

## Scientific Publication from Industry: A Case Study

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### Abstract

*The purpose of the study is to analyze the drivers, benefits, and challenges of publication activities for industry professionals. Specifically, the study seeks to answer the following questions: (a) What motivates authors from industry to publish journal papers? (b) Are the benefits of publication activities commensurate with the time and effort invested? (c) What challenges are faced by industry professionals while working on research papers? It employs a case study approach, focusing on a Saudi national company. A questionnaire was distributed to 170 authors, and 41 of them responded. The study uses descriptive statistics to analyze the responses. It found that industry professionals are motivated by three primary drivers for participating in publication activities: career development, supporting their organizations' publication Key Performance Indicator (KPI), and self-satisfaction and self-fulfilment. The respondents were almost equally divided among the three drivers, with 31% each. The majority of respondents believed that participating in scientific publications helped them develop their competencies, while only 10% indicated that such activities were not worth the time and effort invested. The study also identified the main challenges faced by industry professionals when working on research papers, which include identifying topics, time constraints, lack of incentives, lack of resources, accessing data, lack of financial resources, and lack of management support. The study provides insights into the drivers, benefits, and challenges of publication activities for industry professionals, specifically in the context of a Saudi national company. The findings provide valuable insights for both industry professionals and organizations seeking to promote publication activities.*

**Keywords:** *Scientific Publication, Journal Papers, Knowledge Dissemination, Publication KPIs*

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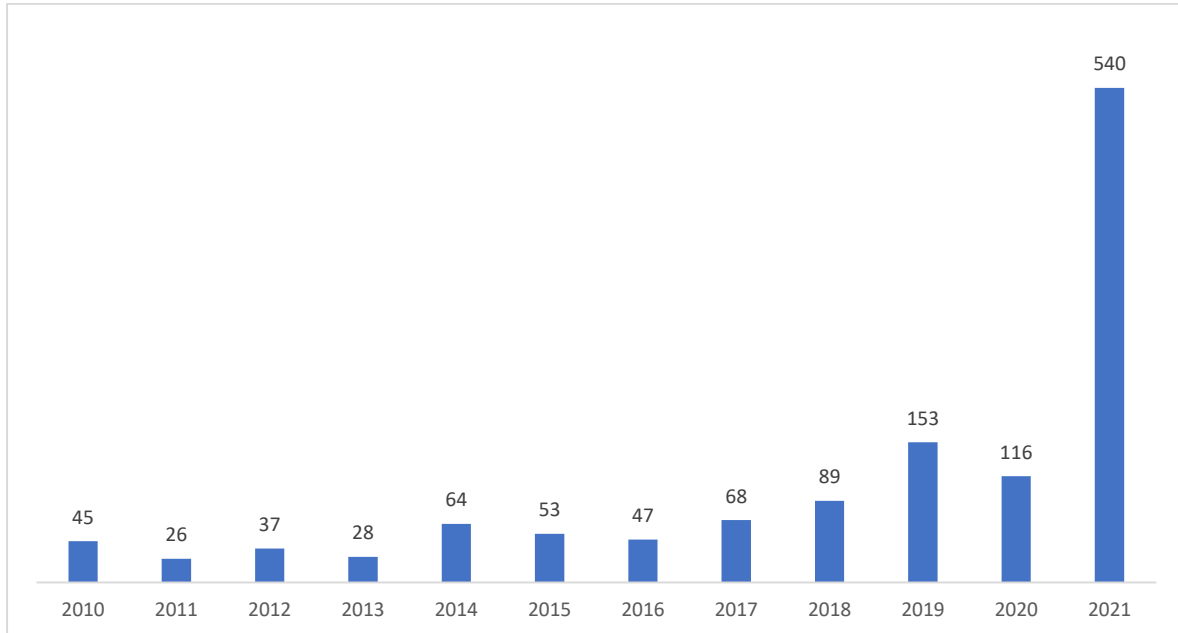
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### I. Introduction

The pressure to publish or perish in academia is well-documented (Eshchanov et al., 2021), with peer-reviewed publications being critical for career advancement and favorable performance evaluations. Unfortunately, this pressure has led to an increase in the quantity of research papers but a decrease in the disruptiveness of science, compromising its quality (Park et al., 2023; Frandsen, 2019). Additionally, the proliferation of peer-reviewed journals and open-source publishers has raised concerns about the credibility of the peer-review process (Kelly et al., 2014).

