021) described culture as the norms and standards established by leadership and codified in rules and regulations. Also, it is widely acknowledged that "culture" is critical for promoting research integrity (Pupovac & Fanelli, 2015). Nichols-Casebolt (2012) substantiates a "culture of integrity" by ensuring that ideas of integrity are included as an integral part of education and research, having clear mission statements, establishing precise requirements, establishing systems for reporting inappropriate research behavior, and setting good examples. In the same manner, Ellis (2015) highlights research culture as a domain in which skewed publication incentives, particularly through unique reward schemes, jeopardize integrity. Besides, Clifford Geertz provides arguably the most fundamental and ubiquitous concept of culture. He describes culture as "a historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men [sic] communicate, perpetuate, and develop their knowledge about and attitudes toward life" (Geertz, 1973, p.89). Although these descriptions of culture might be broadly interpreted as ideas of "what culture does," descriptions of "what culture consists of" have also been provided. The National Academies of Sciences (2017) report, for instance, lists a number of ways that culture might be operationalized for research. These cover a wide spectrum of what might be referred to as "positive behaviors," such as correct data handling, publication, correcting flaws,

collaboration, and peer review. Incentives that undermine ethical research are also mentioned in the report, including the pressure to publish and the requirement for funding, which may be seen to be part of a problematic culture.

It is worth noting that the culture of a research or academic institution may enable researchers to engage in unethical or problematic actions in order to achieve financing and recognition (Al-Adawi et al., 2016). Based on Fraia (2015) research study, researchers have the option of **[a]** accepting, **[b]** resisting, or **[c]** fitting into the convergence between financial support and professional prestige. For instance, scholars who are willing to tolerate a culture that encourages unethical behavior in research have been found to have a strong orientation toward the achievement of funding and recognition objectives (ibid). On the other hand, some researchers vehemently questioned the status quo, whose narratives questioned organizational rules, constraints, perceived pressures, and funding and recognition goals (Felaefel et al., 2018). Lastly, other researchers initially attacked organizational culture that promotes research malpractices. With the passage of time, they try to identify the game's rules (even informal rules) to take part in it to get more rewards and get prompted. This is due to the fact that a culture that supports code of conduct violations could produce a negative push toward doing things morally, as researchers who adhere to ethical norms will never take fair chances in an unethical firm (Al-Adawi et al., 2016; DuBois & Antes, 2018). Awareness of the function that culture plays is the first step in implementing culture. Correspondingly, Clegg et al. (2007) urged for further refinement of the concept of "ethics as practice" to reflect the contextual and dynamic nature of research integrity, as well as the reality that rule-based ethics generally fails to capture the complexities of decision-making on the job floor. In his research study, Gunsalus stated that attaining research integrity involves more than just having the right laws in place. It also involves an institution's leadership "walking the talk" and promoting ethical behavior (Gunsalus, 1993). It is interesting to note that a recent quantitative survey discovered that culture plays a significant role in the occurrence of questionable research practices (Haven & van Woudenberg, 2021). This may give more reason to begin working on other interventions that may help foster a responsible conduct of research culture. This should include training in research integrity (RI), training for PhD supervisors and mentors, encouraging reflexivity within research departments, and interventions that explicitly address research culture (Valkenburg et al., 2021).

2.2.5. Situational factors

It is important to note that the little literature on research misconduct provides several examples of how environmental difficulties contributed to the misconduct. Situational elements do not belong to the individual. Instead, they are temporary situations, which are usually seen as bad or stressful, that are thought to make otherwise ethical people do corrupt things. Even researchers who are honest can find themselves in tough situations that test their ability to handle pressure/capacity to cope. There are many things that can happen that could hurt the quality of the study (Davis et al., 2007). Notably, several of those found guilty of scientific misconduct stated that they were dealing with family and other personal issues during their involvement. Among the problems were but were not limited to loss of family members, a new baby, emotional struggles following a breakup, a wife's complicated pregnancy, a son who has been diagnosed with attention deficit disorder (ADD) and conduct disorder, the disappointment of the respondent's parents over not being accepted into medical school, and a wage cut following the purchase of a new home. Although these factors as potential causes have gotten less attention in the literature, it is crucial to investigate them in order to curb the wicked problem of research misconduct (Mumford et al., 2007).

This scoping review has demonstrated the diversity and interdependence of the factors that negatively impact research integrity (*Table 2*). As a result, organizations shouldn't focus their improvement efforts on a single level because they're unlikely to produce sustainable results. To create significant long-term changes, it is vital that all involved stakeholders collaborate with clearly specified responsibilities (Buljan et al., 2018). Research organizations should create explicit policies, offer educational programs catered to the needs of the researchers, set up committees for investigating and punishing violations of research integrity, and modify the criteria for evaluation (Roje et al., 2022). Researchers and research organizations should collaborate with funders and publishers to reform the scientific system by implementing programs that would lessen pressure and competition while fostering a culture of integrity, honesty, trustworthiness, and fairness (Tomić et al., 2022).

Table 2: Taxonomy of the intertwined triggers of research misconduct most often mentioned across publications

List of Factors	Positive	Negative
<p>1- Individual Factors</p>	<ul style="list-style-type: none"> • Positive personality attributes, such as high moral integrity, honesty, a feeling of social responsibility, and respect. • Willingness to report fraud and other forms of dishonesty in science. 	<ul style="list-style-type: none"> • <i>“Dark Triad of Personality” is a grouping of three linked but distinct personality traits: sub-clinical psychopathy, narcissism, and Machiavellianism.</i> • Strive for success, recognition, and prosperity by publishing a great deal of work despite rules governing research integrity, taking shortcuts, and balancing the consequences of research misconduct against the rewards for scientific achievements. • Not disclosing misconduct because of concern for the consequences.

(Continued)

Table 2: (continued)

List of Factors	Positive	Negative
<p>3- Organizational Factors</p> <p>[a] Unethical environment</p> <p>[b] Lack of institutional research integrity policies</p> <p>[c] Insufficient mentoring of junior researchers</p> <p>[d] Substandard training about RCR</p>	<ul style="list-style-type: none"> • Promoting an environment of honesty, openness, deliberation, compliance, teamwork, and inclusivity. • Responding to cases of wrongdoing. • Formulating new rules and guidelines for research integrity; putting them into effect; improving them. • Ensuring that researchers follow research integrity rules and procedures. • Protecting whistleblowers. • Senior researchers, mentors, and supervisors ought to routinely meet with students, model ethical behavior for them, and offer advice and support. • Educating researchers about research integrity issues. 	<ul style="list-style-type: none"> • Poor climate, governance, and leadership within the organization. • Avoiding conducting investigations into improper behavior. • Lack of comprehensive, precise, and explicit regulations and guidelines for research integrity. • Inadequate oversight. • Lack of a competent procedure for handling cases of misconduct and protecting whistleblowers. • Poor role models (failure to pay attention to the work of young researchers, pressure to supervise a large number of students, lack of training). • Lack of RCR training in the organization.

(Continued)

Table 2: (continued)

List of Factors	Positive	Negative
4- Cultural Factors	<ul style="list-style-type: none"> • Creating a secure environment to discuss research integrity issues. • Increasing awareness of research integrity and RCR. • Organizational justice and a positive ethical climate. • Increasing transparency (by publishing the number of cases of research misconduct and other bad practices). 	<ul style="list-style-type: none"> • Poor organizational leadership that resists discussing allegations of research misconduct. • Ignoring RCR principles and putting too much emphasis on revenue, profitability, and performance. • Absence of positive organizational values. • Ignoring research misconduct cases.
5- Situational Factors	<ul style="list-style-type: none"> • No temporary difficult and hard circumstances that cause ethical individuals to compromise the quality of scientific research. 	<ul style="list-style-type: none"> • Challenging issues might happen to researchers including: Loss of family members, a new baby, emotional challenges after a breakup, a wife's challenging pregnancy, a son with ADD and conduct disorder, the respondent's parents' regret in not getting into medical school, and a wage cut after buying a new home

Source: created by the author. Her conceptualization is based on Roje et al. (2022)

2.3. Collaborative governance as an approach to deal with wicked problems

2.3.1. The governance of wicked problems

Most government planning is characterized by "wicked" challenges, with a particular emphasis on social concerns. These are complicated policy issues with significant risk, uncertainty, and interconnectedness among affecting variables. Issues that are "wicked" cannot be grouped within the boundaries of a single organization or categorized according to administrative levels or ministerial departments. They are characterized by their dynamic complexity, involving multiple levels, actors, and sectors (Bianchi, 2016). Education, social cohesion, climate change, unemployment, criminality (Bianchi & Williams, 2015), homelessness, healthcare, poverty, societal aging, and immigration are among the issues (Bianchi & Xavier, 2014).

The primary qualities or criteria of 'wickedness' arising from the literature may be condensed and classified into two categories. These are known, respectively, as the complexity and diversity aspects. Complexity, the first dimension, is related to the difficulties in understanding the wicked problem and potential remedies. These difficulties result from a skewed knowledge base, intricate relationships between processes and structures, unpredictability brought on by the contingent and dynamic character of social issues and processes, and the incommensurability of several risks and potential trade-offs (Grewatsch et al., 2021). The second dimension is the diversity dimension, which relates to the quantity and variety of actors participating. It includes actors as well as the institutional settings and situations in which they operate. The variety of actors or institutional backgrounds from the decision-maker's perspective creates substantially comparable sorts of issues. Recognizing/defining issues and thinking about viable solutions involve exchanging information pertinent to the situation. They could also hold divergent interests or beliefs, making them differ on the nature of the issue and the best course of action. They are all possible sources of information, authorization, or resources, and they are all anticipating something from the management or decision-maker (B. Head, 2022). An issue typology may be created by combining these two dimensions (*Table 3*). Tame problems are those that have modest degrees of complexity and diversity. The difficulty becomes more severe as the scenario becomes more complex and varied. According to this paradigm, there are numerous kinds of wicked issues and, as a result, different ways to address them.

Furthermore, Grint (2022) contends that the ambiguity caused by wicked situations is what makes them appear so difficult to address. Uncertainty is classified into three types: Institutional (a), strategic (b), and substantive (c). "Substantive" uncertainty refers to information gaps and competing interpretations that result in no agreed-upon or complete comprehension of the nature of wicked issues (B. Head, 2022). The term "strategic" uncertainty describes the fact that numerous actors are involved, each with distinct preferences, and that the interaction between their points of view is unpredictable. Thirdly, "institutional" uncertainty refers to the fact that relevant actors are affiliated with diverse organizational areas, systems, and laws and regulations, implying that decision-making processes regarding pernicious problems are likely to be disorganized and uncoordinated. Thus, three forms of uncertainty substantially complicate efforts to address wicked problems in this view (ibid).

Wicked problems are typically ingrained in major social issues of modern life, the interpretation of which is ambiguous due to the adopted value perspectives (Head & Alford, 2015). As a result, the concept of a "wicked problem" accounts for the fact that there is not always a single, optimal solution. Instead, a combination of suboptimal solutions is required (Bianchi, 2016). Furthermore, wicked problems entail a multitude of stakeholders. Due to the different perspectives and cultures of the policymakers who may be engaged, dealing with a wicked problem requires a systematic learning approach focused on conflict resolution and discourse (Bauhr, 2017).

Policymakers tend to seek symptomatic solutions to wicked problems. A lack of policy coordination across multiple governmental agencies, non-profit organizations, and other private parties is the outcome of using a short-term perspective and a sector-specific approach in plan creation and execution. Given that policymaking generally involves multiple agencies, both at the national, regional, and local levels, and in terms of the domain (e.g., policing, welfare, education, and justice), this method may not aid governments in selecting sustainable solutions (Bianchi, 2016).

Based on Borgonovi (2004), governments should coordinate their management of three key sets of levers: organizational and structural changes, performance management systems, and cultural and social systems. The goal is to create and implement more flexible and ubiquitous governmental methods that can encourage more sensible, informal, and intelligent collaboration

among many stakeholders, not only those in the public sector. In order to frame and evaluate the desirability of the effects produced by the adopted policies, implementing such reforms necessitates an outcome-oriented perspective on performance. This strategy takes both short-term and long-term effects into account. In addition, it considers them not only from the perspective of a single unit or institution but also from an inter-institutional perspective, i.e., that of the relevant system structure that generates observed behavior. In addition, by focusing solely on single-input and single-output measures, policymakers may be hindered in assessing the ability of their own actions to find sustainable solutions to wicked problems. By combining these measures with outcome performance indicators such as those related to the community's quality of life, governments can better assess the temporal and spatial sustainability of their own policies. The third way to make these changes happen is through cultural and social processes. Cross-sectoral cooperation and coordination could change in a big way if different groups worked together to build a strong sense of norms, collaboration, diversity, and trustworthiness. Changing culture and building trust is not an easy or quick process. Each unit's performance management cycle needs to be supported by a learning-based and systems-based approach (Bianchi, 2016).

Table 3: Typology of problems

Diversity Complexity	One party	Multiple Parties with partial knowledge	Multiple parties with opposing values/interests
Both the issue and its remedies are well-known	1 Tame issue	2	3
The issue is understood, but the remedy is uncertain (the cause- and-effect link is ambiguous)	4	5	6 Wicked issue
The issue and its remedy are both unknown	7	8 Wicked issue	9 Extremely wicked issue

Source: Created by the author. Her conceptualization is based on (Head (2022)).

2.3.2. Collaborative governance: promoting sustainable outcomes

Based on Bianchi (2021), the term collaborative governance refers to an explicit and formal approach for which includes stakeholders in a collaborative, consensus-based process of decision-making. Diverse terminologies have been used to describe similar concepts, including the collaborative networks (Agranoff, 2006), cross-sector collaboration (Bryson et al., 2006), new public governance (Osborne, 2009), holistic governance, public value governance (Bryson et al., 2014), participatory governance, integrated governance, interactive governance (Fung & Wright, 2001), mosaic governance (Buijs et al., 2016), co-production (Osborne, 2009), whole-of-government (Christensen & Læg Reid, 2007), and joined-up government (Hood, 2005). Collaborative governance is not a “winner-take-all” approach to interest mediation. In collaborative governance, stakeholders frequently have antagonistic connections to one another, but the objective is to convert confrontational relationships into beneficial and collaborative (Ansell & Gash, 2008, p.5). Collaborative governance generally refers to individuals and organizations cooperating with one another. Therefore, it emphasizes the importance of genuine collaboration among public institutions, citizens, and other stakeholders (Bianchi, 2021).

Based on Ansell & Gash (2008), collaborative governance consists of four main broad variables, which are: (a) initial circumstances, (b) institutional structure, (c) facilitative leadership, and (d) collaborative procedure. Each of these wide variables can be subdivided into more specific variables. Initial conditions determine the fundamental levels of confidence, disagreements, and social capital, which transform into liabilities or assets during cooperation. Institutional design determines the fundamental ground principles for collaboration. In addition, leadership enables and manages the process of collaboration (ibid). The process of collaboration is portrayed as a loop as it is extremely iterative and nonlinear (*Figure 7*).

Initial circumstances can be broken down into three broad categories: imbalances in the resources or power of different stakeholders, incentives for stakeholders to work together, and the history of conflict or cooperation between stakeholders (ibid). In collaborative governance, disparities in authority between stakeholders are a commonly cited problem. If some stakeholders lack the capacity, organization, status, or resources to participate equally with others, the collaborative governance approach will be prone to manipulation by more potent actors (Head, 2022). Moreover, given the primarily voluntary nature of participation, it is crucial to understand

stakeholders' incentives to partake in collaborative governance and the variables that influence those incentives (Agranoff, 2006). Participation incentives are partly influenced by stakeholder expectations regarding whether collaborative processes will produce meaningful outcomes, especially in light of the duration and dedication required for collaboration. When stakeholders perceive a direct correlation between their involvement and concrete, tangible, and practicable policy outcomes, incentives increase (Futrell, 2003). Similarly, according to the literature, the history of hostility or cooperation among stakeholders would either restrict or assist collaboration (Ansell & Gash, 2008; Futrell, 2003). High levels of conflict can be a strong motivator for collaborative governance when parties are highly interconnected (Ansell & Gash, 2008). A history of conflict makes people suspicious, distrustful, and quick to make assumptions. On the other hand, a history of working together well in the past can build social capital and trust, leading to a cycle of working together well. Therefore, it is crucial to keep in mind that collaborative governance is difficult to succeed if there is a history of conflict amongst stakeholders unless there is a substantial degree of interdependence between them or actions are made to address the lack of confidence and social capital between them (Weber, 2006).

Institutional design refers to the core cooperation guidelines and protocols, which are necessary for the collaborative process's procedural validity (Head, 2022). The first requirement for effective collaboration is that it must include every stakeholder affected by or affected by the issue (Chrislip & Larson, 1994). Notably, a diverse enough range of stakeholders must be included for the collaboration to be effective in order to accurately portray the issue at hand (Kramer, 1990). Based on Ansell & Gash (2008), Broad-based involvement goes beyond just reflecting collaborative governance's open and inclusive nature. It is essential to a process of legitimacy based on (a) the chance for stakeholders to discuss policy results with others and (b) the conviction that the policy conclusion reflects a broad-based consensus. The validity of collaborative achievements is thus threatened by inadequate or exclusive representation. Consequently, proactive strategies to mobilize less well-represented stakeholders are frequently regarded as crucial. Additionally, the literature suggests that clear ground rules and process transparency are crucial design elements (Bauhr, 2017; Chrislip & Larson, 1994; B. W. Head & Alford, 2015). The use of deadlines is the last issue in designing institutions. Even though some authors say that deadlines are important, especially because meetings, where people work together, can last forever, (Ansell & Gash, 2008; Glasbergen & Driessen, 2005). On the contrary, Freeman (2011)

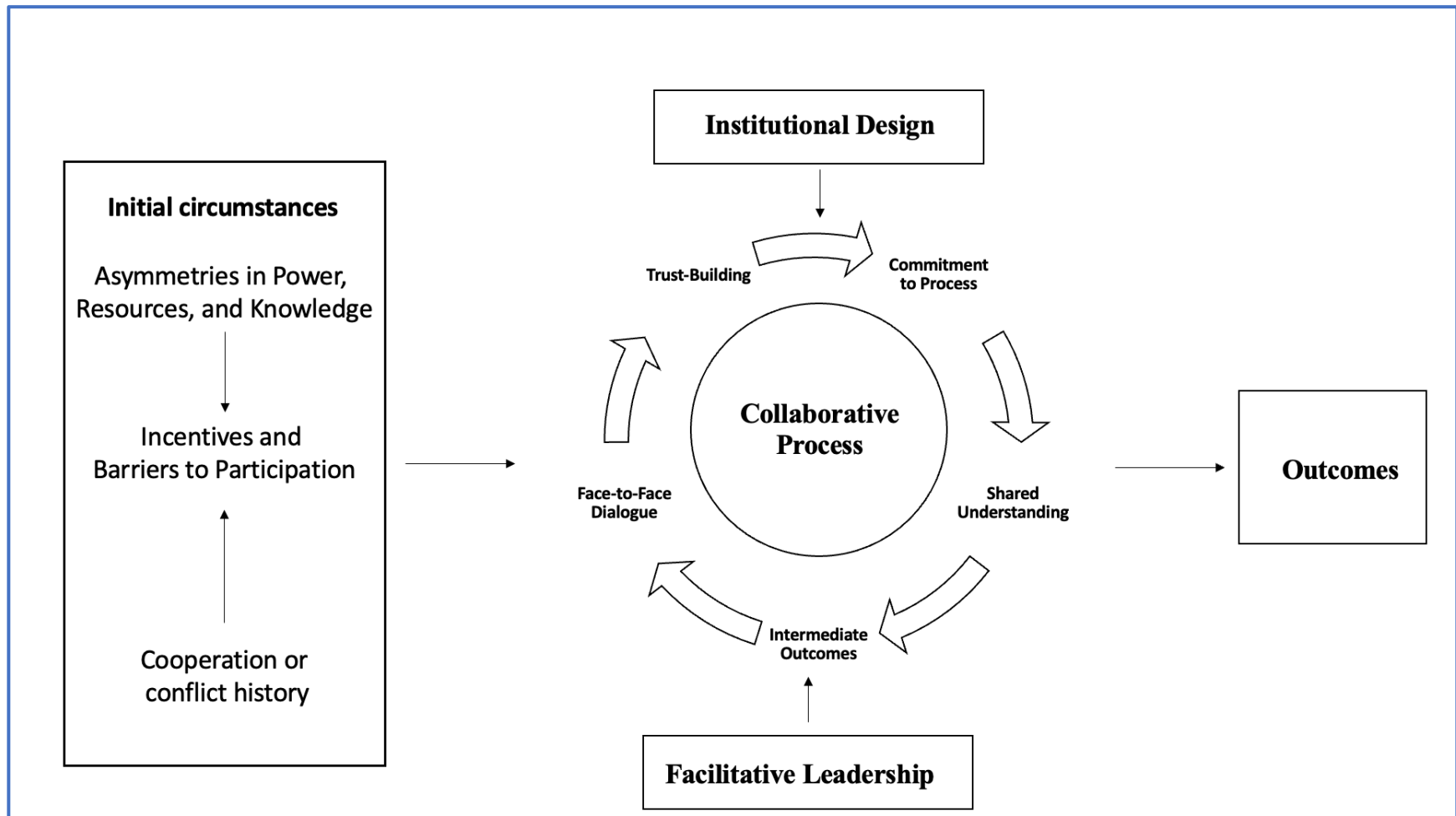
claims that deadlines can make it hard to talk about everything. The author claims that the problem is that deadlines might hurt the ongoing nature of the collaboration, making it less likely that people will work together for a long time. So, when timetables are used, they must be realistic (Ansell & Gash, 2008).

The concept of collaborative process can be broken down into six broad categories, including (a) collaborative process, (b) face-to-face dialogue, (c) trust building, (d) commitment to the process, (e) shared understanding, and (f) intermediate outcomes (ibid). The process of collaboration is cyclical rather than linear. Collaboration appeared to frequently depend on achieving a virtuous cycle between communication, trust, commitment, comprehension, and results. This cyclical or iterative process is crucial at every stage of the collaboration (Huxham, 2003). Likewise, all forms of collaborative governance are built on direct communication between stakeholders. Public dialogue is essential for stakeholders to locate opportunities for mutual gain because it is a consensus-oriented process. Face-to-face communication is more than just a means of negotiating, though. It is fundamental to the process of removing communication barriers like stereotypes and others that prevent the initial exploration of potential mutual benefits. It is at the core of a procedure for establishing mutual respect, trust, understanding, and dedication to the procedure (Gilliam et al., 2002). Additionally, a lack of trust among stakeholders is frequently where collaborative governance begins (Glasbergen & Driessen, 2005). The collaborative process entails not only negotiation but also the establishment of trust among stakeholders. It is worth noting that trust building becomes the most important and challenging part of the early collaborative process when there is a history of antagonism among the stakeholders. Good collaborative leaders recognize they must first earn the trust of their former adversaries. Establishing trust takes time and requires a sustained effort to reach the desired collaborative results. Therefore, if there is a history of hostility, stakeholders and policymakers should set aside resources to facilitate trust restoration (Huxham, 2003). Moreover, the level of collaboration commitment among stakeholders is a crucial variable in determining success or failure. Commitment to the process entails the belief that bargaining in good faith for mutual gains is the most effective means of achieving desirable policy outcomes (Freeman, 2011). Based on Margerum (2001), member commitment was the most important factor in fostering collaboration. Similarly, at some point during the collaborative process, stakeholders must establish a shared understanding of what they can accomplish collectively. In the literature, shared understanding is

referred to as a “common mission” (Alexander et al., 1998, p.313), “common ground” (Roush, 2002, p.1034), “common purpose”, “common aims” (Huxham, 2003, p.401), “common objectives” (Padiila & Daigle, 1998, p.65), “shared vision” (Ansell & Gash, 2008, p.8), “shared ideology” (Waage, 2001, p.839), “clear goals” (Glasbergen & Driessen, 2005, p.263), “clear and strategic direction” (Margerum, 2001, p.422), or the “alignment of core values” (Heikkila & Gerlak, 2005, p.587). Shared understanding can also imply agreement on a definition of the problem. Or, it might mean agreement on the relevant knowledge necessary for addressing a problem (Ansell & Gash, 2008). In the end, cooperation is more likely to happen when the prospective goals and advantages of collaboration are quite specific and when it is possible to achieve "small wins." Although these intermediate results may be seen as concrete outputs in and of themselves, they may also be seen as significant process results that are necessary for building the momentum that might result in a successful partnership. These little successes may reinforce the teamwork process and encourage a circle of trust and commitment (Buijs et al., 2016).

It is commonly accepted that effective leadership is necessary to convene parties and steer them through the difficult stages of the collaborative process. While "unassisted" discussions are occasionally feasible, the great majority of studies show that effective facilitation is crucial for bringing stakeholders together and inspiring them to cooperate (Ansell & Gash, 2008; Huxham, 2003; Kumar, 2008). Based on Chrislip & Larson (1994) description, A collaborative leader is a caretaker of the process. This is also called "transforming," "servant," or "facilitative" leadership, and it is a style of leadership that focuses on promoting and protecting the process. Also, leadership is important for giving power to and speaking for weaker parties. For instance, Ozawa (1993) describes what he terms "transformative" techniques in which mediation procedures help to achieve a "balance of power" among the parties involved. Facilitative leaders must give participants a meaningful voice and encourage participants to listen to one another. Leaders should stimulate creativity by synthesizing the diverse participant's knowledge in order for the group to generate new ideas and comprehension (Ansell & Gash, 2008).

Figure 7: The Collaborative governance model



Source: Created by the author. Her conceptualization is based on Ansell & Gash (2008).

2.3.3. Factors motivating collaborative governance

The literature provides numerous explanations for why collaborative governance regimes are implemented (Huxham, 2003; Ulibarri et al., 2023). They can be started by the government, by groups of citizens and other stakeholders, or by a mix of both (Ulibarri et al., 2020). Self-organizing partnerships can address a common problem, provide a service, or complete a task (Huxham & Vangen, 2000). Some are purposefully designed, and their structure reflects the intentionality that emerged from the founding members' commitment to the same goals. Others are emergent and take form as participants confront various challenges (Head & Alford, 2015). Government agencies, funders, and other 'top-down' forces can also encourage or compel members to participate in a collaborative governance regime (Ansell & Gash, 2008). An earlier analysis of 21 collaborative partnerships conducted by Ulibarri and colleagues (2020) suggests that self-initiated processes have higher levels of leadership, a more deliberative decision-making process, and more accountability. Understanding different types of initiation can provide valuable insight to higher-level authorities who use collaborative governance as a policy instrument to externally drive the development of new collaborative governance regimes (Ansell & Gash, 2018). In addition, based on Dobbin et al. (2022), collaborative governance is an approach to policymaking in which a wide range of stakeholders and decision-makers work together to create and implement mutually beneficial policies. The benefits of collaborative governance range from reduced conflict and increased compliance to increased democratic legitimacy and more equitable outcomes.