However, this culture of publishing is not limited to academia, with professionals from major corporations also embracing it (Siaminwe, 2010). This is due to the recognition of the vital role that knowledge generation plays in creating organizational value (Setiawan and Yuniarsih, 2020). In some cases, scientific publications from authors in industry have exceeded those from medium-sized universities, with companies such as IBM producing more scientific contributions than prestigious universities like Carnegie Mellon (Csomós, 2017). The motivations for firms to publish vary across industries, including enhancing reputation, retaining talent, recruiting researchers, and collaborating with other institutes (Csomós, 2017).

Inspired by a significant surge in scientific publications in a sector of a Saudi company after introducing key performance indicators (KPIs) to promote scientific publications in 2020, the authors of this study seek to understand the drivers, benefits, and challenges of publishing scientific papers for professionals in industry. The KPIs resulted in a significant increase in the number of scientific publications produced by the case study company, from 116 in 2020 to 540 in 2021, as shown in Figure 1. The objectives of the initiative were to promote the company in the global professional community, improve Saudi Arabia's scientific contributions, and develop the technical competencies of the company's professionals.



**Figure 1: Number of scientific publications produced by the case study company**

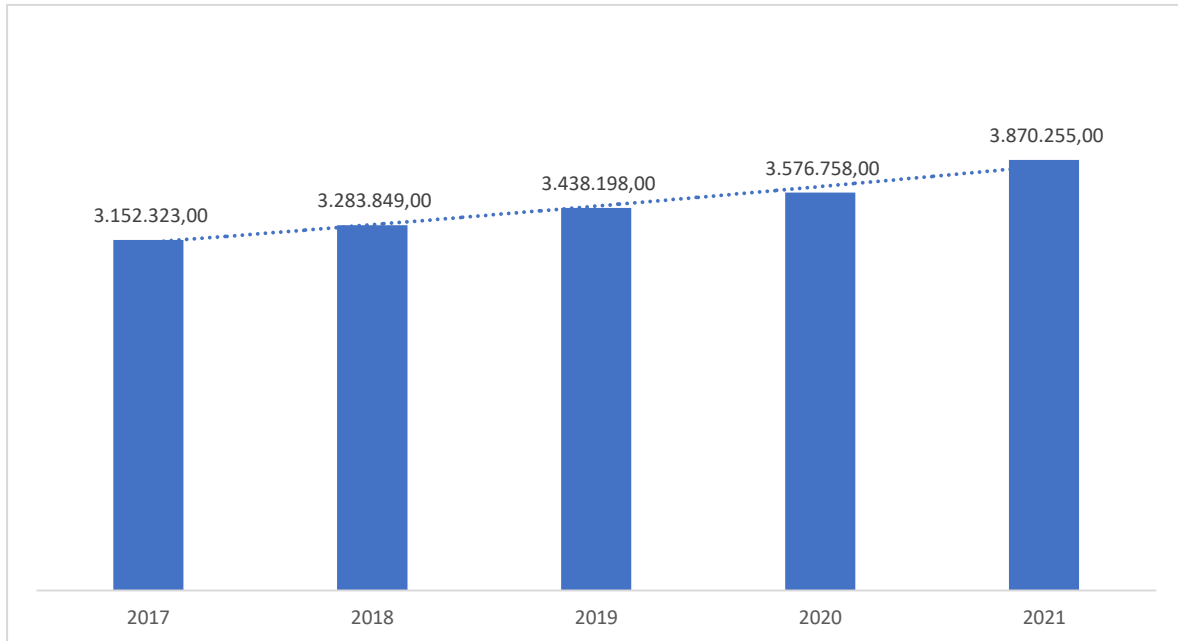
Despite the challenges and time required to publish scientific papers, the literature on the efforts and challenges that researchers face is limited (Shalayel and Alsareii, 2018; Song et al., 2013). Additionally, there is a lack of studies on the drivers for authors in industry to contribute to scientific publications. Therefore, this study aims to address this gap in the literature by answering the following questions:

- (a) What are the drivers for publishing journal papers by authors from industry?
- (b) Are publication activities worth the time and effort?
- (c) What are the challenges faced while working on a research paper?