Accountability and political dynamics are viewed as additional factors influencing the collaborative dynamics (Ulibarri et al., 2020). Political dynamics refers to the interactions and relationships between various political system actors, such as individuals, groups, and institutions. Berthod and colleagues (2022) mentioned that powerful government actors used institutional rules to influence and shut down the collaborative movement, restricting the scope of what was attempted and the number of participants. Another factor influencing collaborative governance is accountability. Accountability is a challenging aspect of collaborative dynamics. On the one hand, accountability methods that are both formal (like written contracts and shared strategies) and informal (like social norms and peer pressure) can be strong motivators for individuals as well as organizations to become involved in and contribute to collaborative processes. However, too much responsibility can be discouraging and halt individuals from getting involved (Imperial, 2005).

Taylor (2022) paper on public-private partnerships highlights the complex connection between trust and accountability. In her case, government agencies were concerned with maintaining legal accountability to avoid lawsuits, which limited the amount of flexibility they could offer collaboration partners. Being accountable to the law but not to their collaborators ultimately eroded the partners' trust in the collaboration. In addition, the paper by Lakshmisha & Thiel (2023) sheds light on mechanisms for developing internal and external legitimacy by highlighting the interplay between government actors as stewards of the participatory process and third-sector organizations as conveners of heterogeneous communities that promote a shared definition of problems.

2.3.4. Stakeholders and their role in collaborative governance

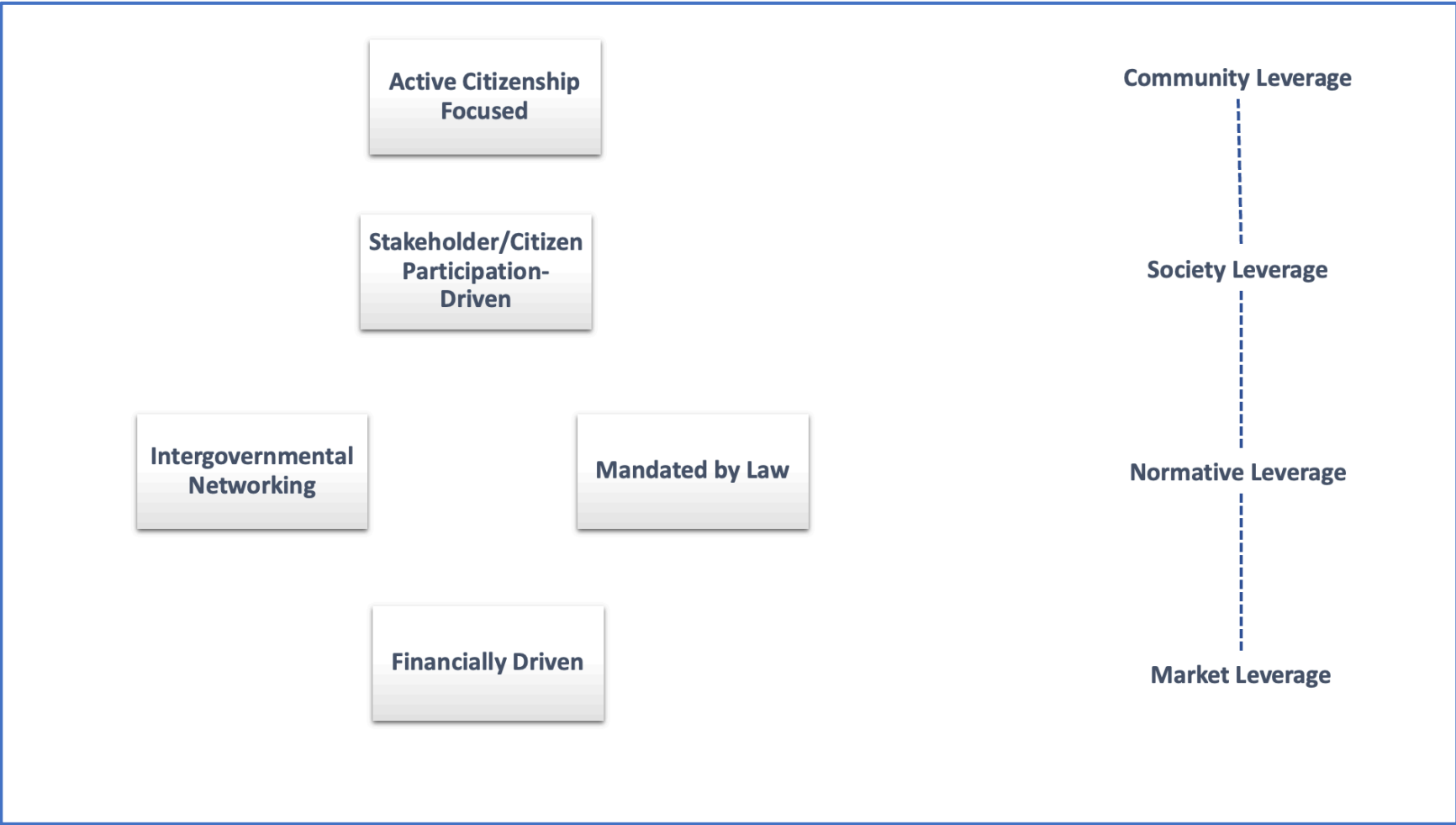
Frequently, collaboration is prompted by a problem requiring actions from multiple stakeholders (Ansell & Gash, 2018). Finding the "right" participants, embracing them, and supporting them, as well as deciding when they should join (or leave) a collaboration, is a challenge that never dissipates (Ulibarri et al., 2020). Much of the literature on collaboration assumes that each person represents the interests of a certain organization or stakeholder group. This ignores each person's unique set of skills, personal interests/values/motivations, and previous experience/knowledge (Dobbin et al., 2022; Ulibarri et al., 2023). However, each stakeholder has their own area of expertise, and the success of collaborative governance depends on how tasks and responsibilities are divided, each stakeholder's role, and how well they all understand each other (Ansell & Gash, 2008). Collaborative governance involves involving multiple stakeholders due to certain reasons: [1] a complex problem necessitates external assistance; [2] participation of stakeholders in collaborative governance can result in more efficient use of resources and; [3] participation of stakeholders in collaborative governance can result in more creative and sustainable approaches to solving complex problems (Bianchi, 2021).

2.3.5. Different modes of governance and points of leverage

In regard to the outside-in performance viewpoint that may be understood from within the foundations of collaborative governance, various governance styles have been deployed. Better project execution along the collaborative path may result from comprehension of the governance modalities. Based on *Figure 7*, there are five network governance modes based on four major leverage points. Each governance mode entails unique challenges for DPG in improving collaborative platforms. The following analysis is not intended to be exhaustive in its depiction of

the "universe" of policy network settings. The identified governance modes should not be viewed as a discrete sequence; rather, they are located on a continuum in which relevant factors for a given governance mode may also play an important role in other network governance settings. As shown in the figure, the first mode of governance may be described as "financially driven" networks. This is associated with market leverage, which depicts competitive conditions and market negotiations as driving forces for policy network development and the acquisition of the necessary resources. When cultural, institutional, and financial barriers significantly hinder the development of policy networks that rely on local government funding and broad participation from private-sector organizations and civil society, "financially driven" networks are frequently an option. Other governance modes can be classified as "intergovernmental networks" and "policy networks mandated by law." Both modes of governance are driven by normative leverage: networking is mandated by law or other public sector regulation. When spontaneous networking is discouraged by cultural constraints and a lack of experience in collaborative governance by the government and other stakeholders, such leverage is frequently chosen. It may also be adopted due to a pressing need for powerful tools to ensure that networked national and local governments promptly and effectively implement designed policies at the supranational level. "Stakeholder/citizen participation-driven" networking is another governance mode. Such a setting is characterized by societal leverage, which underpins comprehensive community-building efforts driven by public sector organizations and citizens (ibid). The final mode of governance is "active citizenship, "which operates under community leverage. This mode is intended to facilitate the development of a sense of belonging among citizens of a particular area (Bianchi, 2021, p. 343-345).

Figure 8: Diverse governance modes and leverage points



Source: Developed by the author based on Bianchi (2021).

2.3.6. Promoting research integrity through collaborative governance

Higher education is defined as a multiproduct organization with two main outputs, research and teaching, that use many different inputs. From a management point of view, they are meant to be dynamic, complex organizational structures whose creating value processes are affected by many different variables and factors that interact with one another in order to provide public services and products associated with knowledge transfer, educational programs, and scientific growth (Cosenz, 2014). According to Cosenz's (2022) definition of a wicked problem in his book, research misconduct can be categorized as a wicked problem. This is due to the difficulty in identifying and managing a problem that is related to social pluralism (the variety of the interests of stakeholders and beliefs), institutional complexity (the setting of collaboration among organizations and multilevel governance), and scientific uncertainty (fragmentation and discrepancies in accurate knowledge). In addition, wicked problems, such as research misconduct, are complex policy issues characterized by a high degree of risk, uncertainty, and interdependence among their influencing factors. Therefore, multiple stakeholders are considered accountable for promoting research integrity. Researchers, research organizations, funding organizations, and scientific publications must work together to support systemic improvements in the way research integrity norms are strictly adhered to and enforced in the scientific community. Each stakeholder has a distinct set of obligations contributing to the overall promotion and execution of research integrity standards (Roje et al., 2022). Individual researchers are responsible for conducting research in accordance with the policies and other guiding documents' rigorous scientific standards. Institutions dedicated to research also shoulder other duties. A fair rewards system, open communication, dialogue, diversity and inclusion, support, and training all play a role in creating a culture of integrity inside an organization. Other measures include increasing public understanding of the need for research integrity and offering appropriate education and training. Individual researchers and research organizations are significantly influenced by the actions of organizations that fund research. Their impact on research integrity may be seen in the way that funding policies have adapted to meet the demands of research integrity standards. Finally, academic publishers and journals must be held accountable for correcting erroneous research and implementing other procedures to safeguard the dissemination of only high-quality, credible scientific findings (Bouter, 2020).

2.4. Dynamic performance management & governance as an approach to enhance policy analysis in a collaborative setting to deal with wicked problems

Dynamic Performance Management is a framework that, through a performance governance approach, can improve collaborative platforms. DPM challenges the consolidated accounting practices upon which conventional performance measurement is based, as these practices suggest a limited and static perspective of the system from which reported measurements are derived (Bianchi, 2016). Its goal is to enhance "intelligent" performance management, which is crucial while confronting complex and dynamic issues. Government agencies often encounter policy opposition and unpredictable system behavior due to their failure to account for the dynamic complexity of social "wicked" problems (Bianchi, 2021, p. 5). The DPG is a branching off of the DPM's overarching structure. When applied to Governance, the terms Dynamic Performance Management and Dynamic Performance Governance are synonymous. The DPG framework is being shown off so that policymakers and practitioners can see how it may be used to create policies that are both effective and long-lasting (Bianchi, 2020). An "instrumental" viewpoint is one that serves to understand the relationship between resource accumulation/depletion and associated end-results by identifying performance drivers linked to crucial success elements on which academic decision-makers may act to impact results. In other words, it looks at how resource allocation and consumption results are achieved, as well as how these outcomes develop (or deplete) the associated resources (Cosenz, 2022).

2.4.1. Dynamic performance management/governance in policy design and implementation

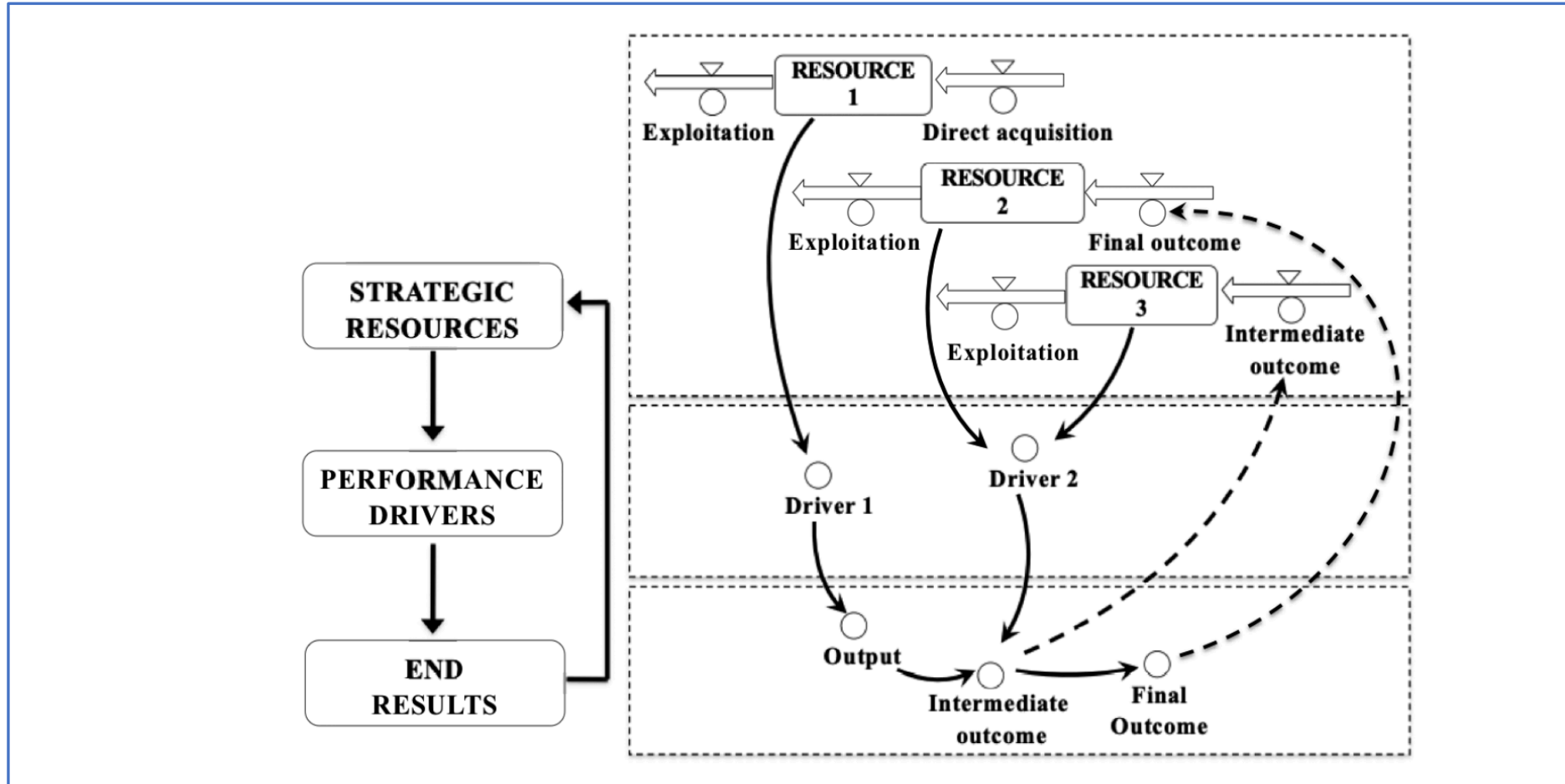
Dynamic performance management is concerned with not only output measures, but also intermediate and final policy outcomes. It also monitors the critical success factors (also known as "performance drivers") that influence these outcomes. These variables are measured as ratios of the current strategic resource levels affecting them to the desired (or benchmark²⁴) levels (Bianchi, 2021). *Figure 9*, demonstrates how end-results provide an endogenous source within a public universities and research institutions for the accumulation and depletion

²⁴ **Benchmark:** A benchmark is a measure or point of comparison that can be used to compare one thing to another. Benchmarking is a technique for spotting areas for improvement and keeping track of how competitors are doing. It is also regarded as an effort to find organizational best practices that produce outstanding performance.

processes that affect strategic resources that cannot be purchased directly from the market. These are the resources generated by management routines (for example, the image and reputation of the university, organizational culture). Performance drivers are made to measure both intermediate and final results. End-results are the final products that come from the combination of multiple processes, while intermediate results are the value that is created when simple operations within these processes are carried out. Measuring intermediate results gives you a better idea of how this value is created along the academic value chain. This is because it focuses on how the different stakeholders work together (*Figure 10*) (Bianchi, 2016).

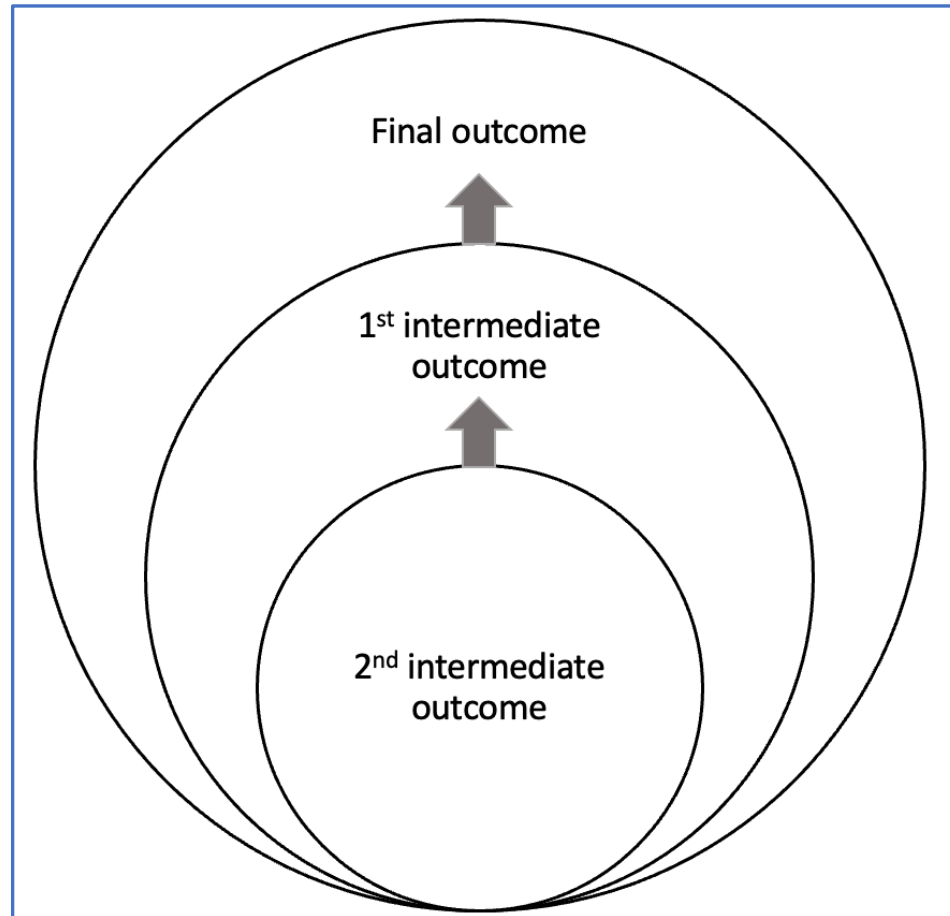
Drivers are classified based on the main performance dimensions, namely competitive, social, and financial. Critical success factors in the competitive academic system are linked to competitive performance drivers. They can be calculated as a ratio between the organizational performance as perceived by clients (such as students) and a target value or benchmark. Such a denominator must be judged based on past performance, client expectations, or even (if it's relevant) the performance of competing universities. For example, a competitive performance driver could be the adherence of RCR codes of ethics ratio, which refers to the ratio of Egyptian researchers who follow the ethical codes of research conduct and the benchmark. Social performance drivers can be measured by the ratios between strategic assets and a target. Most of the time, these ratios can be expressed in terms of what stakeholders want or how they think the organization has done in the past. well. For instance, a social performance driver could be referred to as a research misconduct cases reduction measured as the ratio of actual to desired cases of research misconduct in Egyptian public academic institutions. Financial performance drivers must also be measured in relative terms. For example, relative government spending on scientific research. This performance driver refers to the actual amount of money allocated by the government to support research and development activities in various fields (Cosenz, 2022). When policymakers are able to frame performance drivers, they can find weak signals that may affect the end results and, in turn, the overall performance. Additionally, sustainability of outcomes can be improved when decision makers continuously monitor performance drivers (Bianchi, 2016). To encourage a "shift of mind" from a static to a dynamic view, DPM draws heavily on ideas from systems dynamics. Consider the ideas of feedback and the stocks-and-flows model. Strategic resources are stocks in the DPM framework, and they can be either tangible or intangible. In this regard, the actions of decision makers can have an effect on stocks via performance drivers that have a direct impact on final results. The results represent flows affecting the strategic resources (Bianchi, 2020).

Figure 9: The basic outline of dynamic performance management chart



Source: (Bianchi, 2020, p. 338). Strategic resource dynamics are represented by "faucets," or inflows and outflows that have an impact on their acquisition and depletion over a specific period of time. They build up into strategic resources that are represented by reservoirs.

Figure 10: Final and intermediate outcome layers



Source: Developed by the author based on Bianchi (2021).

2.4.2. "Outside-in" performance governance for social "wicked" issues

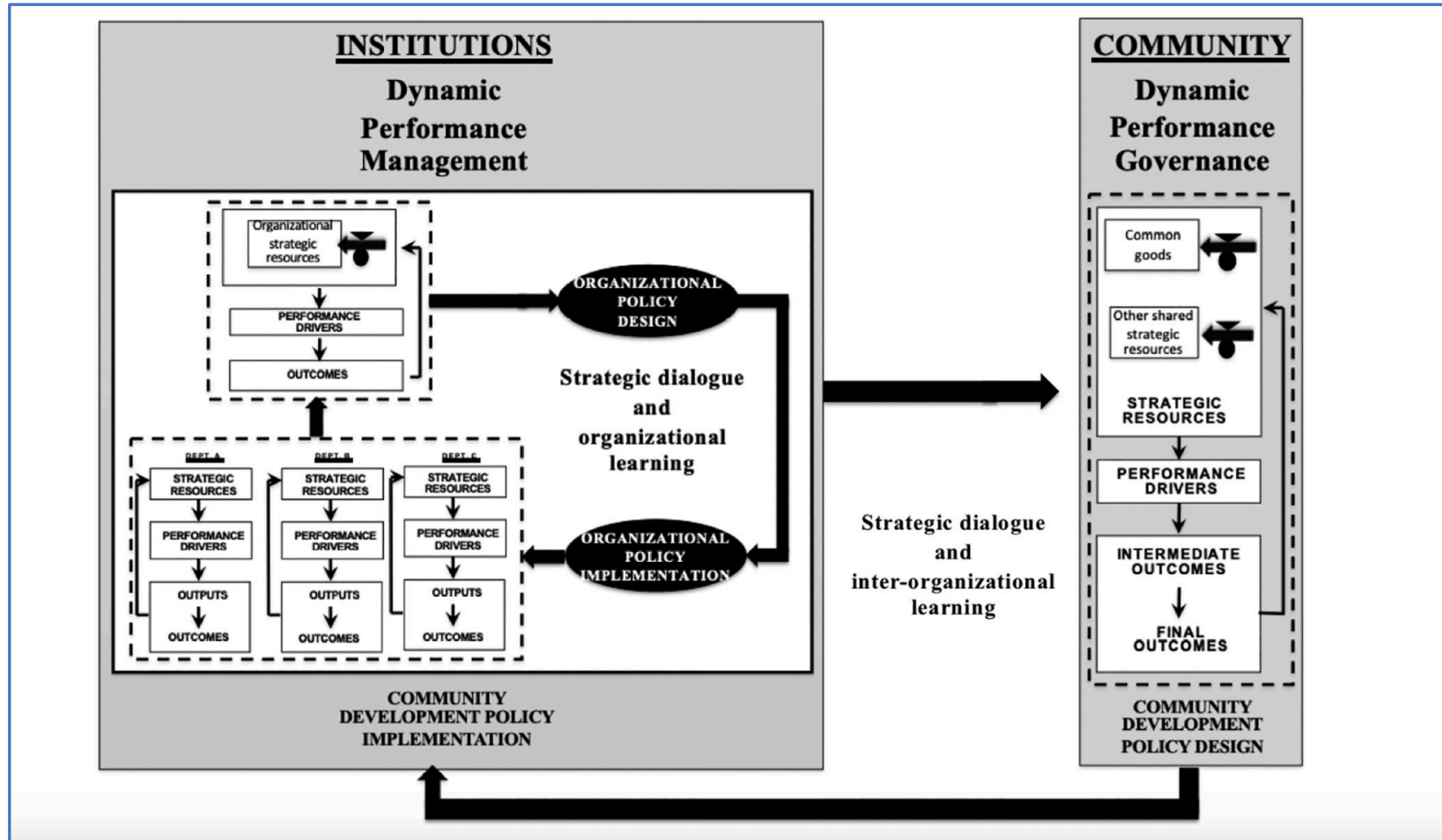
A number of strands are connected to the idea of performance governance, including: [1] organizational relationships within and outside the public sector; [2] participation and citizen engagement in performance feedback; [3] a focus on outcomes, public value, trust in government, and social capital; [4] information sharing; and [5] shared responsibility/accountability (Bianchi, 2021). To emphasize, outcome-based performance management stems from an organizational viewpoint. As a result, it takes an "inside-out" perspective, which means that policy design is articulated via the "lenses" of each individual organization rather than taking into account the broader regional context in which those organizations operate. "Outside-in" policy design, on the other hand, prioritizes the needs of an area over those of specific organizations. As a result, organizations can increase their performance at the agency level by outlining collaborative policies that generate shared strategic resources at the societal level. Stakeholders' mental models can be altered with the help of learning facilitators if they come to realize that prioritizing self-interest over the good of the community increases the risk of crisis and lowers organizational effectiveness. In order to affect the endowment of shared strategic resources in a local area, each agency would have an "outside-in" perspective on policymaking, focusing on how to implement the community policies agreed upon with the other stakeholders. This method also encourages consensus building and promotes the accountability concept in cross-sector collaboration (Bryson et al., 2006).

The ultimate goal of an "outside-in" perspective is to transform a society into a community whose members actively participate in civic life rather than simply obeying the law. This idea extends much beyond that of merely legal or procedural citizenship. A community is a group of people who share not only a physical location, set of rules, or set of legal obligations, but also a common set of aspirations, values, and culture. This circumstance justifies demonstrating civic commitment and allegiance (Ansell & Gash, 2008). Enhancing active citizenship should be viewed as an important intermediate objective by collaborative networks taking an "outside-in" approach to policy design with the purpose of influencing social wellness. Active participation of the private sector and civil society in policy design and implementation aimed at achieving sustainable community outcomes is critical for gathering and deploying a diverse range of ideas, skills, experiences, capabilities, contacts, and energies that can effectively tackle social "wicked" problems, improve local area attractiveness, and quality of life (Bianchi, 2020).

Based on this viewpoint, the characteristics of DPG as an overarching framework to DPM for adopting an "outside-in" view of policy design when a local area is the subject of policy evaluation. This method improves collaborative governance regimes, such as collaborative summits where partners meet on a regular basis to discuss their joined performance. An "outside-in" perspective on DPG defines policy design as a process aimed at supporting long-term outcomes in a given sector (*Figure 10*). This encourages stakeholders to collaborate on policies that will allow them to engage on the same system by playing complementary roles in utilizing shared goods and other strategic resources at both the community and organizational levels. Although shared strategic resources are not individually owned by any of the stakeholder institutions and hence are not directly controlled by them, they are significant levers for building and maintaining local area performance (Bianchi, 2021). More specifically, by taking an "outside-in" approach to Dynamic Performance Management and Governance, the designed community development policies provide a foundation for organizational implementation. This necessitates that each stakeholder institution's corporate policies pursue organizational objectives that are congruent with the desired community outcomes. It also necessitates regular cascading of corporate policies at the departmental level, as well as continuous monitoring of implementation results via performance drivers and emergent outputs and outcomes (Bianchi, 2020).

In the context of enforcing regulations meant to address social "wicked" problems, such a control process should not be limited to a feedback mechanism. It's important that the system supports a proactive feedforward logic, which means that new issues and possibilities discovered during implementation at the divisional level can inform potential adjustments to the policies at the institutional and community levels. This is the heart of an inter-organizational and intra-organizational strategic dialogue (facilitated by learning facilitators) (Ansell & Gash, 2018).

Figure 10: Merging dynamic performance management/governance with an "outside-in" approach to provide a foundation for sustainable performance at the organizational and community levels



Source: (Bianchi, 2020, p. 342).

CHAPTER THREE CONCEPTUAL FRAMEWORK & METHODOLOGY

3.1. Conceptual framework

Integrity in research can be described as the behaviors, conduct, and beliefs connected with the honesty and ethics of independent researchers who train the next generation of researchers (Abdi et al., 2021). This idea emphasizes the importance of trustworthiness and transparency throughout the research process. This means making sure that research is conducted in a fair manner, using correct methods of data collection and analysis, and reporting findings without embellishment (Roje et al., 2022). Research ethics and integrity are vital in ensuring that research is conducted responsibly. They are closely related to research reliability, which is a set of standards for conducting research ethically and reliably. Research ethics is concerned with the moral principles that should guide research, whereas research integrity is concerned with the specific practices and procedures that ensure the reliability and honesty of research (Bouter, 2020). A deviation from these behaviors can comprise research misconduct, with fabrication, falsification, and plagiarism (FFP) being the most common (Al-Adawi et al., 2016).

For the analysis and interpretation of produced data in the current study, the researcher employed the U.S. Office of Research Integrity (ORI) definitions from the publication “Teaching the Responsible Conduct of Research in Humans (RCRH)”. The ORI defined research integrity as the application of ethical principles and regulations for conducting responsible scientific research. The use of principles and practices as a personal principle united with the intellectual, in a moral aspect and experience in ethical principles, with honesty, dependability, and a series of practices that characterize the responsible conduct of research (Korenman, 2006).

The ORI publication states that among the instances of research misconduct, there is a category frequently referred to as FFP used to denote the most frequent and typical misconduct, which is occasionally also regarded as the most serious and of general concern (ibid).

- Data fabrication refers to the creation of data, results, records, procedures, reports, and outcomes that were not actually accomplished.
- Data falsification refers to the manipulation of research materials, equipment, or processes, as well as the alteration or omission of data or results, so that the research is not accurately represented in the research records.
- Plagiarism is the misuse of someone else's intellectual property and the extensive, uncredited textual plagiarism of another person's work. Authorship and credit conflicts

are excluded. It also covers the unauthorized utilization of concepts or original strategies gained through privileged communications, including grant or manuscript review (ibid).

It is worth noting that higher education is getting more complex and uncertain, emphasizing how difficult challenges cannot be solved by a single body working alone (Kongolo, 2019). As a result, tackling such wicked problems requires collaboration among many stakeholders (Himmelman, 2002). Collaborative governance promotes cooperation in order to achieve a common goal through collaborative action. Additionally, it fosters dialogue among all stakeholders, helping them have a comprehensive grasp of the issue. It can also help to balance the interests of numerous stakeholders and reduce policy resistance (Ansell & Gash, 2008). Although collaborative governance has been advocated for in dealing with wicked issues such as research misconduct, it has received less attention in Egypt's higher education system.

The current study seeks to shed light on how collaborative governance can aid in developing practical strategies to avoid research malpractices from tainting scientific research in Egyptian institutions. As a result, the researcher analyzed and interpreted the current study's data using Bianchi's (2016) concept of wicked problems and Ansell & Gash's (2008) definition of collaborative governance. Based on the two publications, the following definitions apply to the two terms:

- Wicked problems are the issues that are difficult to detect and manage and connected to social pluralism (different interests and values of stakeholders), the complexity of institutions (the environment of inter-organizational cooperation and multilevel governance), and scientific uncertainty (fragmentation and gaps in accurate knowledge) are difficult to detect and manage.
- Collaborative governance can be defined as governing framework in which one or more public agencies actively engage non-state stakeholders in a formal, consensus-oriented, and deliberate collective decision-making process aimed at creating or implementing public policy or managing public programs or assets.

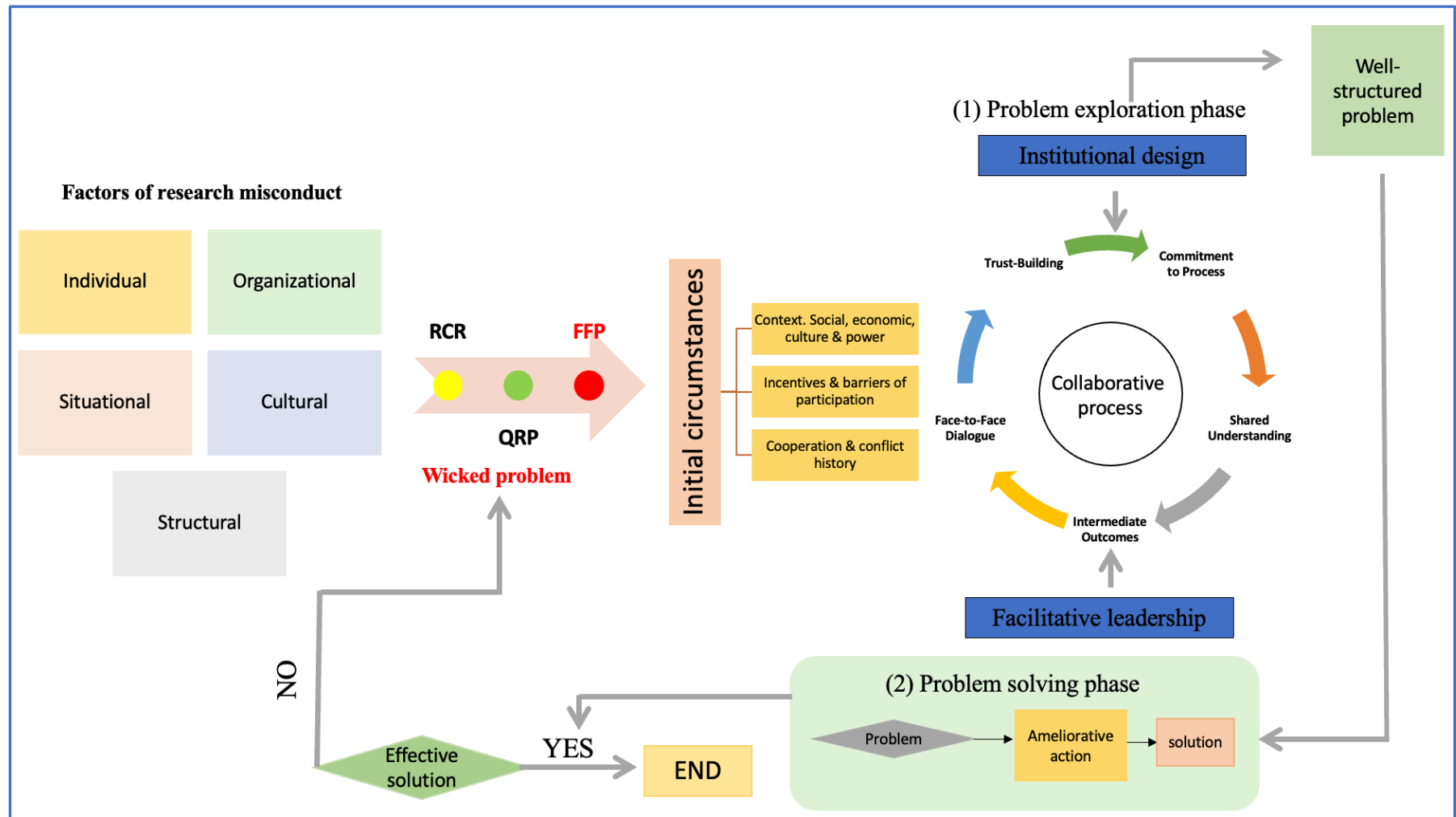
Figure 12 depicts collaborative governance as an approach to combating research misconduct in public academic and research institutions as a wicked problem. As shown in the figure, there are five general categories can be used to classify the causes of research misconduct: individual, structural, organizational, cultural, and situational (Davis et al., 2007). These factors make it easier for irresponsible researchers to stop the ethical conduct of research, which requires

knowledge of and adherence to professional standards and ethical principles in all scientific research activities (Palla & Singson, 2022). Then, researchers are encouraged to engage in questionable research practices (QRP), also known as "sloppy science" (Bouter, 2020). QRP includes misinterpretation, inaccuracy, and bias. Although QRP is alarming, it is not severe enough to necessitate government intervention and does not directly compromise the research process' objectivity and integrity. Then, taking it step by step, they engage in FFP, which are practices that the majority of people agree should be avoided and considered as a wicked problem facing public academic and research institutions.

It is worth noting that four main variables comprise collaborative governance: [a] initial circumstances, [b] institutional structure, [c] leadership, and [d] collaborative procedure. These variables can be subdivided into more specific variables (Ansell & Gash, 2008). Initial conditions determine the trust, power, conflict, and social capital level, which become assets or liabilities. This stage can be put into three broad groups: imbalances in the resources or power of different stakeholders of scientific research, incentives for stakeholders to work together, and the past of conflict or cooperation between stakeholders. Second, institutional design refers to the basic rules and standards for working together, which are important for the legitimacy of the collaborative process as a whole. Third, collaborative process includes all the stakeholders involved in scientific research work together, start face-to-face conversations, build trust, commit to solving the problem of research misconduct, and build a shared knowledge of the problem so that it can be turned from a wicked one into a tame one. They also come up with intermediate results. This process of collaboration is cyclical rather than linear, which is crucial at every stage of the collaboration (Bianchi, 2020). Finally, facilitative leadership is essential for bringing parties to the table and guiding them through the challenging phases of the collaborative process (ibid).

Since this is a cyclical process, the collaborative governance approach includes a phase of problem exploration. During this phase, wicked problems are broken down into one or more well-structured problems. Then, in the problem-solving phase, the solutions that were made are looked at to see if they work to solve the research misconduct problem. If they fail to succeed because the problem was misidentified, the problem-exploration phase should have started from the beginning (Kasser & Zhao, 2016).

Figure 11: Combating research misconduct as a wicked problem: utilizing collaborative governance approach for effective solutions



Source: Created by the author.

3.2. Methodology

3.2.1. Design

This explanatory research is intended to provide some insight on how collaborative governance might help develop practical approaches for preventing research malpractices from tainting scientific inquiry in Egyptian institutions. In addition, this study aims at analyzing the drivers of fabrication, falsification, and plagiarism in Egyptian public academic and research institutions. The author of the current study is a pharmacology researcher at one of the largest Egyptian public research institutions. She received her Master of Public Administration from AUC and her doctorate in pharmaceutical sciences from Cairo University. Her MPA master's thesis focused on combating academic misconduct in Egypt's public research institutions. In Atlanta, Georgia, the researcher presented her master's thesis at the Association for Practical and Professional Ethics (APPE), where she had the opportunity to meet some officials working at the U.S. Office of Research Integrity (ORI). She participated in a number of workshops and meetings organized by the National Academy of Sciences (NAS) in various countries in an effort to promote responsible research conduct in Egypt. Similarly, she was awarded a grant by the NAS to implement a series of seminars on research integrity in various Egyptian public academic and research institutions. The researcher also collaborated with the advisor to the Egyptian minister of higher education and scientific research on an international project aiming at curbing research misconduct practices in low- and middle-income nations and specifically in Egypt. This project was funded by the University of Maryland in the United States and the U.S. National Institutes of Health Fogarty International Centre. As a result, a solid connection was already made with a number of faculty members who are employed by public universities and research organizations in Egypt. Thus, it was anticipated that gathering data would be easier and more wide-ranging.

3.2.2. Methods

The primary objective of this study was to perform a comprehensive examination of research misconduct in Egypt, encompassing both public and research organizations. This issue is acknowledged as a complex and multifaceted problem, often called a "super wicked problem." In order to attain a full understanding, a wide range of research approaches were utilized. The research employed both qualitative and quantitative methodologies. The qualitative approach facilitated an in-depth exploration of the nuanced qualitative components of the topic, while the

quantitative approach generated numerical data for analysis and insight generation. Furthermore, the dynamic performance governance framework was employed to evaluate the progressive characteristics of governance inside these organizations. Moreover, the construction of a causal loop diagram was facilitated by employing system dynamics modeling techniques. This diagram functioned as a visual depiction of the intricate interconnections and feedback loops inherent in research misconduct. Utilizing a multi-method approach allowed for a full investigation of research misconduct in Egypt, leading to a more nuanced and thorough comprehension of this complex matter.

3.2.2.1. Quantitative approach

In the case of the quantitative approach, data were collected through designing and distributing a web-based survey to a group of Egyptian researchers from different governorates in Egypt. The online survey was emailed to researchers in several Egyptian governorates and included questions derived from the main topics and concerns highlighted in the examined literature. The questionnaires were analyzed to determine which questions fit the study's goals. The surveys were conducted using a web-based survey tool (<http://www.survey-monkey.com>). All respondents were reminded three times and asked to complete the survey. They were also informed that survey participation is entirely voluntary and that their responses will remain confidential. The researcher successfully received responses from 80 faculties and students in public universities and research institutes.

3.2.2.1.1. Computation of weighted average

When computing a weighted average, it is necessary to multiply each value in the dataset by a predefined weight before doing the final computation. The provided weights for each number indicate their relative significance or occurrence throughout the dataset. The weighted average is more accurate than a simple average, wherein equal weights are applied to all values inside a given dataset. To calculate a weighted average, each data point value is multiplied by the assigned weight, which is then summed and divided by the sum of the weights. The formula for calculating a weighted average is:

$$W = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i}$$

W = weighted average

n = number of terms to be averaged

w_i = weights applied to x values

x_i = data values to be averaged

Data elements having a higher weight have a greater impact on the weighted mean compared to those with a lower weight. Hence, the above equation may be expanded to:

$$W = \frac{w_1 x_1 + w_2 x_2 + \dots + w_n x_n}{w_1 + w_2 + \dots + w_n}$$

3.2.2.2. Qualitative approach

Subsequently, the qualitative approach was utilized in the current study. A total number of thirty semi-structured, in-depth interviews were carried out with researchers and faculty members from diverse backgrounds and at different stages of their professional careers at public academic and research institutions. After receiving permission from each participant, the conversations were audio recorded. In addition, the majority of conversations were guided by an interview guide designed to address the four primary research questions of the study. The questions were prospectively semi-structured to allow respondents to discuss freely, and probing questions were offered when the dialogue veered off track. The interview transcripts were transcribed and coded by the researcher.

3.2.2.3. Dynamic Performance Governance methodological framework

Later, the Dynamic Performance Governance (DPG) methodological framework was then applied in this study. This approach is important in analyzing the causal relationship affecting the research misconduct problem in Egypt. Similarly, this framework links modeling system dynamics and managing success in governance. With the help of the DPG structure, it was possible to understand how universities and research institutes in Egypt use shared strategic resources, which improved the quality of their produced research. The DPG structure comprises strategic resources, performance drivers, and end results that all work together. In a community, the variables that are owned by more than one organization are the shared strategic resources. The performance drivers are the ratios between stocks or shared strategic resources and benchmarks that are used to guide changes in outcomes or end results. Outcomes are changes in the conditions of a system that affect the shared strategic resources.

3.2.2.3. Causal Loop Diagrams

After the DPG was made, Causal Loop Diagrams (CLD) were made to show the layout of the feedback system. It showed how these variables and contextual factors were used to build a dynamic performance view of Egyptian universities and research institutions. The construction of the CLD in this work was facilitated by the utilization of Vensim software, a robust tool renowned for its capabilities in system dynamics modelling and simulation. Vensim is specifically developed to enhance the examination of intricate systems, hence empowering researchers to delineate causal connections, feedback mechanisms, and the dynamic patterns exhibited by interrelated variables. Vensim is a software tool that offers a user-friendly interface and powerful modelling capabilities. It facilitates the visualization and examination of complex systems, so serving as a significant resource for comprehending the dynamics of diverse phenomena, ranging from environmental concerns to social and economic dynamics. This study utilized Vensim as a tool to provide a systematic framework for constructing a visual depiction of the causal connections involved in the research misconduct phenomena. This facilitated the discovery of crucial factors and feedback loops that exert an influence on this phenomenon.

3.2.3. Sampling

When choosing the respondents, a purposeful sampling strategy was used. The selection process was guided by preliminary criteria that were important to the goals of the research study. This selection criterion stipulated that all respondents must be either post-graduate students, graduates of Egyptian public universities, or academic faculty members at any academic or research institution in Egypt. As much as feasible, diversity in positions and educational backgrounds was considered. In addition, this research employed triangulation in data collection by employing multiple sampling strategies, such as typical case, intensity sampling, and confirming and disconfirming cases (Marshall & Rossman, 2006). The number of respondents was not fixed before data collection, and the number of interviews was determined based on theoretical saturation during data collection. The researcher discontinued conducting interviews when she determined that new data provided no additional insight into the research questions. Additionally, quantitative data was collected and extracted from the online survey instrument and then analyzed using Microsoft Excel. All numbers are rounded to the nearest percent. In addition, several open-ended questions were analyzed qualitatively.

3.2.4. Study population and sample

The survey link was distributed to graduate students and faculty members across many

Egyptian public academic and research institutes. The participants' response rate was 40% (n=80). Of those, (23.75%) were males and (76.25%) were females. Table 4 displays the detailed characteristics of the students and faculty members who reported working at universities across Egypt's governorates including Cairo (13.75%), Assiut (3.75%), Alexandria (1.25%), Beni Suef (2.5%), Giza (52.5%), Damanshour (3.75%), Mansoura (1.25%), Suez Canal (1.25%), Zagazig (18.75%), and Menoufia (1.25%). They belonged to different age brackets and their field experience ranged from 1-5 years (25%), 6-10 years (35%), 10-20 years (22.5%) and more than 20 years (17.5%). This study included teaching assistants (43.75 %), PhD students (10 %), lecturers (3.75%), researchers (10%), assistant professors (5%), associate professors (5%), and professors (22.5 %) as participants. They worked full-time (100%) in public academic and research institutions. Participants in this study represent a variety of fields, such as biochemistry (25%), biotechnology (37.5%), pharmacology (16.25%), veterinary medicine (10%), nursing (3.75%), immunology (1.25%), engineering (1.25%), biology (1.25%), microbial genetics (1.25%), and biomedical sciences (2.5%). The number of publications by the participants ranged from none (37.5%) to more than 10 (26.25%), more than 50 (31.25%), and more than 100 (5%).

Although not all participants decided to identify their workplace, those who did were distributed throughout 16 different universities and research institutions, as shown in Table 5

Table 4: Participants' characteristics

Participants	Characteristic		Responses	
Faculty members	University location	Cairo	13.75%	11
		Assiut	3.75%	3
		Alexandria	1.25%	1
		Beni Suef	2.5%	2
		Giza	52.5%	42
		Damanhour	3.75%	3
		Mansoura	1.25%	1
		Suez Canal	1.25%	1
		Zagazig	18.75%	15
		Menoufia	1.25%	1
	Gender	Male	23.75%	19
		Female	76.25%	61
	Years of experience	1-5 years	25%	20
		6-10 years	35%	28
		10- 20 years	22.5%	18
		> 20 years	17.5%	14
	Current position	Teaching assistants (Master students)	43.75%	35
		PhD students	10%	8
		Lecturers	3.75%	3
		Researchers	10%	8
		Assistant professors	5%	4
		Associate professors	5%	4
	Field of knowledge	Professors	22.5%	18
		Biochemistry	25%	20
		Biotechnology	37.5%	30
		Pharmacology	16.25%	13
		Veterinary medicine	10%	8
		Nursing	3.75%	3
		Immunology	1.25%	1
		Engineering	1.25%	1
		Biology	1.25%	1
		Microbial Genetics	1.25%	1
	Number of publications	Biomedical sciences	2.5%	2
		Zero publications	37.5%	30
		>10 publications	26.25%	21
		> 50 publications	31.25%	25
		>100 publications	5%	4

Table 5: Participant-mentioned faculties, universities and research institutions

No	University/ Research center	No	University/ Research center
1	Faculty of Nursing, Alexandria university	9	Faculty of medicine, Ain shams university
2	Faculty of Pharmacy, Cairo university	10	Faculty of Engineering, Assiut university
3	Faculty of veterinary medicine, Cairo university	11	Faculty of pharmacy, Ain shams university
4	Faculty of Engineering, Cairo university	12	Faculty of veterinary medicine, Menoufia university
5	Faculty of medicine, Suez Canal university	13	Faculty of Engineering, Mansoura university
6	Faculty of nursing, Damanhour university	14	Faculty of science, Zagazig university
7	Faculty of science, Helwan university	15	Housing and building National research center
8	Faculty of medicine, Damanhour university	16	National research center

3.2.5. Data analysis

In the analysis of the qualitative data, the researcher performed the in-depth interviews in Arabic and translated them into English. The researcher did thematic sorting, and each interview transcript was divided into various sections. Throughout the procedure, the researcher created a thematic index that was cross-checked by her colleague to ensure the validity of the codes and that they both understood the developed topics and illustrative quotes were chosen. The thematic index was used to assign codes to all of the data.

Microsoft Excel was selected as the program of choice for the quantitative data analysis in order to process and understand different question kinds, such as Likert scale questions and perception-based questions. Because of Excel's flexibility, the researcher was able to work with a variety of data types and analyze Likert scale replies, summarize impressions, and compute percentages and weighted averages.

3.2.6. Ethical consideration

All of the interviews and the survey dissemination took place between October and December of 2022. Before the data collection process, all participants were apprised of the nature and purpose of the research through a consent form (Babbie, 2007). Participation in this study was entirely voluntary, and interviewees who refused to continue were free to depart. Additionally, the researcher obtained each participant's permission to record the conversation. The researcher kept all the survey responses as well as the transcripts and recordings of interviews confidential and analyzed and interpreted the results. In order to avoid causing harm to the participants, confidentiality is guaranteed. Consequently, pseudonyms were employed. All informed consents for participation were either signed by the participants or communicated verbally and recorded to ensure that all participants participated voluntarily.

3.2.7. Limitations of the study

The current research has certain limitations since some participants refused to research misconduct problem in their institutions despite being informed that the researcher would be using pseudonyms in her work. Similarly, several participants were unwilling to report their professors or coworkers, despite being told that the transcripts of the interviews would be kept confidential. Due to the fact that some researchers needed to do ongoing experimental experiments or provide lectures to students, interviews were only 30 to 45 minutes long. Another drawback of the current study is the geographical placement of the interviews from a logistical standpoint. The majority of the interviews were conducted in lecture halls or laboratories, neither of which are ideal interview locations given the high concentration of graduate students and the intense workload of the majority of the research participants. Because some researchers had other responsibilities, such as conducting experimental work or presenting lectures to students, interviews were limited to 15 to 25 minutes. Another drawback of the current study is the location of the interviews from a logistical standpoint. The majority of the interviews were done in laboratories or lecture halls, which were unsuitable for interviews due to the large number of graduate students present, and the majority of the participants in this study were extremely busy with their experimental and academic work.

3.2.8. Delimitations of the study

This study's findings cannot be extrapolated to all Egyptian public universities and research centers because they were obtained from a limited number of these institution.

CHAPTER FOUR DISCUSSION ON EMPIRICAL FINDINGS

Three research methods have been used to validate the data from her study in this section: the quantitative approach, the qualitative approach, and the DPG framework.

Since, the quantitative approach produces relatively clear-cut data, an online survey targeting a purposive sample of faculty and students in various Egyptian governments is implemented, and successfully manages to receive responses from 80 faculties and students in public universities and research institutes. The survey's quantitative findings are reported first, followed by the qualitative findings gleaned from the survey's open-ended questions as well as the semi-structured interviews performed. The majority of survey responses from participants consisted of closed-ended questions that were examined quantitatively. These data were gathered and retrieved from the online survey instrument, then analyzed using Microsoft Excel. All numbers are rounded to the closest percent. The online survey, comprised of questions based on the major issues and concerns discussed in the reviewed literature, is divided into eight sections, which are as follows: [1] demographic background & research experience; [2] perceived prevalence of scientific misconduct in the workplace; [3] awareness of acts of research misconduct at the workplace; [4] researchers' attitudes and beliefs about scientific misconduct; [5] researchers' assessments on the work environment factors that affect research misconduct; [6] risk factors that might contribute of the occurrence of research misconduct in Egyptian public institutions; [7] responsibility of different stakeholders for maintaining research integrity in Egyptian public institutions; and [8] promoting research integrity in Egyptian public institutions. The survey was distributed to approximately 200 faculty members, with three reminders, and responses were received from 80 faculty and students working or studying in 16 different Egyptian universities and research institutes. The online survey lasted four months, from the beginning of July 2022 to the end of October 2022. The questionnaires were evaluated to ensure that the appropriate questions were selected to meet the objectives of the study. The surveys were conducted using an online survey tool (<http://www.surveymonkey.com>). Each respondent was prompted three times to complete the questionnaire. In addition, they were informed that their participation was entirely voluntary and that their individual responses would be kept confidential.

Following that, since research misconduct is regarded as a collective social behavior,

data collection was also reliant on qualitative research methods. Thirty semi-structured in-depth interviews were conducted with researchers from various backgrounds and career levels who are either working as academic faculty members or have completed or are currently pursuing postgraduate studies at various Egyptian academic or research institutions. After obtaining permission from each informant, the interviews were audio-recorded. Furthermore, the interviews were primarily based on an interview guide that was designed to revolve around the main research questions of the research study. The researcher conducted the in-depth interviews in Arabic and translated them into English. In addition, she performed thematic sorting, and each interview transcript was divided into several sections. The interview transcripts were transcribed and coded by the researcher. Both semi-structured interviews and the number of open-ended questions in the survey were qualitatively analyzed. The data analysis section is divided into 2 themes. The first theme is mainly about the serious potential causes of misconduct in research. This theme is divided into 4 subthemes, which are: [1] false beliefs, [2] ChatGPT and AI-written research papers, [3] inability to balance pressure to publish with scientific papers, and [4] other possible factors. The second theme is strategies on how to maintain research integrity in Egyptian universities and research institutions. Throughout the process, this thematic index that was cross-checked by the researchers' colleagues to ensure the validity of the codes and that they both understood the formed themes and illustrative quotes were chosen. Thematic indexing was used to code all data.