To achieve this, the paper provides an overview of the relevant literature in Section 2, which outlines the pressure to publish in academia and the increasing trend of industry professionals to publish scientific papers. The literature also highlights the motivations for firms to publish and the concerns around the credibility of the peer-review process. Section 3 outlines the methodology used to conduct the study, which is a case study approach that involved distributing a questionnaire to professionals in a Saudi national company. Section 4 presents the findings and analysis of the survey, which sheds light on the drivers, benefits, and challenges of publishing scientific papers for industry professionals. Section 5 discusses the implications of the study's results and provides recommendations for industry professionals and organizations seeking to promote publication activities among their employees. Finally, Section 6 concludes the paper and highlights the contributions of the study in addressing a significant gap in the literature.

## II. Literature Review

The surge in scientific publication output in recent years has been unprecedented, with almost 3.9 million articles recorded in 2022, according to the Scopus database (Pranckutė, 2021). This exponential growth in publication output, as shown in Figure 2, highlights the increasing importance of scientific research and its dissemination in the global academic community.



**Figure 2: Number of publications by year, as indexed on Scopus**

While the increase in publication output is significant, the contribution to this growth varies across countries and economies. According to Scimago Lab (González-Mariño, 2022), China and the United States had the largest volume of publications in 2021, accounting for 33% and 27% of global output, respectively. In contrast, Saudi Arabia ranked twenty-second globally in terms of citable scientific publications. These trends suggest that there is still room for improvement in scientific research and publication in certain countries and regions, including Saudi Arabia.

### 2.1 Importance of Scientific Publication

Over the past 350 years, scientific journals have been the most important means of disseminating scientific knowledge (Moxham, 2015). The primary purpose of scientific publications is to nurture and shape the advancement of our modern way of life by producing new knowledge and solving global challenges.

Scientific publication serves multiple stakeholders, including researchers, affiliates (e.g., universities), the nation, either in terms of tangible benefits (e.g., gross domestic product growth) or intangible benefits (e.g., soft power), and society.

Researchers pursue scientific publications to build their reputations and become authority figures in their fields. The authors, whose work in most cases is unpaid, often believe that there is a potential benefit from such work in terms of career advancement or promotion in their institutions (May, 2020). Scientific publication is a recognition tool for researchers related to their work and novelty. Accordingly, researchers and their affiliations build their visibility and reputation via scientific publications (Rao, 2021). Additionally, the incentive for authors could be moral, in the sense of achieving personal satisfaction (Elsevier, 2021).

Scientific publication is essential for university rankings because the assessment of academic research is vital in many global university rankings. For example, in the Times Higher Education World University Ranking (2022), 30% of the scores of the institutions are allocated to research, including volume, income, and reputation. At the same time, another 30% of the ranking is allocated to citations (research influences). This situation reflects the importance of research in the rankings of any university.

Generally, research and scientific publications are supposed to have a positive impact on any country in more than one aspect. There is a correlation between the advancement of the nation and the number of scientific publications. Leading countries in technology have the highest number of citations for their scientific publications. There is also a proportional relationship between research and development spending and gross domestic product (GDP) (Cimini et al., 2014). This does not mean that all scientific publications, even with a high number of citations, will contribute positively to GDP growth in all cases.