Then, the Dynamic Performance Governance (DPG) methodological framework was utilized in this study to analyze the causal relationship affecting the research misconduct problem in Egypt. This crucial framework serves as a link between system dynamics modeling and performance management as it relates to governance. The DPG framework made it possible to comprehend how universities and research institutes in Egypt perform in terms of their use of shared strategic resources, thereby fostering the integrity of their research. The DPG structure consists of interconnected strategic resources, performance drivers, and final outcomes. In a community, the shared strategic resources are the variables that are jointly owned by multiple organizations. The ratios between stocks/shared strategic resources and benchmarks that are used to direct changes in outcomes/final results constitute the performance drivers. Outcomes/final results are the changes in a system's conditions that have an impact on the shared strategic resources. Later, after depicting the DPG, causal Loop Diagrams (CLD) were created to illustrate the feedback system's structure. It demonstrated how these variables and contextual factors were used to construct a dynamic performance perspective of Egyptian universities and research institutions. Then, meetings were held with representatives from

various stakeholder groups to discuss the CLD and DPG chart. The purpose of these meetings was to provide feedback on the information gathered from stakeholders and demonstrate how the DPG framework can be applied. Additionally, the meetings were useful for capturing questions and suggestions raised for improving both the DPG and CLD charts.

5.1. Quantitative results

Figure 12 depicts the participants' perspectives on whether or not they witnessed research misconduct at their university/research institution. According to the data, (67.61%) of participants reported witnessing research misconduct in their universities, while (32.39 %) said they had not. Thus, the participants of this study have the perception that scientific misconduct is prevalent inside their respective institutions. These findings are in line with Felaefel et al. (2018), who stated that scientific misconduct is a serious problem in various Egyptian universities. It is worth noting that Egypt possesses a substantial number of public academic and scientific institutions, however experiencing a present state of decline. Regrettably, the advent of FFP is seen to be one of the main factors contributing to the deterioration of scientific research quality in Egyptian universities and research organizations (El-Dessouky et al., 2011; Mohammed & Abdel Salam, 2022).

Figure 12: Participants responses whether or not they witnessed research misconduct at their university/research institution.

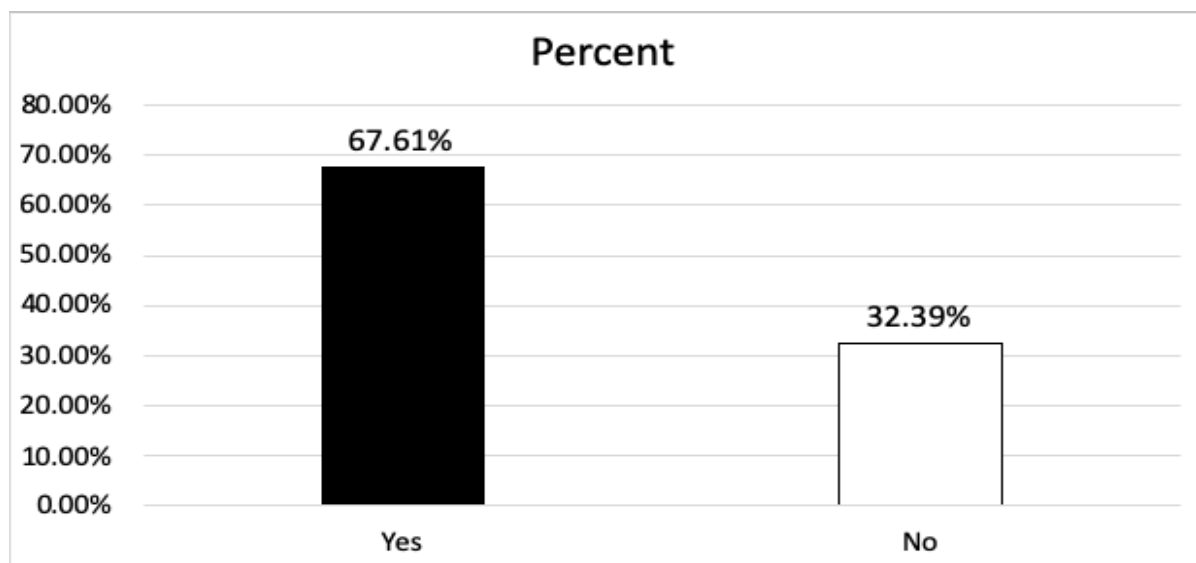


Figure 13 shows the personal opinions of the participants about the different types of research misconduct in their workplace. Participants were asked to rate seven different forms

of research misconduct, from what they thought was the most common to what they thought never happened. The researcher created a 6-point Likert scale (ranging from 0=never to 5=most often) and calculated the weighted average for each type in order to gain a comprehensive understanding of the participants' viewpoints and their level of agreement. The research misconduct type ranked highest by the participating graduate students and faculty was “plagiarism of text” (0.54). This was followed by “falsifying data” (0.52), then “patchwriting” (0.50), then “collusion” (0.37), then self-plagiarism (0.35), then “fabrication data” (0.32), and finally plagiarism of ideas (0.29). These findings conclude that the majority of researchers reported that instances of plagiarism and data falsification and patchwriting occurred 'most frequently' in their institutions, compared to other types of research misconduct. These types of research misconducts taints research institutes' reputation, credibility, and integrity (Davis et al., 2007).

Figure 13: Perceived occurrence of various types of research misconduct in the workplace

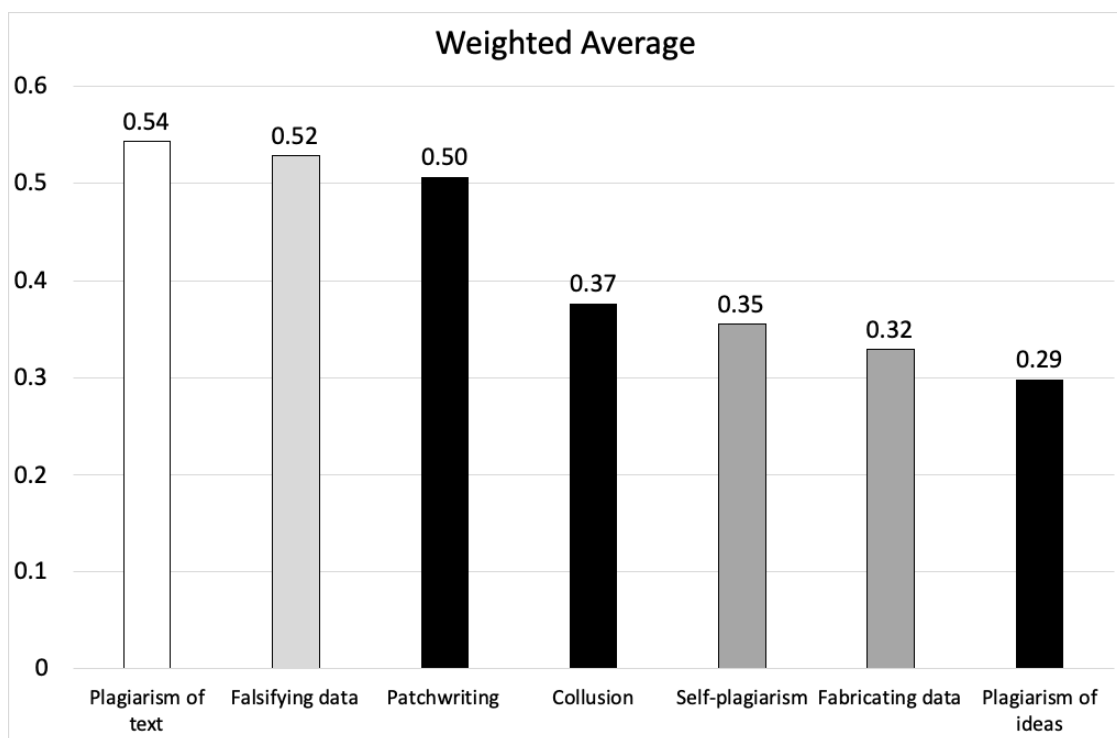


Figure 14 depicts how frequently participants encountered or heard about incidences of research misconduct at their university/research institution. Findings show that over a third of respondents (40.85%) reported seeing more than three instances of research misconduct during their careers. Though (5.63%) of respondents claimed to have seen three instances of research misconduct, (28.17%) reported seeing two, (2.82%) saw one, and (22.54%) claimed to have seen none. These findings imply that the increased prevalence of research misconduct is posing

problems for various Egyptian public academic and research organizations, and that FFP has become ingrained in the research culture, jeopardizing the integrity of scientific research (Felaefel et al., 2018).

Figure 14: Participants' reports of how often they witnessed or heard of cases of research misconduct at their university/research institution

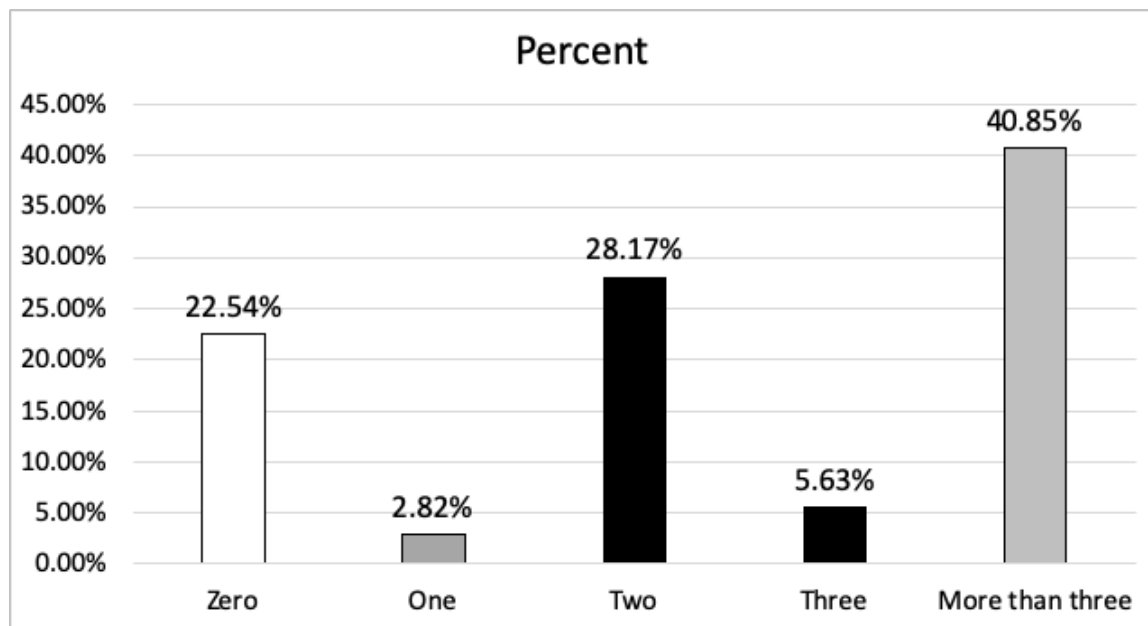


Figure 15 illustrates participant responses to whether or not they unintentionally engaged in research misconduct. According to the data, approximately half of the respondents (45.07%) indicated that they had unintentionally committed research misconduct, while the remaining (54.93%) indicated that they did not engage in research misconduct practices. The data presented suggests that despite the implementation of globally acknowledged guidelines and codes of conduct pertaining to scientific misconduct in numerous Egyptian universities and research institutes, a significant number of researchers remain unaware about these protocols. Consequently, their involvement in unethical practices has contributed to the escalation of the research misconduct issue within Egypt (Al-Adawi et al., 2016). Furthermore, Egyptian researchers have little awareness of FFP, and the majority of them lack professional training regarding the ethical aspects of scientific research (Felaefel et al., 2018).

Figure 15: Participants' responses on whether or not they unintentionally committed research misconduct

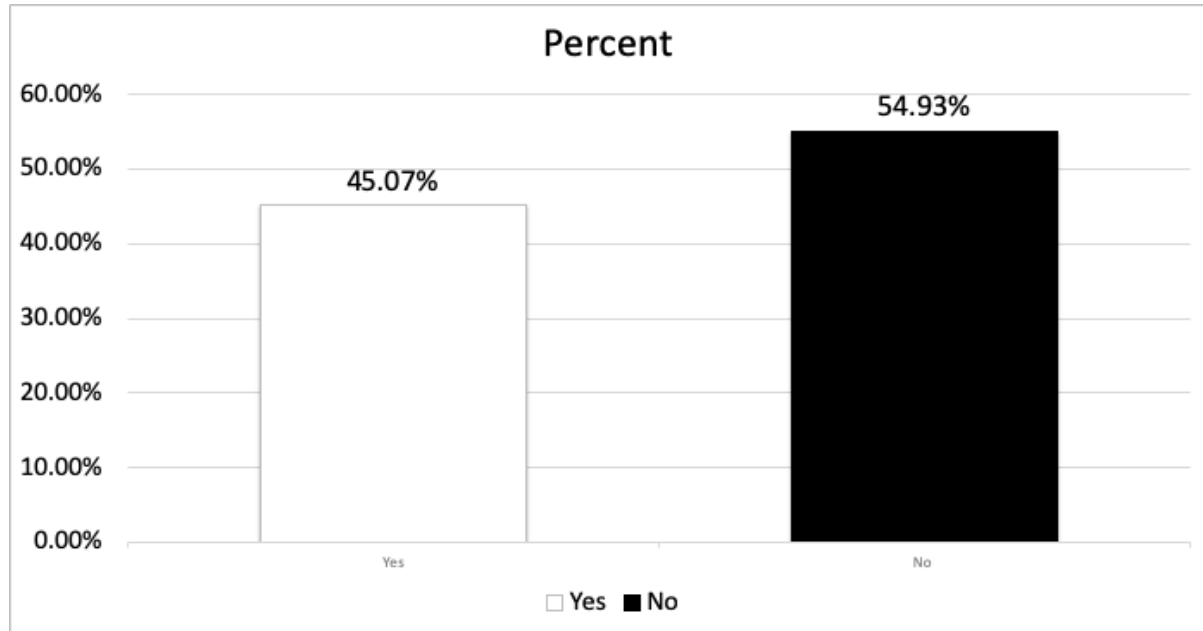


Figure 16 depicts respondents' reflections on their own commitment to research misconduct. According to the findings, the majority of respondents (75%) admitted to indulging in the three most common types of research misconduct: FFP, while 12.5% committed plagiarism, 8.75% committed data fabrication, and 3.75% committed data falsification. These findings are in line with Felaefel et al. (2018), who alluded that scientific misconduct represents a serious problem in various Egyptian universities.

Figure 16: Respondents' reflections on their own involvement in acts of research misconduct.

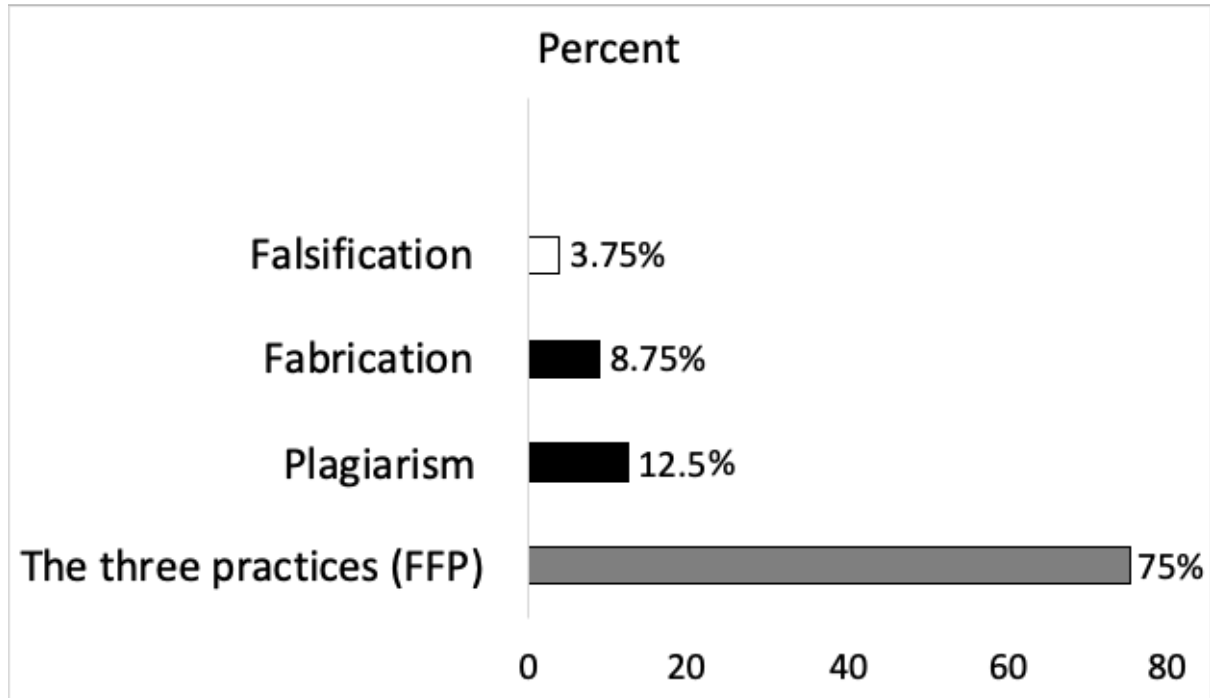


Figure 17 depicts participant responses on whether they personally reported any cases of research misconduct in their workplace. According to the data, the vast majority of respondents (90.14%) said they had not reported any instances of research misconduct at their institutions, while only 9.86% said they had. Unfortunately, because some researchers have positive and acceptable views toward the "three big" practices of research misconduct, deviant research behaviors have been ingrained in the research cultures of the majority of developing countries (DuBois & Antes, 2018). Additionally, a lot of researchers think that coworkers shouldn't disparage or criticize one another's reputations or disclose their colleagues' bad behavior (J. Lee, 2011).

Figure 17: Participant responses on whether or not they personally reported any research misconduct case in their organization.

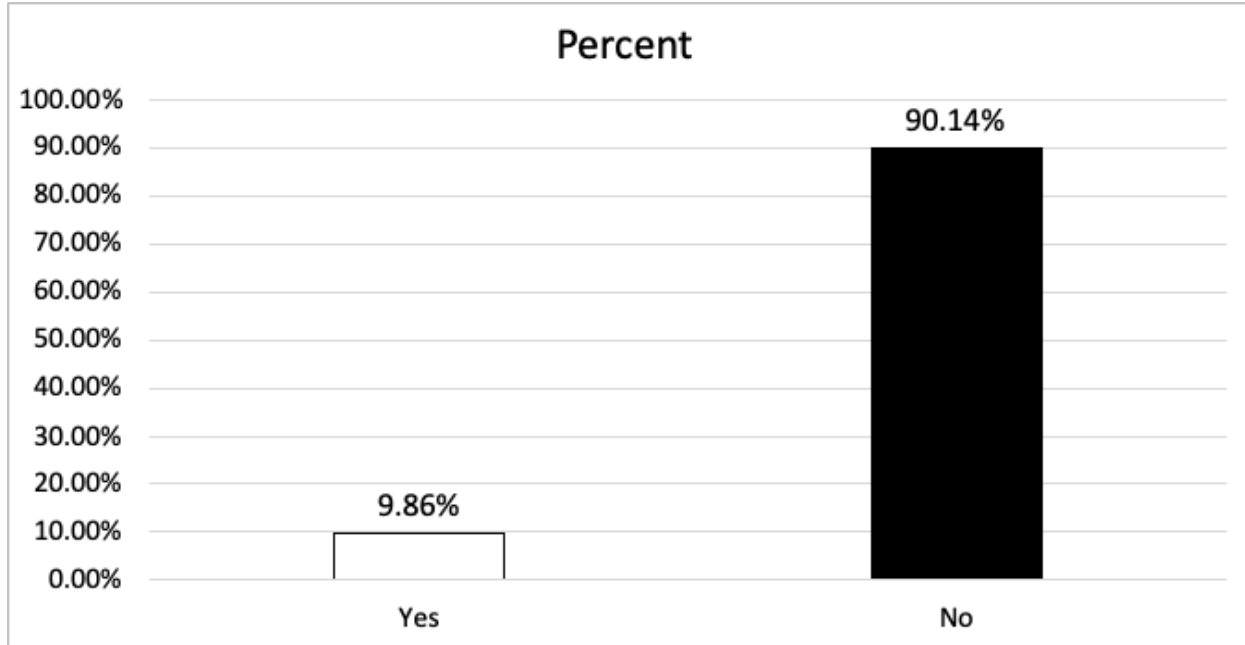


Figure 18 indicates the level of agreement among participants with the following statement: "fabrication and falsification diminish the quality of scientific publications." According to the findings, there was consensual agreement (87.32%) that FFP reduce the quality of scientific publications with 73.24 agreeing with a very great extent and 14.08% agreeing to a great extent. Though 1.41% agreed to a moderate extent, 1.41% agreed to some extent, 1.41% agreed to a small extent, and 8.45% objected to the fact that FFP reduce the quality of scientific publications. These findings are in line with DuBois & Antes (2018), who stated that research misconduct practices are as bad as deception or theft because they erode confidence in scientific research and cause serious problems in the real world. Additionally, although inadequate knowledge of the big three practices of research misconduct is considered an important factor contributing to the rise of research ethics violations in Egypt, there are many other intertwined factors that can lead to this complex phenomenon (Moustafa, 2019).

Figure 18: The level of participants' agreement with the following statement: "Fabrication and falsification diminish the quality of scientific publications."

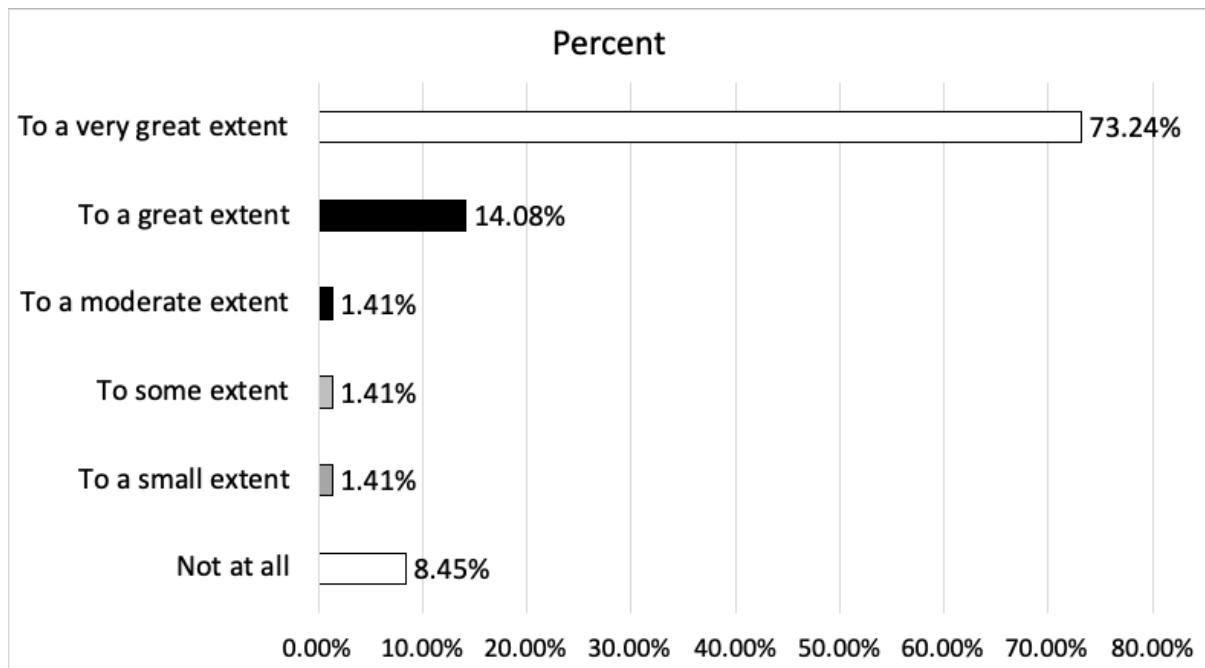


Figure 19 depicts the attitudes and perceptions of participants toward research misconduct. Respondents were asked to rank their attitudes and beliefs towards research misconduct. A Likert scale consisting of five points, ranging from "strongly agree" to "strongly disagree," was developed. The researcher calculated a weighted average for each belief and attitude, aiming to obtain a full understanding of the participants' perspectives and the extent of their agreement. To ascertain the participants' most prevalent belief and attitude towards research misconduct, the highest weighted average scores given by the respondents to the various options were ranked in descending order as follows: I feel uncomfortable discussing unethical practices of research conduct with my colleagues (0.60), I am ready to take serious actions towards research misconduct malpractices (0.53), dishonesty and data misrepresentation became part of our research culture (0.52), I will not take any action towards wrongdoers to avoid any conflicts with my colleagues (0.51), I will not take a positive action towards irresponsible researchers because I feel that they are "victims" of the whole system (0.45) and finally research misconduct became prevalent in our society and do not significantly harm anyone (0.28). Based on the data, the majority of the participants feel awkward speaking up about unethical research activity with their fellow researchers. From their perspective, the best way to deal with this scenario is to prevent any confrontations with their colleagues.

Figure 19: Participants attitudes and beliefs about research misconduct

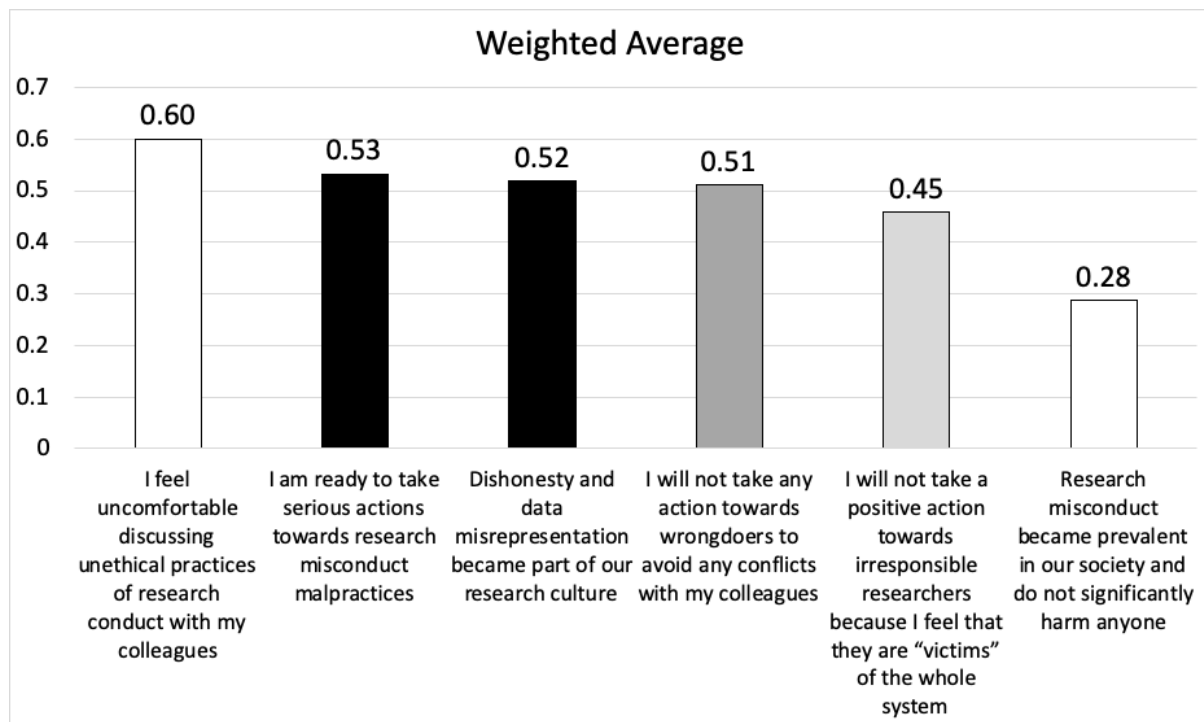


Figure 20 illustrates how participants evaluated the work environment factors that encourage research misconduct. Respondents were asked to rank the work environment factors that influence research misconduct in their organization, beginning with the factor believed to be very low and progressing to the factor perceived to be very high. A 5-point Likert scale (from very low to very high) was created, and a weighted average was calculated for each factor to provide the researcher with a comprehensive picture of the participants' thoughts and level of agreement. When determining the most common environmental factor causing researchers to commit FFP, the greatest weighted average scores provided by respondents to the various alternatives were listed in descending order as follows: researchers are not willing to prosecute scientific violators (0.54), absence of RCR guidelines in your organization (0.50), researchers are unaware of scientific misconduct practices (0.48), low chances of getting caught for scientific misconduct if it occurs (0.46), and finally absence of scientific misconduct penalties (0.44). It is noteworthy that the data indicate that while the majority of participants recognizing that research misconduct has a detrimental impact on the quality of scientific research, as depicted in Figure 19, a number of individuals admitted to lacking awareness of FFP. The findings of this study indicate a lack of RCR rules and processes in Egyptian public universities and research centers. Additionally, the probability of individuals being implicated in scientific misconduct is minimal due to the leniency of penalties for research misconduct.

These findings are in harmony with (Moustafa, 2019), who stated that Egyptian public universities and research institutes must educate their researchers, faculty, and students on the various types of research misconduct. In addition to establishing efficient policies that deter problematic research activities, they must also develop clear and widely disseminated rubrics and guidelines that define irresponsible research practices.

Figure 20: Participants’ rating of work environment factors that affect research misconduct

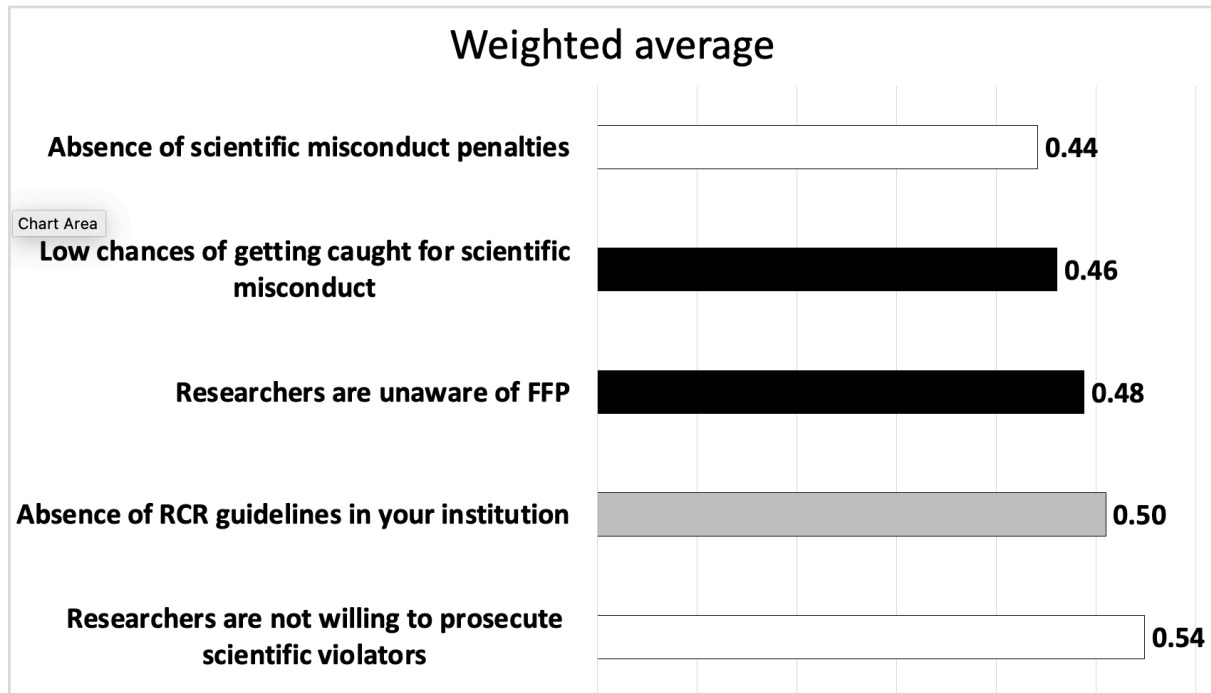


Figure 21 depicts the perspectives of participants on the reasons of research misconduct in Egyptian academic and research institutions. The weighted average was generated for each cause to provide the researcher with a comprehensive assessment of the participants' opinions and level of agreement. Several causes were provided to the respondents, and they were asked to highlight how significant they thought these causes were in influencing researchers to commit to FFP. The weighted average of the scores given showed the following descending order: research culture in the field (0.82), pressure to publish or perish in reputable journals (0.77), institutional failure of oversight and weak regulations (0.75), inadequate training on research integrity in public institutions (0.74), individual factors such as personality traits & beliefs and desires of violators (0.73), lack of awareness and conceptual confusion (0.71), unethical environment (0.68), and finally ease of cooking data (0.67). These findings show that, while the majority of participants agreed that the research culture of Egyptian public universities and research institutions is the most important factor that leads to FFP

commitment, there are other interconnected factors that may contribute to this multifaceted phenomenon. It should be noted that the culture of a research or academic institution may encourage researchers to participate in unethical or questionable behavior in order to obtain funding and recognition (Valkenburg et al., 2021). The participants also agreed on other interconnected triggers of research misconduct, such as individual, institutional, organizational, and environmental factors since they believe these are ubiquitous at their institutions and serve as motivators committing for FFP.

Figure 21: Perspectives of participants on the causes of research misconduct in Egyptian academic and research institutions

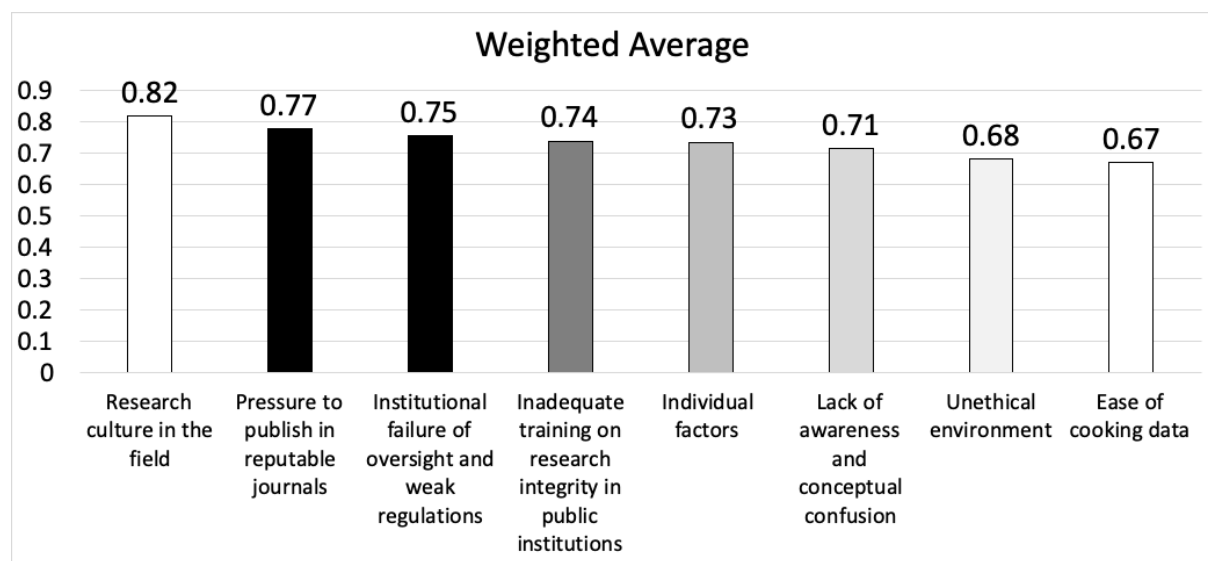


Figure 22 depicts the participants' perspectives on who is responsible for supporting research integrity at Egyptian public academic and research institutions. Respondents were asked to rank who is accountable for maintaining research integrity in Egyptian public institutions, beginning with the choice deemed most important and progressing to the choice deemed least important. To give the researcher with a thorough picture of the participants' opinions and level of agreement, a 5-point Likert scale (from strongly agree to strongly disagree) was created, and a weighted average was generated for each aspect. The highest weighted average ratings offered by respondents to the different options were listed in descending order for determining who is responsible for maintaining research integrity: funders should take step to protect the integrity of scientific research through funding training on responsible science (0.91), both the graduate students and the supervisors are responsible for upholding scientific integrity in her or his research (0.90), researchers should act responsibly and whistle-blow violations of research integrity (0.89), scientific journals should protect

research integrity (0.88), all the researchers involved in a research are responsible for abiding by the principles of responsible conduct of research (0.87), Egypt should invest more heavily in fighting scientific misconduct (0.86), protecting the integrity of research lies with Egyptian universities and research institutions (0.79), supervisors have many students and cannot monitor all stages of their experimental work (0.50), the responsibility for the scientific integrity of a study lies with the principal investigator only (0.31) and finally the graduate student alone is responsible for upholding scientific integrity in her or his research (0.24). Emphasizing how wicked problems cannot be solved by a single body working alone in light of how complex and uncertain higher education is today (Kongolo, 2019). As a result, to solve such a wicked problem, cooperation among numerous stakeholders is crucial. Collaborative governance can foster dialogue among all interested parties, enabling them to grasp the issue at hand comprehensively. It can also lessen policy resistance and balance the interests of several stakeholders (Bianchi, 2006).

Figure 22: Participants' perceptions on who is accountable for maintaining research integrity in Egyptian public academic and research institutions

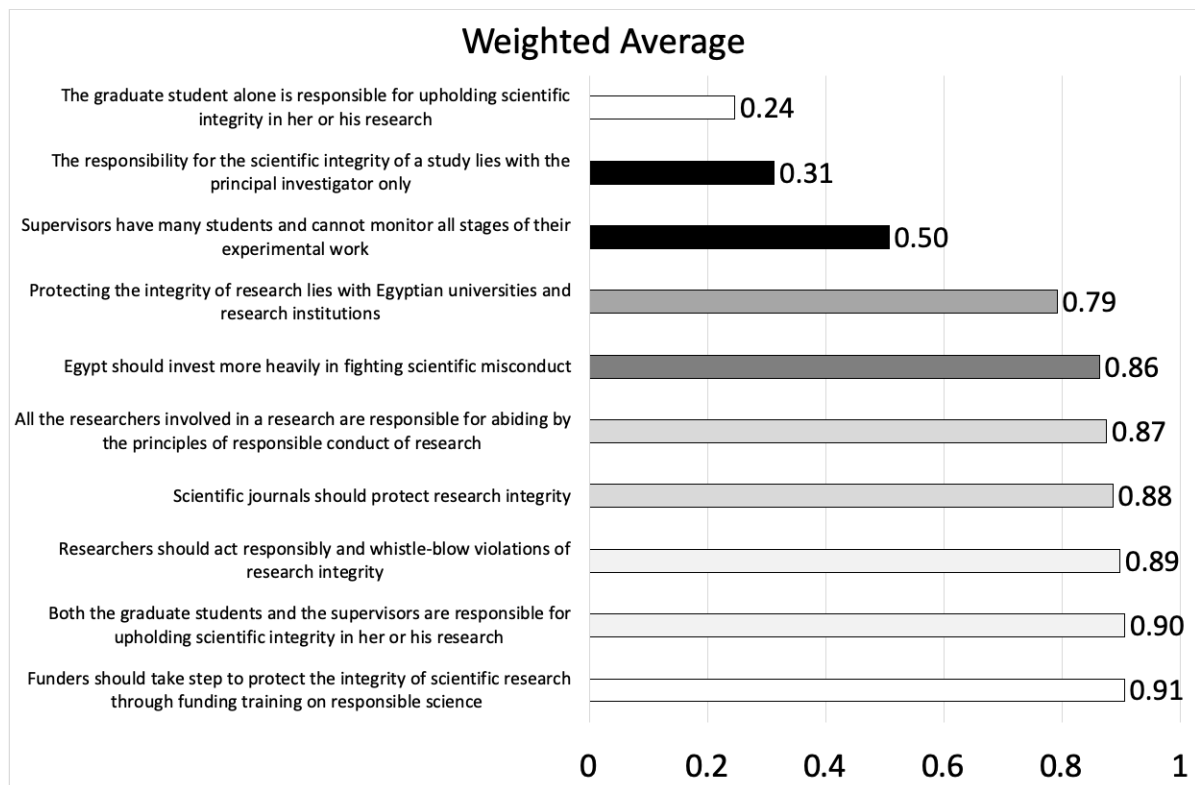


Table 6 shows how participants perceive the availability of research misconduct courses at their institutions for students, researchers, and academic staff at various career levels. The majority of respondents (78.79%) stated that their institution does not offer undergraduate courses in research misconduct and scientific writing, whereas just (21.21%) stated that their university does offer such courses. Further, (69.70%) of participants reported that their institution does not provide graduate students with research misconduct and scientific writing courses, whereas (30.30%) stated that their university does. Besides, (66.67%) of participants reported that their institution does not provide teaching assistants and lecturers with research misconduct and scientific writing courses, whereas (33.33%) stated that their university does. Finally, (78.79%) of participants reported that their institution does not provide assistant professors and professors with research misconduct and scientific writing courses, whereas (21.21%) indicated that their universities offer such courses to all academic staff at all career levels. In agreement with Moustafa (2019), academic and research institutions in Egypt generally lack formal training in understanding of the ethical features of scientific research. In the same manner, El-Shinawi et al. (2016) alluded that Egyptian medical researchers are unfamiliar with the fundamental principles of RCR.

Table 6: Participants' opinions on research misconduct courses for students, researchers, and academic staff at different career levels at their universities.

Availability of research misconduct courses	Answer Choices	Responses			
		%	No	+Total no of resp.	*Non-resp.
My university offers <i>undergraduate students'</i> courses in research misconduct and scientific writing	Yes	21.21%	14	66	14
	No	78.79%	52		
My university offers <i>graduate students</i> to take courses in research misconduct and scientific writing	Yes	30.30%	20	66	14
	No	69.70%	46		
My university offers all <i>teaching assistants and lecturers</i> to take courses in research misconduct and scientific writing	Yes	33.33%	22	66	14
	No	66.67%	44		
My university offers <i>assistant professors & professors</i> to take courses in research misconduct and scientific writing	Yes	21.21%	14	66	14
	No	78.79%	52		

*Total no of resp. = Total number of responses to the question.

+Non-resp. = Total number of non-responses to the question.

Figure 24 indicates how satisfied the participants are with their institution's courses on responsible science. The majority of respondents (94.74%) were dissatisfied with their universities' RCR courses, with 84.21% very unsatisfied and 10.53% unsatisfied. On the other hand, only 2.63% were neutral about the offered RCR by their institutions and a total of 2.63% checked the box satisfied. As a result of these findings, faculty members and graduate students concur that RCR education needs to be improved in Egyptian public academic and research institutions. In agreement with El-Shinawi et al. (2016), both students and faculty members appear to lack the necessary knowledge, skills, and a supportive environment to foster a culture of scientific integrity.

Figure 23: Participants' opinions regarding how satisfied they are with their institution's courses on responsible conduct of research

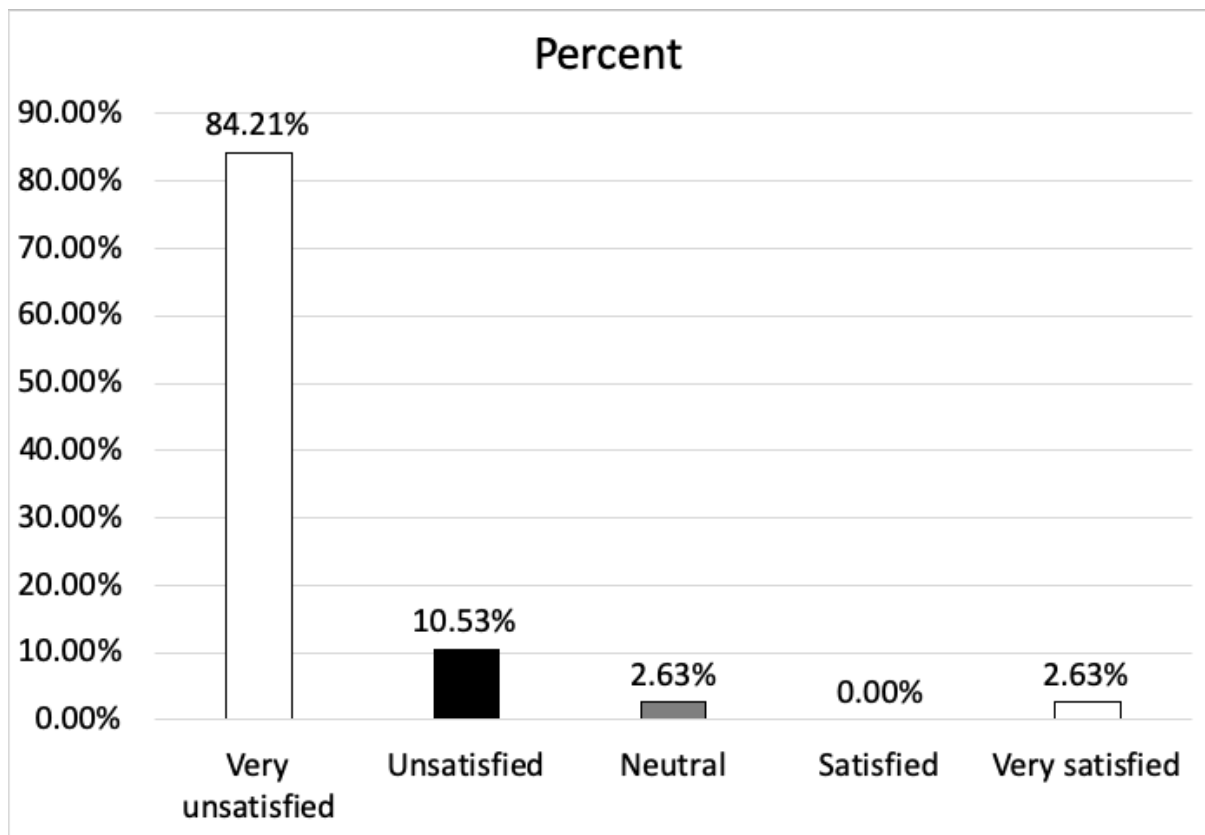
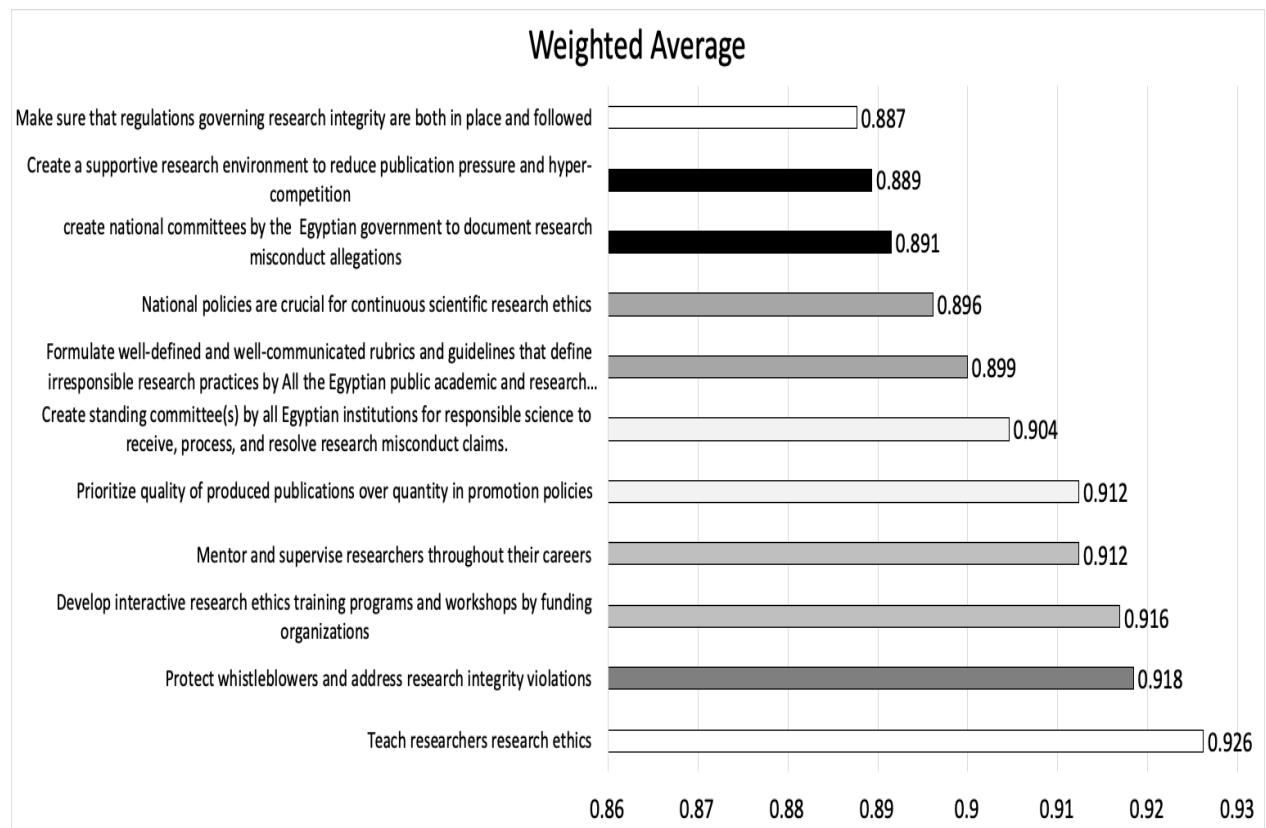


Figure 25 displays participants' ideas for addressing the issue of research misconduct in Egypt. Respondents were asked to rank various strategies for combating research misconduct in Egypt, beginning with the most important option and progressing to the least important option. A 5-point Likert scale (from strongly agree to strongly disagree) was developed, and a weighted average was generated for each option to provide the researcher with a comprehensive picture of the participants' thoughts and level of agreement. For

identifying the best technique to combat research violations in Egypt, the highest weighted average ratings given by respondents to the various choices were listed in descending order: (a) teach researchers research ethics (0.92), (b) protect whistleblowers and address research integrity violations (0.918), (c) develop interactive research ethics training programs and workshops by funding organizations (0.916), (d) mentor and supervise researchers throughout their careers and (e) prioritize quality of produced publications over quantity in promotion policies received the same average weight (0.91), (f) create standing committee(s) by all Egyptian institutions for responsible science to receive, process, and resolve research misconduct claims received average weight (0.90), (g) formulate well-defined and well-communicated rubrics and guidelines that define irresponsible research practices by all the Egyptian public academic and research institutes (0.899), (h) national policies are crucial for continuous scientific research ethics (0.896), (i) create national committees by the Egyptian government to document research misconduct allegations received the same average weight (0.89) and the two strategies (j) create a supportive research environment to reduce publication pressure and hyper-competition and (k) make sure that regulations governing research integrity are both in place and followed received the same average weight (0.88). These findings reveal that both comprehensive and long-term measures for reducing research misconduct and potential research misuse are required by the Egyptian government and academic and research institutions (Al-Adawi et al., 2016; El-Shinawi et al., 2016; Felaefel et al., 2018).

Figure 24: Participants' suggestions about how to address the issue of research misconduct in Egypt



5.2. Qualitative findings

5.2.1. Serious potential causes of misconduct in research

5.2.1.1 False beliefs

Mohamed, a professor at one of Egypt's most prestigious research institutions, which is affiliated with the ministry of higher education, stated that he is unsure whether researchers should rewrite paragraphs when writing research papers. He declared:

"Paraphrasing in scientific research bothers me. I think previous scientists' statements should be copied verbatim (...) I know some professors who don't let their students paraphrase because they consider previous published articles sacred texts."

(Mohamed, Professor, November, 2022).

Because of false beliefs about the insignificance of paraphrasing, as demonstrated by Professor Mohamed's statement, scientific malpractice might occur. His remarks piqued my interest, particularly when he stated that many professors at Egyptian public academic and research institutions ban their students from rephrasing when writing research studies because they regard previously published research articles as holy texts. This quote is very serious as

the mistaken belief that paraphrasing is unimportant can lead to a lack of understanding of the importance of proper citation and referencing, which can contribute to unethical behavior in research. Researchers need to have a solid understanding of the significance of accurate citation and referencing to protect their work's credibility and avoid engaging in academic dishonesty. This finding aligns with Felaefel (2015), who mentioned that plagiarism is one of the most pressing issues in Egyptian academic institutions owing to a need for more awareness about using wording from published studies.

Similarly, Noha, a professor at one of the largest public universities in Egypt, advises her students to copy and paste verbatim. He mentioned the following:

“The practice of paraphrasing is not recommended. When students paraphrase paragraphs in scientific papers, they cannot convey the original meaning. (...) Also, as professors, we struggle to identify the source of the information.”

(Noha, Professor, November, 2022).

According to Professor Noha's comments, some academics prefer to receive a plagiarised paper from their students than one that has been paraphrased. The majority of students fail in their attempts to transmit the original meaning in their scientific papers by paraphrasing paragraphs, which is the cause of this. Professors also prefer this approach since it makes it easy for them to pinpoint the information's original source. The professor's comment, in my opinion, is relevant for multiple reasons. First of all, it shows that all researchers in Egypt must learn how to effectively paraphrase in order to maintain the credibility of their work. Second, some professors are looking for shortcuts while reviewing the theses of their students, and as a result, they have given their students poor guidance and this results in tarnishing the credibility of their research. This finding is in agreement with El-Dessouky et al. (2011), who stated that scientific research is deteriorating in Egypt due to the lack of awareness about the unethical nature of research misconduct practices among academics.

5.2.1.2. ChatGPT and AI-written research papers

Noura, a former professor at one of the largest public universities in Egypt and now a tenured professor at the American University of Cairo, sheds light on the fact that ChatGPT, the most recent AI technology tool, has raised several questions regarding research integrity. She declared:

“The artificial intelligence chatbot ChatGPT has made academic and scientific fraud more likely. It is causing concern among scientists that it could be abused to plagiarize

texts and ideas, create fictitious references, and fabricate studies. (...) Yes, it can write entire manuscripts for researchers without any effort on their part (...). The problem is that plagiarism detection software such as Turnitin is not 100% effective in detecting this chatbot's writing"

(Noura, Professor, November, 2022).