Additionally, scientific publications and, more generally, scientific contributions are essential to any nation. Positive reflections of the country in the world community are provided with such scientific productions (Courtioux et al., 2019). Scientific contributions have become a form of soft power for any country. They provide a window into the return on a country's scientific investment (Narin and Hamilton, 1996). According to the National Science Foundation's National Science Board (2021), such data reflect the state of a nation's research activity, scientific capabilities, and research ecosystem. This explains why nations allocate resources to support research.

On the other hand, Newman's (2014) report, published by the UK Department for International Development, concluded that there has to be a distinction between the impact of the investment on research in low-income countries and in developed countries. It was asserted in the report that there is no evidence of a direct correlation between research and growth or education in low-income countries. However, research was seen as a source for former researchers to supply the government and industry with expert researchers who could act as policy advisors (Newman, 2014).

### 2.2 Types of Scientific Publications (Research)

This literature review focuses only on scientific publications. Scientific publications, also known as "scientific articles," "journal articles," or "scientific papers," are a special type of published report that is (a) peer-reviewed, (b) citable, (c) includes citations, and (d) follows a standardized structure and style (Vanderbilt University, 2020). There are various classifications of scientific publications in the current literature.

Kaur's (2013) study classified scientific publications into (a) primary literature, (b) secondary literature, and (c) tertiary literature. The primary literature includes scientific publications that disclose new knowledge and provide genuine work. A critique or presentation of knowledge, such as a literature review, is provided by secondary literature. A summary of materials with references to primary or secondary sources is provided by tertiary literature.

Another thorough classification is suggested by Springer (2014). It categorizes journal articles into five main types. These are original research, short reports, reviews, case studies, and methodologies. Each type is explained in Table 1.

**Table 1: Scientific journal publication types (Springer, 2014)**

Research Type	Characteristics
<i>Original research</i>	Also known as "original article," "research article," "research," or just "article"
	The most common type of articles
	Includes the following sections: "introduction," "methods," "results," and "discussions"
<i>Short reports or letters</i>	Also known as "brief communications"
	Has a strict length
	Useful for time-sensitive results
<i>Review articles</i>	Provide a summary on a certain topic
<i>Case studies</i>	Report instances on a specific phenomenon
<i>Methodologies or methods</i>	Suggest a new or improved method or procedure

### 2.3 Challenges of Scientific Publication for Researchers

The literature addressing the challenges that researchers face in scientific publications is not extensive. One of the significant challenges, especially for young or inexperienced researchers, is finding an appropriate mentor and a suitable topic to be researched. Pursuing writing for a scientific publication,

especially for those who have not written academic theses in their academic studies without a mentor, is very challenging (Dixon, 2009).

Another challenge mentioned in the literature is finding research partners (Dixon, 2009). Some research entails collaboration between researchers from various backgrounds to complement each other. In addition, some experimental research may require equipment, software, or devices. Accordingly, without support from a sponsor, this could be another challenge for a researcher (Dixon, 2009).

Moreover, the publication process itself can be challenging in some cases as well. Submitting a scientific publication to a reputable journal with a high impact-factor could be a disappointing experience, since the waiting time is usually long, and the acceptance rate is typically low. Thus, researchers sometimes consider second-tier journals, especially when they are under the pressure of time constraints for their publications (Dixon, 2009).

A report by PricewaterhouseCoopers (2019), titled "Advancing Academic Research in the GCC," pinpoints several challenges hindering research in the Gulf Cooperation Council (GCC) within academia. According to the report, the challenges include (a) lack of time for research, (b) limited funding, (c) weak administration support, and (d) lack of collaborative platforms.

A study was conducted in 2021 to investigate the challenges that Saudi researchers in medicine face in the Aseer region in Saudi Arabia (Alhefzi et al., 2021). It was found that multiple factors hinder conducting research, including lack of motivation, time-consuming process, lack of research trainers, and lack of financial rewards.

In response to these challenges, the Saudi Ministry of Education established a comprehensive program for supporting research and innovation in universities in line with the Saudi 2030 vision. It was stated that a contribution should be made to resolving some of the challenges to building an effective research ecosystem (Ministry of Education, 2022). However, the program focuses on research produced by researchers affiliated with universities. Independent researchers might be deprived of the privileges offered by the Ministry.

In summary, based on the reviewed literature, the common challenges for researchers in conducting research include identifying research topics that benefit society, time constraints, lack of training, lack of collaboration, funding, lack of incentives, lack of logistic support, pressure on delivery, unavailability of research tools and data access.

### III. Methodology

Qualitative and quantitative methods were employed to achieve the research objectives. The mixed approach was adopted to gain a deeper understanding of the topic and rationalize the results by eliminating the weaknesses of using only one approach.

The study started with a qualitative approach, in which an unsystematic literature review was conducted to thoroughly understand the elements related to publishing papers in scientific journals. The review was carried out via Google Scholar and Science Direct. The keywords used to find the relevant literature in the search engines were "scientific paper," "journal paper," "impacts of publishing," "benefits of publishing," "types of publications," "scientific publications from industry," and "publishing challenges." Based on the literature review, a questionnaire was developed to survey the researchers who had participated in scientific publication in the case study company. The questionnaire was developed to address the following research questions:

- (a) What are the drivers for publishing journal papers by authors from industry?
- (b) Are publication activities worth the time and effort?
- (c) What are the challenges faced while working on a research paper?

The data collected from the questionnaire were statistically analyzed using Excel and Statistical Package for Social Science software (SPSS) to determine the findings. Subsequently, the results were discussed.

#### 3.1 Questionnaire

The literature review represents the foundation of the questionnaire and the research questions addressed in this study.

Primary data were obtained using an online questionnaire sent to the participants of this study between November 2022 and February 2023. The questionnaire consists of sixteen questions (see Appendix A), which fall under four main aspects: (a) demographic information, (b) respondents' motives to participate in publication activities, (c) efforts needed to produce a manuscript, and (d) obstacles faced when engaging in publishing scholarly articles.

### 3.2 Participants in the Study

The targeted sample was individuals who published scientific papers between the years 2018 and 2021. The questionnaire was sent to the entire population of one hundred and seventy (170) authors of technical publications within the case study company. Forty-one (41) responded. Accordingly, the sample size gives a confidence level of 85% and a margin of error of 10%.

## IV. Findings and Analysis

### 4.1 Demographic of Respondents

#### 4.1.1 Gender

Eighty-three percent of the respondents were male. This high percentage of male respondents does not mean that males have a higher contribution, since the percentage of the males within an overall population is around (82 %). In addition, the females' average age and years of experience are by far lower than the males', since there has been a surge in employing females recently after adopting a diversity and inclusion policy.

#### 4.1.2 Years of Experience

The received responses show that the majority of the participants (37%) had more than 20 years of experience, followed by 29% with 5 to 10 years of experience (see Figure 3). This corresponds to the overall years of experience within the overall population.