The comments made by Professor Noura demonstrate that AI chatbots can be used to plagiarize texts and ideas, as well as fabricate studies. While AI chatbots can help provide information and answer questions, they can also be used to deceive users by providing inaccurate or misleading information. Chatbots could be programmed to plagiarize texts and ideas by copying and pasting information from sources without citing or paraphrasing them. They could also be used to create false data or results in studies. It is critical to be aware of the potential for chatbot abuse and use them cautiously. Researchers should always double-check the accuracy and reliability of chatbot information before relying on it for critical research tasks. The misuse of these chatbots is a serious problem for scientific research, as Chatbots such as ChatGPT can produce undetectable essays by plagiarism detection software such as Turnitin. Therefore, Turnitin should update its plagiarism engine to detect cheating using chatbots like ChatGPT. This finding is in harmony with Khalil & Er (2023), who mentioned that using ChatGPT in academic settings has raised concerns about research misconduct, particularly plagiarism.

Mira, a researcher at one of Egypt's top research institutions, expresses concern in her quote that ChatGPT will exacerbate research misconduct. She stated:

"ChatGPT will exacerbate the situation by producing papers that are convincing yet frequently incorrect. This will distort scientific facts, encourage plagiarism, and disseminate false information. This is beyond the capacity of review processes."

(Mira, Researcher, November, 2022).

Dr. Mira's comments show that the employment of ChatGPT in academic contexts has prompted worries regarding research misconduct and plagiarism. Many scholars now utilize ChatGPT to write their articles. The fundamental issue is a large grey area between clearly plagiarized work and academic help tools, making it impossible to distinguish between human and machine-generated writing. According to Dr. Mira's comment, professors are concerned about students using the free and easy-to-use ChatGPT to generate fake data and help cheating. This finding agrees with Cotton et al. (2023), who mentioned that the use of AI in education is

a hot topic. ChatGPT is an AI tool with many benefits, such as making it easier for students to get involved, work together, and get information. But it also makes me worry about research integrity.

5.2.1.3. Inability to balance pressure to publish with scientific integrity

I encountered an unexpected case of fabrication. I hold a doctorate in pharmaceutical sciences and I work as a researcher at a public research institution in Egypt. I anticipate being promoted to associate professor in six months after completing the necessary number of publications. I collaborated with a renowned professor of medical histology²⁵ at one of the most prestigious public universities in Egypt, along with my team. Before starting the experimental part, the histology professor requested payment of 15,000 Egyptian Pounds and inclusion of her name in three publications. The principal investigator of the project accepted her request and encouraged her to begin her part as soon as possible so that the results of the pilot study could be reported to the funding agency, which is the same research institution where we, as a pharmacology²⁶ team, work.

After successfully publishing two of the three articles in prestigious journals, one journal sent us a harsh email in which the editorial manager stated that they retracted our papers and notified our research institutions that we fabricated all of the histology images. They advised us to look into a website called “Pubpeer²⁷”, where our papers were posted as it included fabricated histology data. When I checked the website, I was shocked to discover that the same professor had fabricated approximately 15 papers published 10 years ago, and it appears that this is not her first instance of research misconduct. I spoke with Dr. Noura, the project's principal investigator, who spoke with the histology professor and blamed her. According to Dr. Noura, the professor admitted to committing research misconduct and began crying to justify her actions. Dr. Noura stated:

²⁵ **Medical Histology:** the microscopic study of tissues and organs through sectioning, staining, and examining those sections under a microscope.

²⁶ **Pharmacology:** is a branch of medicine, biology, and pharmaceutical sciences concerned with drug or medication action, where a drug may be defined as any artificial, natural, or endogenous molecule which exerts a biochemical or physiological effect on the cell, tissue, organ, or organism.

²⁷ **PubPeer:** is a website that allows users to discuss and review scientific research through post-publication peer review. It is a scientific forum or journal club where scientific publications are discussed after publication, and users can post anonymous peer reviews of research that has been published. The website contains all articles, and comments are divided into categories according to the issues discussed in an online journal club. <https://pubpeer.com>.

“When I talked to the professor, she begged me for forgiveness while weeping and explained that she hasn't been feeling well lately due to family issues.”

(Noura, Professor, November, 2022).

Professor Noura's comments reveal that the histology professor committed research misconduct due to personal issues. The odd thing is that she chose to fabricate the work rather than being honest and communicating with the principal investigator and apologizing for being unable to continue the work due to family issues. She wanted to keep all of her three publications, so she took the easiest and least ethical route to finishing them. These results are consistent with those of Martinson et al. (2010), who noted that researchers who committed FFP had long-lasting stressful conditions that left them persistently negative based on the general strain theory. In addition, based on Davis et al. (2007), even the most fundamentally honest researchers may find themselves in difficult situations that test their ability to handle pressure and cope. Numerous situational factors can compromise the quality of research, such as Loss of loved ones, a new baby, emotional difficulties after a breakup, a wife's difficult pregnancy, and many others.

Similarly, Aya, a researcher at one of the largest research institutes, observes that the pressure to publish academic work quickly and frequently leads to the rise of questionable research practices. She stated:

“The “publish or perish” mentality can occasionally clash with scientific integrity. This mindset can jeopardize scientific integrity by putting excessive pressure on researchers to publish, leading to scientific misconduct. However, there are ways to strike a healthy balance between publication pressure and scientific integrity. Resisting the temptation to engage in scientific misconduct is a good practice; as is focusing on scientific rigor and methodology rather than bibliometric indices (...) To avoid the consequences of scientific misconduct, it is critical to prioritize ethical behavior.”

(Aya, Researcher, November, 2022).

Aya's remarks reveal that in academia, the pressure to "publish or perish" can foster a culture that prioritizes research output over ethical behavior. This can lead to academic misconduct, such as plagiarism, which tools like ChatGPT can facilitate. As a result, universities, in my opinion, can take several steps to prioritize ethical behavior in academia. First, they can create and enforce codes of ethics that emphasize the importance of academic

integrity and responsible research conduct. Second, they can provide faculty and students with training and resources on how to use AI tools like ChatGPT ethically and responsibly. Third, universities can implement policies and procedures, such as plagiarism checkers and proctoring solutions, to detect and prevent academic misconduct. Finally, universities can foster an environment that values ethical behavior and recognizes and rewards researchers who prioritize academic integrity over research output. Evidence from the literature suggested that irresponsible investigators may violate research integrity rules in order to publish a large number of papers and justify their actions in the context of "publish or perish" pressure (Al-Adawi et al., 2016).

On the other hand, Adam, a researcher at one of Egypt's top research institutions, highlighted the fact that unethical researchers will always find a good reason to commit unethical research behavior. His thoughts support the "bad apple" theory, which states that only researchers who are morally corrupt, economically desperate, or psychologically disturbed commit misconduct. He alluded:

"Unethical researchers may engage in research misconduct for reasons unrelated to the publish or perish threat." (...) Money and a lack of ethical principles are two other risk factors that contribute to research misconduct (...) When a researcher wants to commit misconduct, she or he will find a good reason to justify her or his bad behavior."

(Adam, Researcher, November, 2022).

Adams' comments clarify that unethical researchers may engage in research misconduct for a variety of reasons. Some researchers may be motivated to falsify data or manipulate results in order to secure funding or advance their careers. Others may commit research misconduct due to personal conflicts or professional disagreements. Furthermore, some researchers may not fully comprehend the ethical, legal, and professional guidelines that govern how research is carried out, resulting in unintentional misconduct. Research misconduct can have serious consequences, including eroding trust among colleagues and the public, damaging reputations, and potentially causing harm to individuals or society as a whole. As a result, universities must provide researchers with training and resources on responsible research conduct, as well as implement policies and procedures to detect and prevent research misconduct. This finding is consistent with Hibel and Penn's (2020) observation that no one is perfect, and "bad apples" will always appear in social situations.

5.2.1.4. Other possible factors

Mohamed, a professor at one of Egypt's most prestigious research institutions, noted that other factors may contribute to research misconduct:

“Lack of awareness and bad language are common reasons for research misconduct (...) researchers need to receive education and training to avoid research misconduct. Some researchers may inadvertently cross ethical lines because they are unaware of them.”

(Mohamed, Professor, November, 2022).

Professor Mohamed's quote indicates that lack of awareness and inappropriate language are two common causes of research misconduct. Researchers may need to be made aware of the ethical, legal, and professional guidelines that govern how research is conducted, which can lead to unintentional misconduct. Furthermore, researchers may lack awareness and training on RCR, which can contribute to research misconduct. Language barriers can also play a role, as researchers may need to fully understand the expectations and requirements for conducting research in a specific language or culture. As a result, universities must provide researchers with training and resources on responsible research conduct and implement policies and procedures to detect and prevent research misconduct. Universities can help researchers understand the significance of ethical behavior in research and prevent unintentional misconduct. This finding is in agreement with Al-Adawi et al., (2016), who mentioned that untrained researchers, who lack confidence in their writing abilities are more susceptible to committing plagiarism.

Similarly, Noha, a professor at one of the largest public universities in Egypt mentioned that curriculum modifications are necessary to include RCR as a required course in order to reduce accidental instances of research misconduct:

"RCR training is critical for preparing undergraduate and graduate students to address potential ethical challenges in research (...) curriculum changes are required to include RCR as a core course in order to reduce inadvertent cases of research misconduct."

(Noha, Professor, November, 2022).

Professor Noha's quote shows that RCR training is important because it promotes the awareness and conduct of established professional norms and principles when performing

activities related to scientific research. RCR training helps prepare investigators to conduct their research activities ethically by teaching them topics such as authorship, data management, conflicts of interest, and research misconduct. RCR training is intended to sensitize the university research community to the wide range of ethical and professional issues that must be considered to ensure research integrity. Therefore, by providing RCR training, universities can help researchers understand the importance of ethical behavior in research and prevent unintentional misconduct. Additionally, RCR training is often required by funding agencies and regulatory bodies, making it an essential component of responsible research conduct. This finding is in line with Felaefer (2015), who stated that The incidence of FFP is reduced among researchers when there is greater awareness about research misconduct.

5.2.2. Maintaining Research Integrity

Mohamed, a professor at one of Egypt's most prestigious research institutions, noted that collaborative governance is the best approach to tackle research misconduct problems in public academic and research institutions. He stated:

“Researchers, institutions, funding agencies, and regulatory bodies all need to work together to create and implement policies and practices that will help ensure that research is conducted in an honest and transparent manner.”

(Mohamed, Professor, November, 2022).

Professor Mohamed comments reveal that collaborative governance can play an important role in preventing research misconduct. Research misconduct is a complex issue that can involve multiple stakeholders, including researchers, academic and research institutions, funding agencies, and scientific journals. Collaborative governance mechanisms can help ensure that all stakeholders are working together to promote ethical behavior in research and prevent research misconduct. For example, co-authors can share responsibility for scientific misconduct and should be aware of their role in preventing it. Institutional leaders can help prevent issues of academic research misconduct by ensuring policies governing academic research are in place and followed, and by making sure everyone in the research environment knows they have a role in protecting research integrity. Funding agencies and journals can also play a role in promoting research integrity by requiring researchers to adhere to ethical guidelines and by providing resources and training on responsible conduct of research. By

working together, stakeholders can promote ethical behavior in research and prevent research misconduct. This finding is in line with Dal-Ré et al. (2020), who mentioned that this tactic is frequently utilized to address difficult-to-solve wicked problems like research misconduct. In order to develop solutions that are sustainable, it is necessary to work together with a variety of stakeholders.

Similarly, Professor Noha mentioned that collaborative governance can combat research misconduct:

“We will understand the root causes of the problem and find long-term solutions if all stakeholders work together.”

(Noha, Professor, November, 2022).

Professor Noha’s comments show that collaborative governance can play an important role in understanding the underlying factors that contribute to unethical behavior in research and locating sustainable solutions. Notably, research fraud is a pernicious problem with potentially catastrophic repercussions. It can erode trust between collaborators and the general public and is a violation of scientific values. While research misconduct may appear to be a simple issue, addressing it can be challenging due to the unique circumstances of each case and the differing perceptions of what constitutes misconduct. In addition, research misconduct is viewed as a complex policy challenge characterized by high risk and uncertainty and a high degree of interdependence among its influencing variables. This problem cannot be confined to a single organization nor assigned to specific administrative levels or ministerial departments. It encompasses multiple levels, actors, and sectors, and is characterized by dynamic complexity. In this situation, decisions should be based on a process of strategic learning with an emphasis on conflict resolution and communication between all stakeholders. This is due to the fact that policymakers who may be able to influence this "wicked problem" have diverse interests and backgrounds or cultures.

5.3. Final and Intermediate Outcome levels

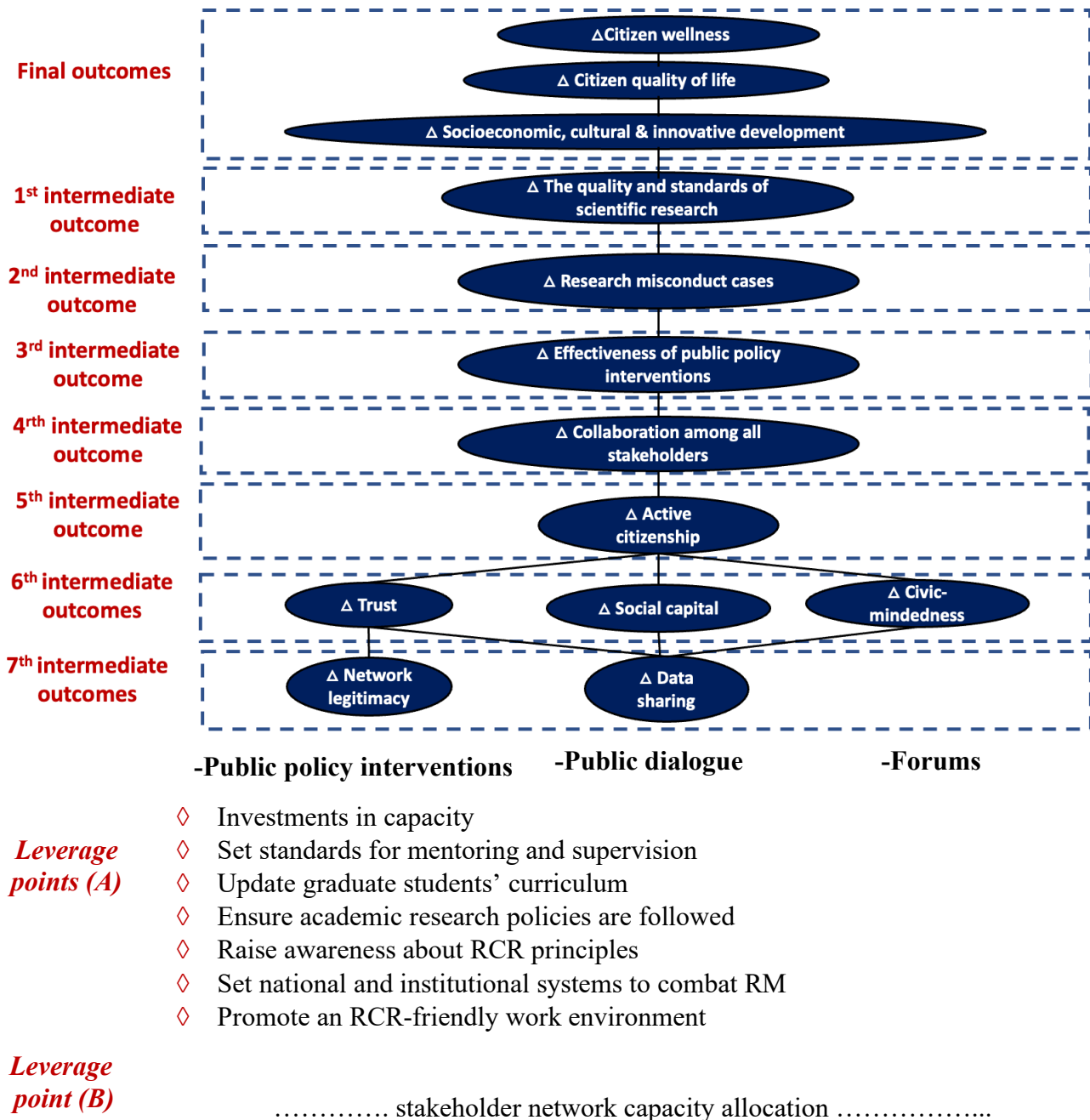
The associated results are made explicit once the goals and objectives have been established by the strategic resources at hand. It is important to differentiate between "end" and "intermediate" results. End results are what universities and research institutes can accomplish

through interactions with the external environment based on the academic products and services offered (Cosenz, 2022). They can be described in terms of finances (e.g., income, cash flow), competitiveness (new publications, new enrolled students), and societal (changes in the university's reputation, changes in student satisfaction, changes in citizen wellness). Academic decision-makers cannot immediately have an impact on the end results since they are the consequence of the interaction of several operations, procedures, and activities that contribute to the final step in the academic value chain (Bianchi, 2016). In addition, as Bianchi notes, end-results are measured sequentially and categorized into numerous interconnected levels. The end results of the first layer best simulate the total value produced by universities and research institutes. This value is created by modifying the endowment of strategic resources that cannot be purchased on the market (*ibid.*).

In the example presented in Figure 26, the researcher synthetically represents the final and intermediate outcome layers connected to an analyzed sequential community wellness development policy. This policy results from active citizenship and successful strategic coordination and collaboration across all Egyptian public institutions' stakeholders to achieve sustainable outcomes. In this study, social capital, civic mindedness, and trust are the three primary characteristics that are linked to active citizenship. As shown in the figure, active citizenship can be leveraged to pursue a broader set of intermediate outcomes across several levels, allowing for the achievement of "little wins" (Ansell & Gash, 2007, p.561) to produce a change in community wellness. The final outcomes, citizen wellness, citizen quality of life and socio-economic, cultural, and innovative development, are influenced by the quality and standards of scientific research in Egypt classified in the 1st layer of outcomes. This outcome is influenced by the number of research misconduct cases classified in the 2nd layer of outcomes. Likewise, the number of researcher misconduct cases in Egyptian public institutions is influenced by the effectiveness of adopted policy interventions classified in the 3rd layer of outcomes. This outcome is influenced by the collaboration among all actors, including: universities, research institutes, researchers, funding agencies, policy makers, and citizens, through active communication strategies. Likewise, collaboration among all stakeholders presented in the 4th layer of outcomes is influenced by active citizenship, classified in the 5th layer, which in turn, influenced by trust, social capital and civic mindedness presented in the 6th layer of outcomes. Social capital and civic mindedness are influenced by data sharing presented in the 7th and last layer of outcomes, to raise community awareness and knowledge of the research misconduct problem and its consequences. More still, public trust in science is influenced by data sharing (e.g., open access research) and network legitimacy classified in the

7th and last layer of outcomes. The various levels of intermediate outcomes are supported by leverage points A and B, which involve implementing specific activities within the broader policy framework.

Figure 25: Conceptual key depicting final and intermediate outcome levels for combating research misconduct in public Egyptian institutes



Source: created by the researcher based on her conceptualization to the literature review

5.4. Dynamic Performance Governance diagram illustrating the promotion of research integrity in Egyptian public institutions

Fraud in research is a wicked issue with potentially disastrous repercussions. It can erode confidence between researchers and the general public and represents a failure to uphold scientific values. While research misconduct may appear to be a straightforward problem, addressing it can be difficult due to the unique circumstances of each case and the varying perceptions of what constitutes misconduct (Kornfeld, 2018). Research misconduct is also considered as a complicated policy challenge characterized by high risk and uncertainty as well as a high degree of interdependence between the variables that affect it. This issue cannot be contained within the confines of a single organization, nor can it be attributed to particular administrative levels or ministerial departments (Dal-Ré et al., 2020). It is characterized by dynamic complexity, encompassing multiple levels, actors, and sectors. In this case, decisions should be based on a strategic learning process with an emphasis on conflict resolution and communication between all the stakeholders. This is because policymakers who may be able to affect this "wicked problem" have different interests and come from different backgrounds or cultures. Therefore, such as problem needs a collaborative governance setting to help all the stakeholders work together more effectively on a strategic level to achieve long-term results. This approach is frequently used to address wicked problems such as research misconduct, which are difficult to solve. It entails collaborating with various stakeholders to find sustainable solutions (Cosenz, 2022).

Dynamic Performance Governance has been shown to be a framework that can help the higher education sector make better decisions, plan better, design better policies, and implement them. In the DPG chart figure 27 & 28, end results are divided into two types of flows: **a)** Flows that have an impact on shared strategic resources but do not contribute to the final outcomes. This is due to the fact that the process of resource allocation, depicted by the black flow, lies outside of the system's investigative boundary in terms of policies that directly affect the final results. The black flows represent variables that are "purchased directly from the market" because they lack direct performance drivers. **b)** Flows that originate directly from outcomes. The outcomes that have a direct impact on the shared strategic resources are represented by "chessboard symbols". A co-flow represented by a 'chessboard symbol' influences a shared strategic resource, which in turn influences a performance driver, which in turn influences an end result within the investigated system's boundary (Bianchi, 2016, p. 93).

This necessitates a method for identifying performance drivers that influence flows that directly impact shared strategic resources. In addition, in this DPG chart, performance indicators can be measured in terms of how they compare to a benchmark or goal value. Therefore, they are relevant measures for performance management (Bianchi, 2016).

The DPG chart shown in figure 27 demonstrates the end results, performance drivers, and shared strategic resources mapped out to combat research misconduct in Egypt. It is worth noting that curbing research misconduct can result in community wellness by promoting and maintaining high levels of scientific integrity in all areas of research (National Academies of Sciences & Medicine, 2017). Therefore, the ultimate outcome, according to the boundaries of the system is to attain community wellness in Egypt through limiting research misconduct and promoting research integrity.

As depicted in the DPG chart, the role of media is a shared strategic resource. This is because media can help in combating research fraud by raising awareness and exposing fraudulent research to public scrutiny. Investigative journalism, in particular, can be effective in exposing corruption allegations and combating impunity. Media can, also, influence people's mindset about research fraud and encourage them to take a proactive approach in addressing this issue through participating in public dialogue (National Academy of Sciences, 2002). Therefore, it promotes active citizenship to combat research misconduct by equipping citizens with the knowledge and skills to evaluate scientific research critically and identify instances of misconduct. Several variables that affect the three parts of active citizenship—social capital, civic mindedness, and trust—can be used to study how active citizenship changes. Notably, when active citizenship is utilized, a strong and active collaborative network is created. This improves the network's capacity, legitimacy, generates more ideas, and brings in more stakeholders (Bianchi, 2016).

The role of media as a shared strategic resource generates one performance driver: the percentage of citizens with greater awareness of research misconduct problem. This refers to the percentage of citizens who better understand what constitutes research misconduct and why researchers engage in such detrimental research practices. This performance driver affects the outcome of change in mindset, a 6th-level intermediate outcome.

Next, the role of universities and research institutes is a shared strategic resource. This is because universities and research institutes have an important role in curbing research

misconduct. They are responsible for the conduct of their researchers and for encouraging a healthy research environment that fosters research integrity (Khan & Sherin, 2019). One way to prevent university research misconduct is by creating a culture of research integrity throughout the enterprise, which would go a long way in preventing such misconduct. Additionally, institutions can establish guidelines and expectations at the institutional level to promote ethical behavior among researchers (ibid). Scientists found guilty of misconduct are often brushed under the carpet by institutions fearing that public awareness of such issues would tarnish their reputations. Therefore, universities and research institutions must assume responsibility for addressing research misconduct and promoting ethical conduct among researchers (The Global Network of Science Academies, 2016).

The role of universities and research institutes as a shared strategic resource generates one performance driver, which is clarity of well-communicated ethical codes and research standards ratio. This relates to the proportion between how well-defined and communicated the current ethical codes of conduct and research standards are in Egyptian public universities and the benchmark. This performance driver affects the outcome of change in research misconduct cases which is a 2nd level intermediate outcome.

The role of funding agencies is a shared strategic resource. This is because Funding agencies play an important role in curbing research misconduct. They establish policies and regulations to prevent research misconduct and promote ethical behavior among researchers (National Academies of Sciences & Medicine, 2017). This shared strategic resource generates one performance driver, which is alignment with RCR standards ratio. This relates to the ratio between the degree of funding agencies alignment with RCR standards and the benchmark. This performance driver affects the outcome, change in research misconduct cases, which is a 2nd level intermediate outcome.

The role of individual researchers is a shared strategic resource. This is because Researchers can act as whistleblowers and play an essential role in curbing research misconduct. Whistleblowers are free to disclose lawfully whatever information supports a reasonable belief of research misconduct, and institutions have a duty not to tolerate or engage in retaliation against good-faith whistleblowers. In addition, institutions must establish policies that acknowledge the whistleblower's contribution to science's integrity and provide effective protection from retaliation. Researchers, also play a crucial role in combating research misconduct by adhering to RCR codes of ethics. Adherence to RCR codes of ethics promotes

ethical behavior among researchers and helps prevent research misconduct. RCR codes of ethics include guidelines for data management, authorship, peer review, and conflicts of interest. Researchers who adhere to these guidelines ensure that their research is conducted with integrity and transparency. Additionally, adherence to RCR codes of ethics can help build trust between researchers and the public by promoting responsible conduct in research. Therefore, researchers have a responsibility to adhere to RCR codes of ethics to promote ethical behavior among themselves and their colleagues and prevent research misconduct (Mohammed & Abdel Salam, 2022).

Two performance drivers come from this shared strategic resource. The first is the whistleblower ratio, which is the number of researchers who report wrongdoing in Egyptian public institutions compared to the benchmark. The second is adherence of RCR codes of ethics ratio, which refers to the ratio of researchers who follow the ethical codes of research conduct and the benchmark. Both performance drivers affect the same outcome, change in research misconduct cases, which is a 2nd level intermediate outcome.

Stakeholders' network capacity is a shared strategic resource. This is because stakeholder collaboration is important in combating research misconduct. Wicked problems, such as research misconduct, are complex and transdisciplinary that involve a large number of stakeholders and are frequently accompanied by high levels of uncertainty and value conflict. A common strategy for addressing wicked problems is a multistakeholder platform based on deliberative dialogue involving a diversity of stakeholders, identified according to their interests (stakes) and cognitive frames, and employing deliberation to develop sustainable solutions. Notably, involving stakeholders can help to promote transparency, accountability, and ethical behavior in addressing wicked problems. Additionally, involving stakeholders can help to bring more visibility to their own activities and support the research team. By involving stakeholders in the problem-solving process, it is possible to develop more comprehensive and long-lasting solutions that take into account the diverse perspectives and interests of all stakeholders involved (National Academies of Sciences & Medicine, 2017).

This shared strategic resource influences two performance drivers. The first is the stakeholder capacity ratio, which compares the actual stakeholder capacity to the benchmark. This performance driver affects the outcome of change in shared information. The second is stakeholders' network saturation ratio, which refers to the ratio between the actual number of stakeholders and resources. Notably, the capacity of stakeholder networks ensures that they

have the resources necessary to address a challenging problem. This can be accomplished if there are sufficient workers and volunteers, information, funds, meeting space, Internet access, office equipment, and supplies. Ultimately, the capacity of stakeholder networks to bring together diverse perspectives and resources to address complex issues can aid in the resolution of wicked problems. This performance driver affects the outcome of change in active citizenship, which is a 5th level intermediate outcome.

Next, public dialogue is a shared strategic resource. Public dialogue can play an important role in combating research misconduct. Tackling wicked problems, such as research misconduct, requires moving beyond traditional component research and involving a wide range of stakeholders in the problem-solving process. public dialogue can help to raise awareness of research misconduct and its consequences and promote best practices in research ethics. Engaging in public dialogue can build trust and credibility with the public and stakeholders, and promote a culture of integrity and responsibility in research (Khan & Sherin, 2019).

Public dialogue generates one performance driver, which is the relative public engagement. This performance driver refers to the ratio between the practice of involving members of the public in agenda-setting, decision-making, and policy-making activities aimed at diminishing research misconduct as a wicked problem and the benchmark. This performance driver affects the outcome of change in active citizenship, which is a 5th level intermediate outcome.

Trust among stakeholders is a shared strategic resource. This is because trust among stakeholders is an important aspect of effective collaboration and wicked-problem-solving. Effective strategies for building trust with stakeholders in public engagement include recognizing which stakeholder groups are of most concern, conducting equitable stakeholder engagement, ensuring clear and honest communication, and being transparent about the role and influence of citizens in decision-making or implementation of solutions. It is important to understand who stakeholders are, what they want, and how to talk to them, in order to better articulate expectations for their involvement and negotiate content. By building trust with stakeholders, it is possible to promote collaboration, transparency, and accountability, and ensure that research and policy development is relevant and responsive to societal needs (Pizzolato & Dierickx, 2021).

Trust among stakeholders generates one strategic resource, which is the relative trust among stakeholders. This performance driver compares the actual trust among stakeholders involved in tackling research misconduct problem to the benchmark. This performance driver affects the outcome of change in active citizenship, which is a 5th level intermediate outcome.

Next, the quality of policy interventions for strengthening research integrity is a shared strategic resource. The quality of policy interventions for strengthening research integrity is an important aspect of ensuring scientific integrity and preventing research misconduct. Policies and procedures for misconduct investigations are needed to prevent the perception or reality of a "witch hunt" and ensure that investigations are conducted fairly and transparently. By promoting transparency, accountability, and ethical behavior in research, it is possible to build trust with stakeholders and ensure that research is conducted in a responsible and ethical manner that benefits society as a whole (National Academies of Sciences & Medicine, 2017).

This strategic resource generates one performance driver, which is the aptitude of policy interventions to combat RM. This performance driver affects the outcome of change in the effectiveness of responding to breaches of research integrity that subsequently influence change in RM cases, which is a 2nd level intermediate outcome.

Next, population mindset is a shared strategic resource. This is because a population mindset refers to a way of thinking that considers entire communities and populations, rather than just individuals. It is worth noting, a population mindset can be applied to combating research misconduct by considering the collective impact of such misconduct on the scientific community and society as a whole. This strategic resource generates one performance driver, which is the percentage of proactive citizens acting responsibly toward research misconduct problem. This performance driver refers to the comparison between the percentage of proactive citizens acting responsibly toward research misconduct and the benchmark. This performance driver affects the outcome of change in citizens' participation in public dialogue.

Perceived transparency is a shared strategic resource. This because perceived transparency among stakeholders is crucial in promoting research integrity and preventing research misconduct (National Academies of Sciences & Medicine, 2017). This strategic resource generates one performance driver, which is relative perceived transparency, which compared the actual perceived transparency among stakeholders and the benchmark. This performance driver affects the outcome of change in stakeholders' network capacity.

Next, shared information is a strategic resource. This is because sharing information is important among stakeholders and the public. Sharing information among stakeholders has several benefits. Effective information sharing can generate more robust data s to solve wicked problems. Engaging stakeholders early on can lead to better planned, informed, and accountable policies, projects, programs, and services. This strategic resource generates one performance driver, which is shared information ratio, which compared the actual shared information among all the stakeholders and the benchmark. This performance driver affects the outcome of change in trust and social capital, which is a 6th level intermediate outcome.

Network legitimacy is a shared strategic resource. It is worth noting that by involving stakeholders in the network and building trust among them, the legitimacy of the network can be maintained, and the network can be more effective in achieving its goals. This strategic resource generates one performance driver, which is network legitimacy ratio, which refers to the ratio between the actual network legitimacy and the desired one. This performance driver affects the outcome of change in perceived transparency.

Next, the effectiveness of adopted public policy interventions to face research misconduct problem is a shared strategic resource. The effectiveness of adopted public policy interventions to face research misconduct problem is important because research misconduct can lead to false or misleading research, which can have negative consequences on science and society. Therefore, public policy interventions to face the research misconduct problem in Egypt should focus on establishing clear definitions, policies, and procedures for misconduct investigations, providing practical training about how to avoid plagiarism, and encouraging whistleblowers to report misconduct (Moustafa, 2019). This strategic resource generates one performance driver, the percentage of enforced public policy interventions. This performance driver affects the two outcomes, which are a change in the quality of policy interventions for strengthening research integrity and a change in network legitimacy.

Intentional and unintentional research misconduct cases such as fabrication or falsification of data, and plagiarism are all considered to be shared strategic resources. This is because misconduct in research is regarded as a serious issue due to the damage it causes to the scientific enterprise, and the erosion of public confidence in government-funded research. Research misconduct can have severe repercussions for the careers of young scientists who collaborate with those who engage in malpractices. Therefore, it is important for researchers and institutions to uphold ethical standards and take measures to prevent and address research

misconduct to maintain the integrity of the scientific enterprise and ensure public trust in research (Mohammed & Abdel Salam, 2022). First, the strategic resource named research misconduct cases generates one performance driver: the research misconduct cases ratio. This performance driver refers to the ratio of actual to desired cases of research misconduct in Egyptian public academic institutions. Second, the fabrication and falsification of strategic resource data generates one performance driver: the relative quality assurance of data. This driver is the ratio between the actual and desired accurate and reliable research data produced by Egyptian researchers working in public academic and research institutes. Third, strategic resource plagiarism generates one performance driver: the relative originality of publication. The relative originality of a publication is one performance driver generated by strategic resource plagiarism. This driver refers to the ratio between the actual number of original publications produced by Egyptian institutes and the benchmark. These three performance drivers affect one outcome: the change in the quality of publications, which is a 1st level intermediate outcome.

Next, the quality of publications is a shared strategic resource. Ensuring the quality of produced publications is important for maintaining the integrity of the scientific enterprise and ensuring that research results are accurate and reliable. This strategic resource generates two performance drivers: relative reproducibility and robustness of research and relative citation ratio. Relative reproducibility and robustness of research refers to the ratio between the actual number of research papers that can be replicated and the benchmark. This performance driver affects one outcome: the number of research articles withdrawn due to misbehavior that compromises research validity. In addition, the relative citation ratio is generated by two strategic resources: the quality of publications and publications in highly ranked journals. This performance driver affects one outcome, which is the change in the image of Egyptian public academic and research institutions.

Retracted publications is a shared strategic resource that generates one performance driver, which is the percentage of retracted publications. This performance driver refers to the proportion of research papers that have been withdrawn from publication due to malpractices that compromise the integrity of the research. This performance driver affects the same outcome, which is change in image of Egyptian public academic and research institutions.

Next, Foreign students is a shared strategic resource. Foreign students play a significant role in Egypt's public universities. Foreign students can bring cultural diversity to the

university, enriching the educational experience for all students. Additionally, international students can contribute to Egypt's economy by paying tuition and living expenses. This strategic resource generates two performance drivers: the foreign students' enrollment ratio and the enrollment capacity saturation ratio. The first performance driver refers to the ratio between the actual foreign students enrolled in public universities in Egypt and the target number of foreign students. The second driver refers to the ratio between the number of students enrolled and university teaching resources. These resources include academic staff, administrative staff, laboratories, classrooms, academic libraries, technology, and counseling services. Both performance drivers affect one outcome, which is the change in the cash flow.

Cash flow is a shared strategic resource. This is because cash flow is important for public universities to advance their mission and maintain the quality of education and training they provide. Higher capacity investments (such as more efficient research equipment, administrative programs and procedures, online education, etc.) are crucial to improve resource efficiency and research quality. Additionally, liquidity may be used to increase the number of academic staff members, who will grow intellectual capital and, as a result, may improve the caliber of both research and education (Cosenz, 2022). Cash flow as a shared strategic resource generates one performance driver: the relative cashflow. This performance driver refers to the ratio between the actual and the desired cash flow generated by public academic and research institutions. This driver influences one outcome: the change in government spending on scientific research. Government spending on scientific research refers to the amount of money allocated by the government to support research and development activities in various fields.

Next, the image of Egyptian public academic and research institutes is a shared strategic resource. The image of Egyptian public academic and research institutes is important for several reasons. Firstly, a positive image can attract foreign students, researchers, and lecturers to the establishment, which can increase the competitiveness of the university in attracting research funding and collaborations. Secondly, a positive image can raise the visibility, profile, status, and reputation of the university and its library within the university and beyond, which can improve the quality of education and research and increase the impact of the university on society. Thirdly, a positive image can highlight the academic publishing performance of the university, which can increase the visibility and impact of the university's research output and improve its ranking in global academic rankings. The image of Egyptian public academic and research institutes as a shared strategic resource generates one performance driver, which is

relative image of public institutions. This driver refers to the ratio between the actual and the desired image of public institutions. This driver influences two outcomes which are change in research funding opportunities and change in international students' enrollment.

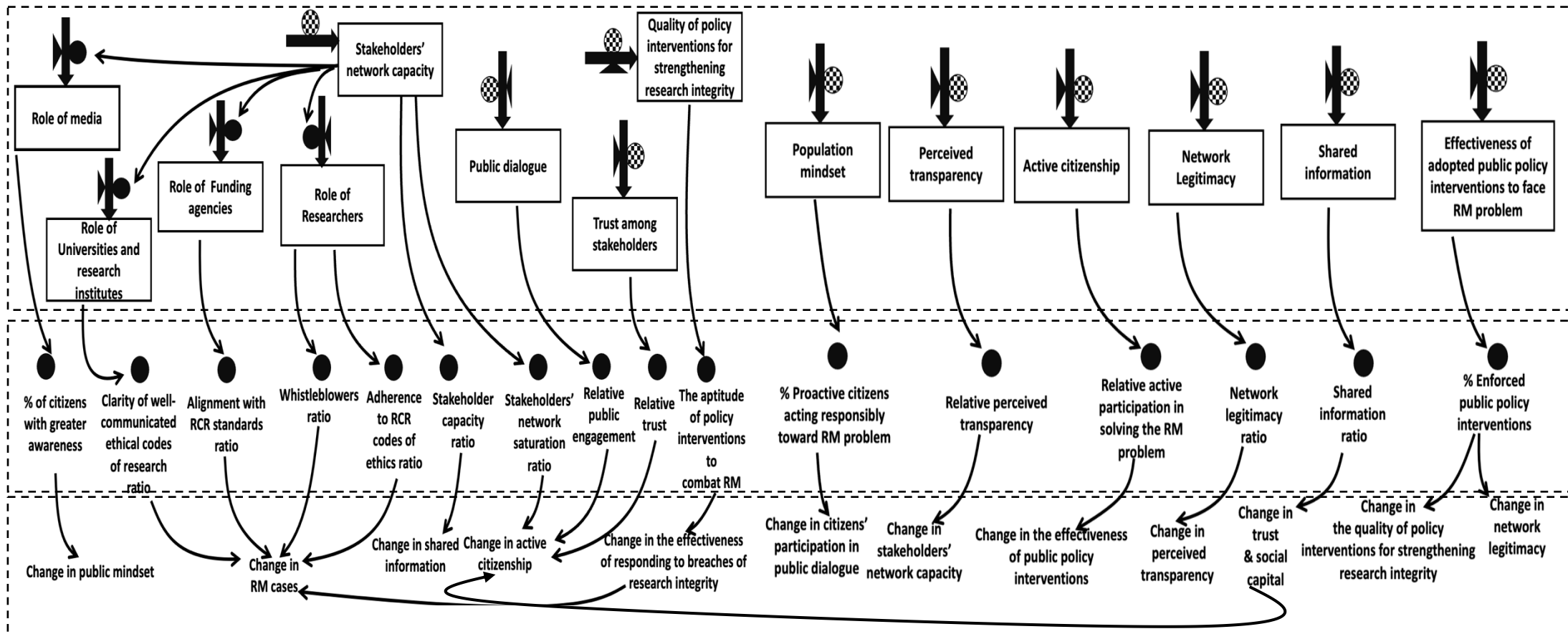
Research funding opportunities is a shared strategic resource. This is because scientific research in Egypt benefits greatly from opportunities for obtaining funding for research projects, equipment, and personnel, all of which enhance research quality and make universities more attractive destinations for incoming research funding and partnerships. Universities can increase their research funding opportunities by applying for grants and scholarships, engaging in collaborative projects, and improving academic publishing performance. Research funding opportunities as a shared strategic resource generates one performance driver: the percentage of accepted grants, which refers to the ratio between the actual number of reviewed grant applications awarded funding and the benchmark. This percentage is calculated annually and is known as the success rate. The success rate can vary depending on the funding organization, grant type, and funding competition. The likelihood of receiving funding may also depend on the caliber of the research proposal, the qualifications of the researcher, and the proposal's compatibility with the funding agency's priorities. It is important to note that a low success rate does not necessarily indicate that a research proposal is of poor quality, but rather that competition for funding is fierce and the proposal may need to be revised and resubmitted in the future. The percentage of accepted grants as a performance driver affects one outcome, which is change in the number of top journal publications.

Government expenditure on scientific research is a shared strategic resource. This strategic resource is considered to be important for several reasons. Firstly, scientific research can lead to the development of new technologies, products, and services that can improve the quality of life and contribute to economic growth and competitiveness. Secondly, scientific research can address societal challenges such as climate change, public health, and national security, which require long-term and sustained investment. Thirdly, government expenditure on scientific research can support the training and development of a highly skilled workforce, which can contribute to innovation and economic growth. Fourthly, government expenditure on scientific research can attract private sector investment and partnerships, which can leverage public investment and accelerate the translation of research into practical applications. Finally, government expenditure on scientific research can support the development of a vibrant and diverse scientific community, which can foster collaboration, creativity, and innovation. When

the government spends money on scientific research, it invests in capacities like research tools, administrative programs and procedures, online learning, etc. Also, it is very important for governments to spend money on hiring reputable academic staff who can improve the quality of education and, as a result, bring in more international students (Cosenz, 2022). Government expenditure on scientific research as a shared strategic resource generates one performance driver, which is the percentage of government spending on scientific research that refers to the ratio between of the national budget allocated to research and development (R&D) activities and the benchmark. This performance driver influences two outcomes, which are change in the cash flow and the change in the cultural, economic, and innovative advancement.

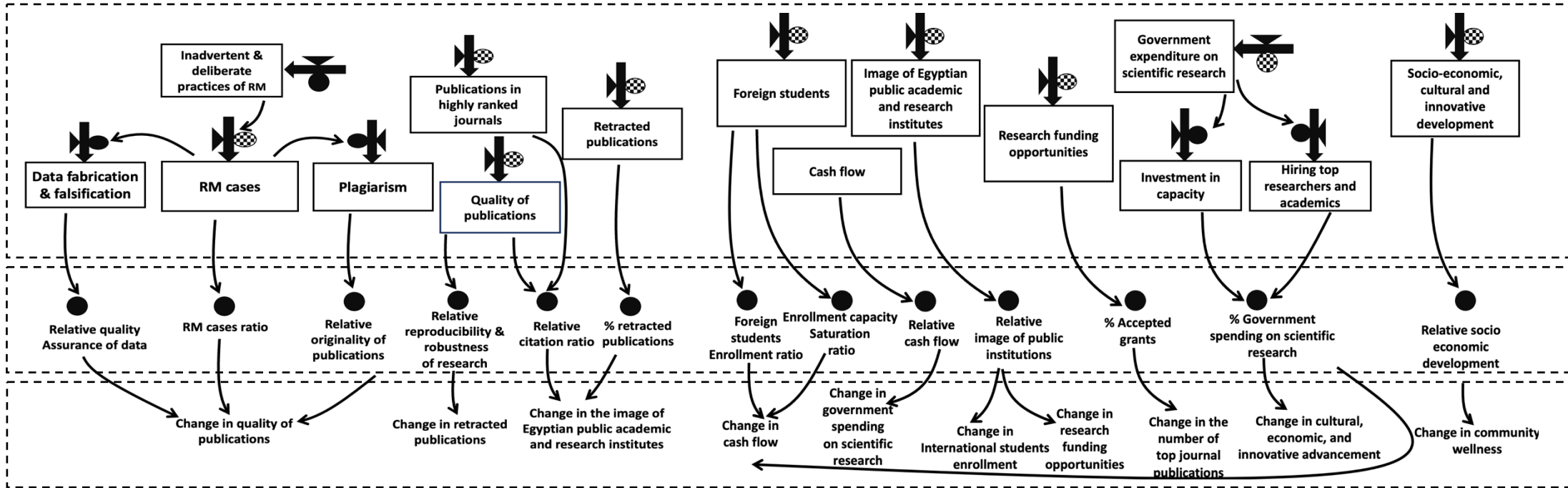
Finally, socio-economic, cultural and innovative development is a shared strategic resource. This strategic resource generates one performance driver, which is relative socio-economic development. This refers to the ratio between actual and desired socio-economic development. This performance driver affects the final outcome, which is change in community wellness.

Figure 26: DPG chart for promotion of research integrity in Egyptian public academic and research institutions



Source: Created by the researcher using Microsoft® PowerPoint Slide Presentation Software

Figure 27: DPG chart for promotion of research integrity in Egyptian public academic and research institutions



Source: Created by the researcher using Microsoft® PowerPoint Slide Presentation Software

5.5. Causal Loop Diagram illustrating the promotion of research integrity in Egyptian public institutions

The CLD for research misconduct problems in Egyptian public institutions is depicted in Figure 28. This diagram depicts 11 distinct feedback loops that influence research fraud. Some of these feedbacks are classified as either reinforcing (**R**), which strengthens efforts to combat research misconduct, or balancing (**B**), which balances efforts to combat research misconduct in Egyptian public institutions. Each of these loops is labelled and further explained below. This diagram, also, includes delays, which are depicted as two short parallel lines intersecting in the center of an arc. Delays increase the expressiveness of the diagram, as the effects of time can be incorporated. If there is no delay on an arc, the correlative effect of one concept has an immediate effect on the other. Therefore, the absence of a delay in an arc indicates that time has no bearing on the influence of one concept on another. On the other hand, if there is a delay, the correlative effect is not immediately applied.

The reinforcing loop (**R1: Role of Media**) is crucial as it shows that the media play a key role in combating research misconduct. It has the potential to raise awareness among the public, encompassing both researchers and the general populace, regarding corruption and has the capacity to fundamentally alter how the public perceives the RM issue in Egypt. It depicts that an increase in stakeholders' network capacity leads to increase responsibilities of media. An increase in the responsibilities of media results in an increase in the percentage of impacted citizens by RCR initiatives. An increase in % of influenced citizens by RCR initiatives leads to a change in the population mindset and the number of proactive active citizens ready to act responsibly towards the RM problem in Egyptian public academic and research institutes. This leads to fostering a public dialogue that results in an increase in relative engagement of the public with different stakeholders and nurturing active citizenship. An improvement in active citizenship results in relative active participation in solving the RM problem in Egypt. This leads to an increase in the effectiveness of adopted public policy interventions to face the RM problem in universities and research institutes. An improvement in the effectiveness of public policy measures taken to combat RM results in an increase in the percentage of enforced public policy interventions to combat RM. This leads to network legitimacy and a further increase in the network legitimacy ratio. An improvement in the network's legitimacy ratio leads to

improved perceived transparency among citizens. This leads to an increase in relative perceived transparency, further improving stakeholders' network capacity.

The reinforcing loop (**R2: Role of Universities and Research Institutions**) is a vital loop as it illustrates the fact that universities should communicate research ethics codes to their researchers and students. These codes should include guidelines for responsible research conduct, such as honesty in all scientific communications and accurately reporting data, results, methods, and procedures. It depicts that an increase in stakeholders' network capacity leads to an increase role of universities and research institutions towards research misconduct problem. The increased responsibilities of Egyptian institutes lead to an increase in the clarity of well-communicated ethical codes of research ratio. The more the clarity research codes of ethics ratio, the less the research misconduct cases. The less the research fraud cases the less the research misconduct cases ratio. The lower the ratio of research misconduct cases, the higher the quality of publications produced. The more the quality of publications the more the relative citation ratio. When the ratio of relative citations rises, the image of Egyptian public academic and research institutions improves. This improves the relative image of public institutions, resulting in increased enrollment of international students in public universities. An increase in foreign student enrollment increases the percentage of international students enrolled in public universities, which improves cash flow. Increased cash flow leads to increased relative cash flow, which leads to increased government spending on scientific research. The more the government spending on scientific research, the more the socio-economic cultural wellness, which further improves relative socio-economic development and community wellness. The greater the level of community wellness, the greater the level of trust and social capital, which in turn increases relative trust. The greater the relative level of trust, the greater the level of active citizenship. Improvement in active citizenship results in relative active participation in solving the research misconduct problem in Egypt. This leads to an increase in the effectiveness of adopted public policy interventions to face the research misconduct problem in universities and research institutes. An improvement in the effectiveness of public policy measures taken to combat research misconduct results in an increase in the percentage of enforced public policy interventions to combat research misconduct. This leads to network legitimacy and a further increase in the network legitimacy ratio. An improvement in the network's legitimacy ratio leads to improved perceived transparency among citizens. This leads to an increase in relative perceived transparency, further improving stakeholders' network capacity.

The reinforcing loop (**R3: Role of Funding Agencies**) is important as it shows the fact that funding agencies are accountable for public safety, which can be jeopardized by the consequences of research misconduct. They fund and participate in research, so they should encourage research and academic institutions to promote research integrity by adhering to RCR standards. The loop depicts that an increase in stakeholders' network capacity, which leads to increase role of funding agencies in curbing research misconduct problem. The more the role of funding agencies the more the ratio of alignment with RCR standards. This will further reduce research misconduct cases. Fewer instances of research misconduct lead to a lower ratio of research misconduct cases. Consequently, this leads to an enhancement in the quality of publications from public universities, ultimately resulting in an increase in the relative citation ratio. The image of Egyptian public academic and research institutions improves as the ratio of relative citations rises. This results in an increase in international student enrollment at public universities. Increased foreign student enrollment raises the percentage of international students enrolled in public universities, improving cash flow. Increased cash flow increases relative cash flow, which increases government spending on scientific research. The greater the government's investment in scientific research, the greater the socioeconomic and cultural wellness, which improves relative socioeconomic development and community wellness. The higher the level of community wellness, the higher the level of trust and social capital, and thus the higher the level of relative trust. The higher the level of trust, the higher the level of active citizenship. Improvements in active citizenship lead to more active participation in solving Egypt's research misconduct problem. This increases the effectiveness of public policy interventions to address the research misconduct problem in universities and research institutes. An increase in the percentage of enforced public policy interventions to combat research misconduct results from an improvement in the effectiveness of public policy measures taken to combat research misconduct. This results in increased network legitimacy and the network legitimacy ratio. Increasing the network's legitimacy ratio improves citizens' perceptions of transparency. This improves stakeholders' network capacity by increasing relative perceived transparency.

The reinforcing loop (**R4: Role of Researchers**) is vital as it clarifies the fact that researchers must uphold shared values in their work and behavior, follow good scientific practices, and adhere to accepted professional codes and norms. The loop depicts that an increase in stakeholders' network capacity leads to an increase in the role of researchers in combating research misconduct problem. The greater the researcher's responsibility, the greater

the adherence to RCR codes of ethics ratio and the less research misconduct cases. The less the research misconduct cases the less the research misconduct cases ratio. The lower the ratio of research misconduct cases, the higher the quality of publications produced. The more the quality of publications the more the relative citation ratio. When the ratio of relative citations rises, the image of Egyptian public academic and research institutions improves. The improvement of the relative image of public institutions, resulting in increased enrollment of international students in public universities. An increase in foreign student enrollment increases the percentage of international students enrolled in public universities, which improves cash flow. Increased cash flow leads to increased relative cash flow, which leads to increased government spending on scientific research. The more the government spends on scientific research, the more socio-economic cultural wellness, further improving relative socio-economic development and community wellness. The greater the level of community wellness, the greater the level of trust and social capital, increasing relative trust. The greater the relative level of trust, the greater the level of active citizenship. Improvement in active citizenship results in relative active participation in solving the research misconduct problem in Egypt. This leads to an increase in the effectiveness of adopted public policy interventions to face the research misconduct problem in universities and research institutes. An improvement in the effectiveness of public policy measures taken to combat research misconduct increases the percentage of enforced public policy interventions to combat research misconduct. This leads to network legitimacy and a further increase in the network legitimacy ratio. An improvement in the network's legitimacy ratio leads to improved perceived transparency among citizens. This leads to an increase in relative perceived transparency, further improving stakeholders' network capacity.

The reinforcing loop (**R5: Prompting Trust**) depicts that an increase in stakeholders' network capacity leads to an increase in network capacity ratio and a further rise in shared information among all stakeholders. An increase in shared information leads to an increase in the shared information ratio. This leads to an improvement in trust and social capital and a further improvement in relative trust and social capital. An improvement in trust and social capital leads to an enhancement in active citizenship. An increase in active citizenship leads to a more dynamic approach to addressing Egypt's research misconduct issue through active participation in solving the research misconduct problem in Egypt. As a result, public policy initiatives adopted to address the research misconduct problem in universities and research institutions are more effective. Enhancing the effectiveness of public policy measures to curb research misconduct results in an increase in the percentage of enforced public policy

interventions to fight research misconduct. This leads to network legitimacy and a further increase in the network legitimacy ratio. This leads to a rise in the legitimacy ratio of the network, which raises citizens' perceptions of transparency. This results in an increase in relative perceived transparency, thus enhancing the network capacity of stakeholders.

The balancing loop **(B1: Stakeholders' Network Saturation)** depicts that an increase in stakeholders' network capacity leads to an increase in stakeholders' network capacity saturation that further leads to a reduction in active citizenship. Reducing active citizenship lowers relative active participation in solving the research misconduct problem in Egypt. This leads to decreased effectiveness of adopted public policy interventions to face the research misconduct problem. A reduction in the effectiveness of public policy measures taken to combat research misconduct results in a decrease in the percentage of enforced public policy interventions to combat research misconduct. This leads to less network legitimacy and a further reduced network legitimacy ratio. Reducing the network's legitimacy ratio leads to lowering perceived transparency among citizens. This leads to a decline in relative perceived transparency, further reducing stakeholders' network capacity. The balancing loop B1 can be counteracted or corrected by strengthening the reinforcing loops R2 and R5. Reinforcing loops R2 and R5 can be strengthened by investing more resources in promoting trust among stakeholders in order to foster active citizenship.

The reinforcing loop **(R6: RM Policy Interventions)** is important as it shows that research misconduct policy interventions are vital in preventing research misconduct, which threatens public health and safety and undermines public confidence in science. They are critical for dealing with research integrity violations. These interventions should prevent false or misleading research, such as results fabrication, manipulation, or plagiarism. The loop depicts that an increase in the effectiveness of adopted public policy interventions to face RM problem results in an increase in the quality of policy interventions for strengthening research integrity. The more the quality of policy interventions, the more the aptitude of policy interventions to combat research misconduct. The more the aptitude of policy interventions, the more the effectiveness of responding to breaches of research integrity that further results in reduction in research misconduct cases. The less the research misconduct cases the less the research misconduct cases ratio. The lower the ratio of research misconduct cases, the higher the quality of publications produced. The more the quality of publications the more the relative citation ratio. When the ratio of relative citations rises, the image of Egyptian public academic

and research institutions improves. The improved the relative image of public institutions, leads to increased enrollment of international students in public universities. An increase in foreign student enrollment increases the percentage of international students enrolled in public universities, which improves cash flow. Increased cash flow leads to increased relative cash flow, which leads to increased government spending on scientific research. The more the government spends on scientific research, the more socio-economic cultural wellness, further improving relative socio-economic development and community wellness. The greater the level of community wellness, the greater the level of trust and social capital, which in turn increases relative trust. The greater the relative level of trust, the greater the level of active citizenship. Improvement in active citizenship results in an increase in the relative active participation in solving the research misconduct problem in Egypt. This leads to an increase in the effectiveness of adopted public policy interventions to face the research misconduct problem in universities and research institutes. An improvement in the effectiveness of public policy measures taken to combat research misconduct results in an increase in the percentage of enforced public policy interventions to combat RM. This leads to network legitimacy and a further increase in the network legitimacy ratio. An improvement in the network's legitimacy ratio leads to improved perceived transparency among citizens. This leads to an increase in relative perceived transparency, further improving stakeholders' network capacity.

The balancing loop (**B2: Foreign Students Enrollment Capacity Saturation**) loop depicts that an increase in foreign students' enrollment in public universities results in an increase in enrollment capacity saturation ratio. The more the enrollment capacity saturation ratio, the less the cashflow. Reduced cash flow results in decreased relative cash flow, which causes a decrease in government spending on scientific research. The less the government spending on scientific research, the less the socio-economic cultural wellness, which further dampen relative socio-economic development and community wellness. The lower the level of community wellness, the lower the level of trust and social capital, which decreases relative trust. The lower the level of relative trust, the lower the level of active citizenship. Deterioration in active citizenship reduces relative participation in solving RM problem. This decreases the effectiveness of adopted public policy interventions in universities and research institutes to combat the research misconduct problem. The less effective the public policy measures taken to combat research misconduct, the lower the proportion of public policy interventions that are enforced to combat research misconduct. This results in diminished network legitimacy and a further decline in network legitimacy ratio. A decline in a network's legitimacy ratio diminishes

citizens' perception of its transparency. This results in a decline in perceived relative transparency, which further diminishes the network capacity of stakeholders. The balancing loop B2 can be counteracted or corrected by strengthening the reinforcing loop R2, R3, R4 and R6. These reinforcing loops can be strengthened by allocating more resources to reduce cases of research misconduct and, as a result, improve the image of public academic institutions.

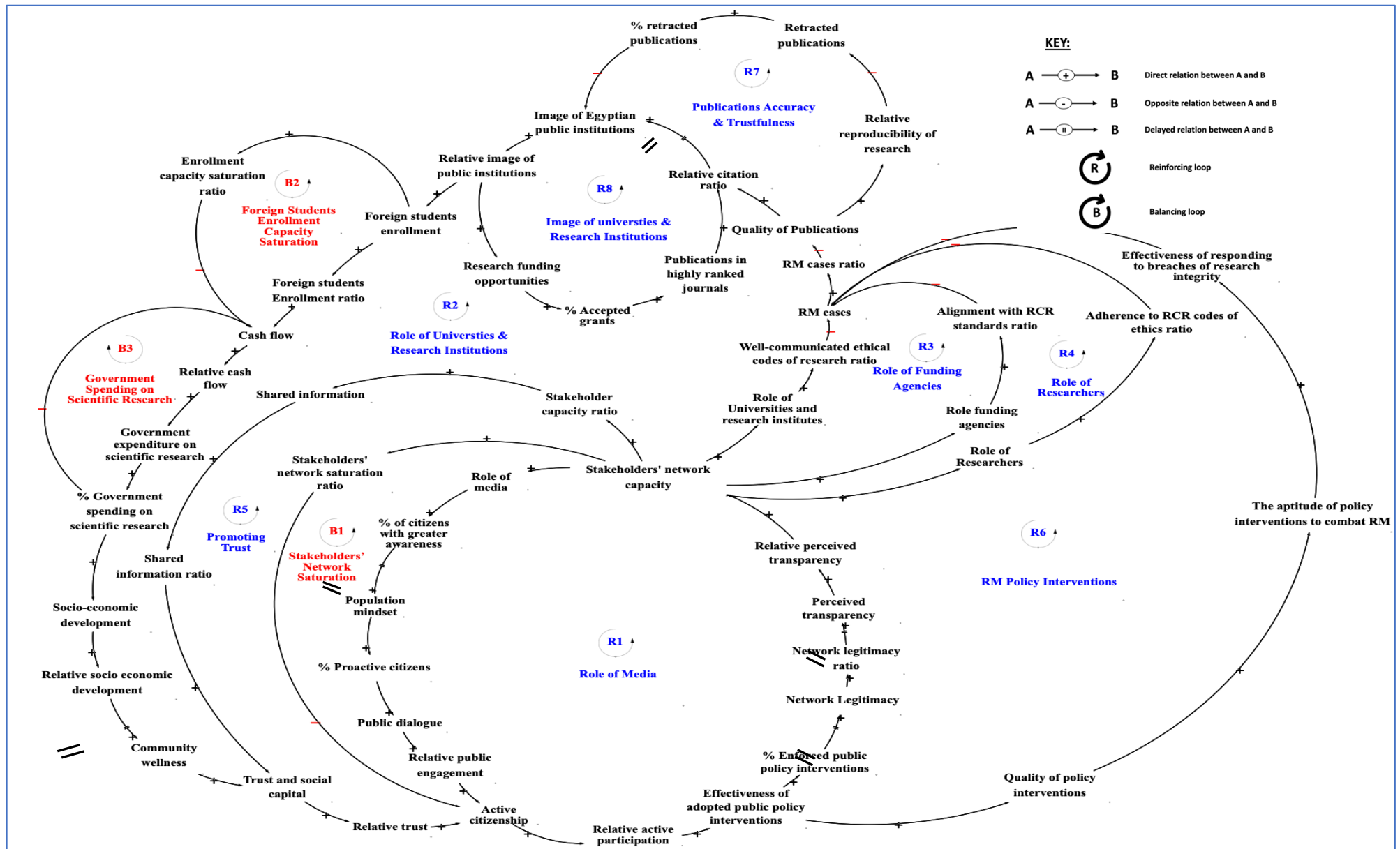
The balancing loop (**B3: Government Spending on Scientific Research**) shows that as government spending on scientific research increases, cash flow decreases. Less cash flow means fewer relative cash flow, which results in less money being spent on scientific research by the government. The percentage of government spending on scientific research decreases as government spending on research decreases. The balancing loop B3 can be counteracted or corrected by strengthening the reinforcing loop R2, R3, R4 and R6. These loops can be made stronger by putting more money into reducing cases of research misconduct and, in turn, improving the image of public academic and research institutions.

The reinforcing loop (**R7: Publications Accuracy and Trustfulness**) depicts that an increase in quality of publications results increase in relative reproducibility of research. The greater the reproducibility of research, the fewer publications are retracted. The less the retracted publications, the less the % of retracted of publications. The lower the percentage of retracted publications, the greater the enhancement to the reputation of universities and research institutions. The better the image of universities, the better the relative image of public institutions. This leads to an increase in enrollment of international students in public universities. An increase in foreign student enrollment increases the percentage of international students enrolled in public universities, which improves cash flow. Increased cash flow leads to increased relative cash flow, which leads to increased government spending on scientific research. The more the government spends on scientific research, the more socio-economic cultural wellness, further improving relative socio-economic development and community wellness. The greater the level of community wellness, the greater the level of trust and social capital, which in turn increases relative trust. The greater the relative level of trust, the greater the level of active citizenship. Improvement in active citizenship results in relative active participation in solving the research misconduct problem in Egypt. This leads to an increase in the effectiveness of adopted public policy interventions to face the research misconduct problem in universities and research institutes. An improvement in the effectiveness of public policy measures taken to combat research misconduct results in an increase in the percentage

of enforced public policy interventions to combat RM. This leads to network legitimacy and a further increase in the network legitimacy ratio. An improvement in the network's legitimacy ratio leads to improved perceived transparency among citizens. This leads to an increase in relative perceived transparency, further improving stakeholders' network capacity. An increase in the stakeholders' network capacity results in an increase in the role of universities and research institutions towards RM problem. The increase in responsibilities of Egyptian institutes leads to an increase in the clarity of well-communicated ethical codes of research ratio. The more the clarity research codes of ethics ratio, the less the RM cases. The less the RM cases the less the research misconduct cases ratio. The lower the ratio of research misconduct cases, the higher the quality of publications produced.

The reinforcing loop (**R8: Image of Universities and Research Institutes**) illustrates that the relative image of public institutions improves as the image of public universities and research institutes improves. The greater the relative image of public institutions, the greater the opportunities for research funding. This increases the percentage of accepted grants, which in turn increases the number of publications in highly ranked journals. The greater the number of articles published in highly ranked journals, the greater the relative citation ratio, which further enhances the reputation of public institutions.

Figure 28: Casual loop diagram illustrating the promotion of research integrity in Egyptian public institutions



Source: created by the researcher by using Vensim PLE 9.3.5. software

CHAPTER FIVE CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Scientific research improves the quality of life for citizens and is increasingly viewed as a significant growth catalyst and indicator. To preserve the integrity of research, studies must be conducted in a way that instills confidence in both the methodologies used and the results obtained. Researchers are expected to adhere to the ethical, legal, and professional standards regulating research. Misconduct in research is detrimental to the scientific community and the broader public. Because of how profoundly it has permeated the research culture and how it threatens the accuracy of scientific findings, it is regarded as a particularly wicked issue. Fabrication and falsification add wrong information to scientific papers, which wastes money and puts patients at serious risk. Plagiarism, on the other hand, takes credit away from the original authors. Fabrication, falsification, and plagiarism (FFP) hurt the credibility of scientific study and the reputations of research organizations. Even though the number of cases of wrongdoing in research is going up in Egypt, there aren't any strong laws that make it illegal to break the rules of scholarly conduct and ethics in scientific research.

The world around us is undergoing rapid transformation. It has never before experienced such swift change with such global consequences. Universities are no exception. They are undergoing rapid and often turbulent change. Higher education is rapidly evolving, and its future is uncertain. The constant changes in society put more pressure on higher education institutions, forcing them to quickly change how they create knowledge and new ideas and how they teach. Since higher education is getting more complicated and uncertain, this shows that wicked problems can't be solved by a single body working alone. Consequently, collaboration among various parties is required to resolve such complex issues. Although collaborative governance is an important instrument for addressing wicked problems in Egyptian public institutions, such as research misconduct, it has gotten less attention in Egypt's higher education system.

In that regard, this instrumental research study has two goals. First, look into the various reasons that can lead to FFP in Egypt's public academic and research institutes. Second, to cast light on how collaborative governance could aid in the development of practical measures to prevent research fraud in Egypt. To achieve the aforementioned goals, semi-structured interviews were conducted with Egyptian graduate students enrolled in graduate programs at

Egyptian public universities, alumni who completed graduate studies there, and academic faculty members working at various Egyptian public universities in various governorates with a variety of backgrounds and career stages. In addition, data were obtained by creating and distributing an online survey to a purposive sample of Egyptian researchers from different governorates. Afterwards, the dynamic performance governance framework was applied to comprehend how universities and research institutes in Egypt utilize shared strategic resources, thereby enhancing the integrity of their research. After depicting the dynamic performance governance (DPG), causal loop diagrams were developed to depict the structure of the feedback system. It illustrated how these variables and contextual factors were employed to develop a dynamic performance perspective of Egyptian universities and research institutions.

Based on the findings of the current study, both academic and research organizations in Egypt are now dealing with a wicked problem called "research misconduct." The researcher noted that the existence of at least three profoundly distinct narratives regarding scientific misconduct suggests that it will continue to be a source of conflict and debate for years to come. According to the first explanation, scientific misconduct is essentially an issue of the individual. A second, more moderate narrative asserts that scientists are influenced by the institutions that support them, as proposed by those who advocate for greater external control of science. A third possibility is that instances of scientific fraud are symptoms of a larger problem that surpasses the individual or institution and affects the practice of contemporary science as a whole. In addition, the current study shed the light on the fact that this complicated issue is caused by a number of linked factors that can be roughly put into five groups: individual, structural, organizational culture, and situational factors. In addition, the advent of artificial intelligence (AI) has created new hurdles in maintaining research integrity. Artificial intelligence-generated works can result in data falsification and the fabrication of non-existent results, posing severe problems to the scientific and medical communities. Similarly, AI chatbots can generate high-quality articles that easily avoid plagiarism detection and can be used to quickly generate research studies.

5.2 Recommendations

First, all stakeholders attempting to combat the research fraud problem should theoretically and practically apply both dynamic performance management (DPM) and DPG for the following reasons. **[a]** This framework can be used for addressing difficult challenges in public policy and management; **[b]** it can aid in balancing the competing interests of

stakeholders in resolving wicked policy issues; **[c]** it provides policymakers with a more comprehensive, time-bound understanding of how to approach difficult challenges; **[d]** it defines policy design as a process aimed at supporting long-term outcomes in a given community. This encourages stakeholders to collaborate on policies that will allow them to engage in the same system by playing complementary roles in utilizing shared goods and other strategic resources at both the community and organizational levels; **[e]** this comprehensive and in-depth analysis has the potential to change different viewpoints and coordinate different policies to combat research misconduct. Therefore, this framework can be utilized to address multi-level governance and wicked problems within a scientific research system.

Second, the Egyptian government should set clear policies and harsh penalties to prohibit research misconduct malpractices. The government should ensure that policies controlling research integrity are not merely in place, but that they are followed. The government may evaluate the seriousness of the misconduct, the impact of misconduct on the research and the research community, and the efforts made by the researcher to remediate the misconduct when imposing sanctions for research misconduct. The penalties for scientific fraud can include losing a job, having research funding terminated, or being disqualified from receiving federal funds.

Third, Egyptian public universities and research institutes must educate their researchers, faculty, and students on the various types of research misconduct. In spite of the fact that prevention of research misconduct is preferable to punishments or solutions, it needs more attention from the Egyptian public academic and research institutions. Increasing researchers' awareness of research misconduct is essential for fostering ethical research practices. This can be done through: **[a]** Regular training on research ethics and responsible research conduct. This can assist researchers in understanding the significance of ethical research practices; **[b]** Institutions should have measures in place to protect whistleblowers and encourage researchers to report cases of research misconduct; **[c]** Institutions must develop and communicate well-defined rubrics and norms that characterize irresponsible research practices; **[d]** universities need to foster an ethical climate that encourages responsible research practices by developing thorough and discreet procedures for examining allegations of research misconduct.

Fourth, to avoid research misconduct, plagiarism detection technologies should be able to recognize AI-generated content. Plagiarism detection software should develop AI plagiarism

analyzers capable of detecting AI-generated content using advanced AI to detect even the smallest textual variations. This can be accomplished by analyzing various textual characteristics, such as the use of a specific language, a particular format or structure, and the repetition of specific keywords. Therefore, to identify AI-generated work and stop research misconduct, researchers and institutions should be urged to use AI plagiarism checkers.

Fifth, promotional policies should place more emphasis on publishing quality than quantity. In academia, "publish or perish" has become a cliché. When it comes to advancing in one's academic career, criteria such as the number of publications rather than their quality and/or publication in prestigious journals are crucial. Therefore, evaluating the research performance of a researcher is a difficult job that should look at productivity, scientific impact, and the quality of the study. It is also advised that other characteristics be considered when rating the research output of individuals. Quantitative parameters are not quantified by bibliometrics include teaching, mentoring, participation in collective tasks, and partnership building, as well as the number of patents, speaker invitations, international contracts, distinctions, and technological transfers. A balanced blend of qualitative (experts) and quantitative (bibliometrics) is the optimum course of action.

Sixth, investing more heavily in higher education is crucial for Egypt to fight the practices of research misconduct. Notably, if the government is serious about combating scientific misconduct, it must invest in public higher education. Investment in higher education will result in socio-economic, cultural, and innovative development as well as citizens' wellness.

Lastly, the Egyptian government should keep a permanent database of research misconduct instances. A permanent record of research misconduct cases can assist in capturing the names of those involved, the specifics of the misbehavior, and any repercussions that resulted from it. Additionally, a permanent record of cases of research misconduct can deter future misconduct by making it obvious that such behavior will not be tolerated. Also, maintaining a permanent record of cases of research misconduct can increase scientific community transparency and promote accountability. It, likewise, can assist in identifying patterns of misbehavior and areas where more education or supervision may be required. Additionally, it will assist institutions in complying with government rules and guidelines.

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APPENDICES

APPENDIX A: SURVEY QUESTIONS



UNIVERSITÀ
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DEALING WITH RESEARCH MISCONDUCT IN EGYPTIAN PUBLIC ACADEMIC INSTITUTIONS

A Dynamic Performance Governance Approach to Enhance Collaboration

Section A: Demographic Background & Research Experience

Please answer the following questions:

1- What is your current university or research institution?

2- How long have you been working as a researcher at your institution?

Please mark “√” on the box that corresponds to your answer:

3- What is your gender?

Male Female

4- What is your current position?

Master student PhD student Teaching Assistant
 Lecturer Researcher Assistant Professor Associate Professor
 Professor

5- What is your field of knowledge (scientific background)?

Medicine Pharmacy Engineering Other (lease specify): _____

Please answer the following questions:

6- What is your specialization or your research experience?

7- What is your total number of publications? (optional)

Section B: Perceived Prevalence of Scientific Misconduct in the Workplace

Please mark “√” on the box that corresponds to your answer:

8- From your own point of view, what are the most common misconduct practices in your organization using a scale of 0= never to 5= most often:

Response options	0	1	2	3	4	5
A- Plagiarism of ideas: The theft of another person's idea or hypothesis expressed anyplace.						
B- Text plagiarism: is sometimes known as "copy-paste" or "word-to-word" authoring.						
C- Self-plagiarism occurs when a researcher utilizes significant portions of his study in two independent papers using the same data without referencing it.						
D- Collusion is defined as asking another individual to write a piece of work for the infringement, who then presents it as his own.						
E- Patchwriting is the practice of copying bits of another work and altering a few words or the sequence of words to make it look unique.						
F- Falsifying data is modifying (changing) equipment and changing or eliminating data such that the research is not accurately represented in the published research record.						
G- Fabricating data is when results are made up (created) and then reported in scientific research investigations.						

Section C: Awareness of acts of research misconduct at the Workplace

Please mark “√” on the box that corresponds to your answer:

9- Have you personally witnessed any instances of research misconduct in your university or research institution? If so, please indicate the kind of research misconduct you have observed.

Yes No

You can provide us with specific details regarding any research misconduct case you observed in your university or research institution:

10- How many instances of research misconduct have personally you either observed or heard about at your organization?

- Zero One Two Three More than three

11- Have you unintentionally committed to any research misconduct practice?

- Yes No

If yes, please specify whether it is Fabrication, Falsification or Plagiarism: _____

12- Have you personally reported any research misconduct case in your organization?

- Yes No

If yes, you can provide us with specific details regarding any research misconduct case you reported in your university or research institution:

13- To what do you agree with the following statement, “Fabrication and falsification degrade the quality of scientific publications”

- Not at all
- To a small extent
- To some extent
- To a moderate extent
- To a great extent
- To a very great extent

Section D: Researchers' attitudes and beliefs about scientific misconduct

14- Based on your opinion, please read the following choices and mark “√” on the box that corresponds to your answer:

Response options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A- I feel uncomfortable discussing unethical practices of research conduct with my colleagues					
B- I am ready to take serious actions towards research misconduct malpractices					
C- I will not take any action towards wrongdoers to avoid any conflicts with my colleagues					
D- I will not take positive action against irresponsible researchers because I believe they are "victims" and this issue should be addressed by formulating national laws and regulations to direct the process of scientific research at universities.					
E- Dishonesty and data misrepresentation became part of our research culture					
F- Research misconduct became prevalent in our society and do not significantly harm anyone					

Section E: Researchers' assessments on the work environment factors that affect Research misconduct

Please mark “√” on the box that corresponds to your answer:

15- Please rate the presence of the following work environment aspects in your organization based on your own experience.

Response options	Very Low	Low	Moderate	High	Very High
A- Absence of scientific misconduct penalties.					
B- Low chances of being caught for scientific misconduct.					
C- Researchers are unaware of responsible conduct of research principles					
E- Absence of responsible conduct of research guidelines in your institution.					
F- Researchers are not willing to prosecute scientific misconduct.					

Section F: Risk factors that might contribute of the occurrence of research misconduct in Egyptian public institutions:

Please mark “√” on the box that corresponds to your answer:

16- For your own point of view, what is the reason behind the commitment of research misconduct in Egyptian public institutions?

Response options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A- High-pressure to publish in prestigious journals					
B- Lack knowledge and misunderstanding about concepts					
C- Individual factors (personality traits & beliefs and desires of violators)					
D- Institutional failure of oversight and weak regulations					
E- Unethical environment					
F- Ease of cooking data					
G- Inadequate training on research integrity in public institutions					
H- Research culture in the field					

Section G: Responsibility of different stakeholders for maintaining research integrity in Egyptian public institutions:

Please mark “√” on the box that corresponds to your answer:

17- From your own point of view, who is responsible for maintaining research integrity in Egyptian institutions?

Response options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A- The lead investigator alone is accountable for a study's scientific integrity.					
B- It is the responsibility of every researcher engaged in the study to adhere to the responsible research conduct guidelines.					
C- The graduate student alone is responsible for upholding scientific integrity in her or his research					
D- Both the graduate students and the supervisors are responsible for upholding scientific integrity in her or his research					
E- The supervisors are responsible for a large number of students, thus they are unable to monitor the development of all the phases of their students' experimental activity					
F- Protecting the integrity of research lies with Egyptian universities and research institutions					
H- The Egyptian government should invest more heavily in fighting research misconduct					
I- Scientific journals should take precautions to safeguard the integrity of scientific research					
J- Funders should take step to protect the integrity of scientific research through funding training on responsible science					
K- Researchers should act responsibly and whistle-blow violations of research integrity					

18- If you are working or studying in Egyptian public university, please respond to this question: my university is offering mandatory course to all undergraduate students about research integrity and scientific writing

Yes

No

19- If you are working or studying in Egyptian public university, please respond to this question: my university is offering mandatory course to all graduate students about research integrity and scientific writing

Yes

No

20- If you are working Egyptian research institution, please respond to this question: my organization is offering mandatory course to all Teaching assistants and lecturers about research integrity and scientific writing

Yes

No

21- If you are working Egyptian research institution, please respond to this question: my organization is offering mandatory course to all Associate professors and professors about research integrity and scientific writing

Yes

No

22- To what extent are you satisfied with the responsible conduct of research courses offered by your institution?

Very unsatisfied

Unsatisfied

Neutral

Satisfied

Very satisfied

Section H: Promoting research integrity in Egyptian public institutions:

Please mark “√” on the box that corresponds to your answer:

23- From your own point of view, what are the potential remedies for the issue of research misconduct in Egypt?

Response options	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
A- Researchers of all experience levels need to have access to high-quality training on research integrity from knowledgeable instructors.					
B- Dealing seriously with breaches of research integrity and protecting whistleblowers.					
C- Researchers at all phases of their careers need access to competent supervision and mentorship.					
D- Nurture a supportive environment that discourages unhealthy publication pressure and hyper-competition among researchers					
E- Ensure that policies governing research integrity are not only in existence but also adhered to					
F- Responsible research practices should be clearly established and communicated throughout all Egyptian public academic and research institutes.					
H- The quality of a publication, rather than its number, should be the focus of any promotion or employment rules.					
I- Standing committee(s) for responsible science should be established in all Egyptian public academic and research institutes to receive allegations of research misconduct, investigate the allegations, and make recommendations for corrective action.					
J- Public academic and research institutions should get funding to help them create dynamic training					

programs and seminars on the ethical conduct of research.					
K- In order to maintain a comprehensive database of research misconduct instances, the Egyptian government should form specialized national-level committees.					
L- National policies are very important to make sure that ethics standards for scientific study are always published and followed.					

24- Did you take any special trainings on research integrity? Please provide us more details about the training as well as the name of the institution that offered you this training.

-Thank you-

APPENDIX B: INFORMED CONSENT FORM



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Documentation of Informed Consent for Research Study Participation

Project title: DEALING WITH RESEARCH MISCONDUCT IN EGYPTIAN PUBLIC
ACADEMIC INSTITUTIONS
A Dynamic Performance Governance Approach to Enhance Collaboration

Principal Investigator:

Passant Elwy Moustafa, mobile: +201225608081, email: passantelwy@aucegypt.edu,
Address: Midtown compound, New Cairo, Infront of the American University in Cairo.

You have been requested to take part in a research study. The intended duration of your involvement is a one-hour in-depth interview, and I may call you for any additional information during the three-month research period.

The following are the research procedures: I'll see you at your university or research institute, where you're either working or studying for your postgraduate degree, and I'll ask you some questions concerning the following topics:

- 1- How can collaborative governance as, an approach, combat FFP in Egyptian public institutions?
- 2- What are the drivers of FFP practices in the Egyptian research community?
- 3- To what extent are Egyptian researchers aware of FFP practices of research misconduct?
 - 1- How does research misconduct affect the quality of scientific publications?
 - 2- What are the current policies and initiatives are public universities implementing to address this problem?

There are no potential risks or discomforts linked with this research, and no compensation will be provided for the time spent during the interview.

There are no advantages to participating in this study. Furthermore, confidentiality is an important consideration in this investigation. The study will not include any information that could endanger the participants. Any comments that participants decline to include on the interview sheet will be taken into account.

This study is entirely voluntary. If you choose not participate, there will be no penalty or loss of benefits to which you are otherwise entitled. You may withdraw from the interview at any time without penalty or loss of benefits to which you are otherwise eligible.

Please use the contact information provided above to contact me if you have any questions.

Printed Name

Signature

Date