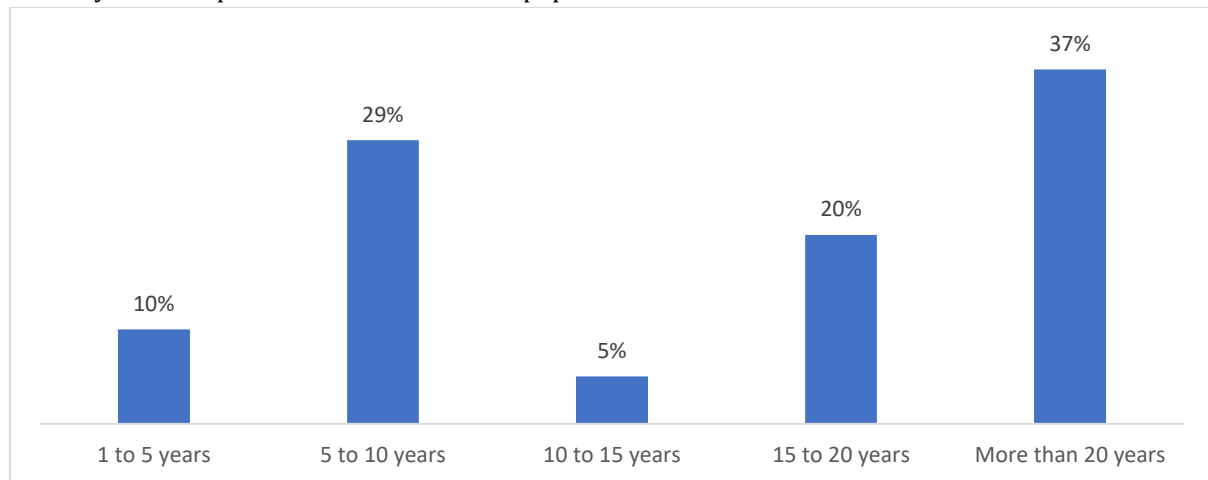
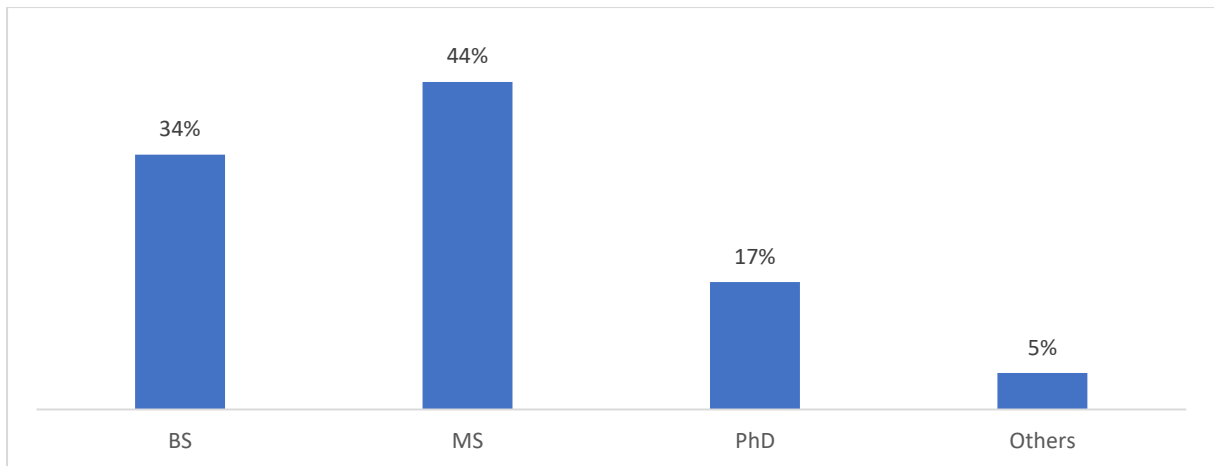


Figure 3: Participants' years of experience

#### 4.1.3 Education Level

Seven of the respondents (17%) were PhD holders, eighteen respondents (44%) were master's degree holders, fourteen respondents (34%) were bachelor's degree holders, and two respondents (5%) held other degrees (see Figure 4). The contribution of PhD holders is by far higher than others in comparison with their total number within the overall population. Similarly, the contribution of master's holders exceeds their representation within the overall population. This could be due to the fact that PhD holders and master's holders have been trained during their academic lives to conduct scientific research.



**Figure 4: Participants' academic qualifications**

## 4.2 Efforts Needed to Produce a Manuscript

### 4.2.1 Authorship Pattern

The respondents authored a total of 324 scientific papers since they started engaging in publication activities. These were conducted in single-authorship and joint-authorship patterns. 11% of the manuscripts were published in a single-authorship pattern, and 46% were jointly authored. When the authors jointly developed research papers, they were the first authors in 51% of the manuscripts.

**Table 2: Respondents' authorship pattern and order**

Authorship Patter		Order in Joint-Authorship Articles	
Single-Authorship	Joint-Authorship	First Author	Non-First Author (second, third, etc.)
11%	89%	51%	49%

The responses were also examined according to the respondents' gender, educational level, and years of experience. The authorship pattern and order with the highest share for each group is highlighted in grey in the Table below.

It was found that contribution to single and joint authors publications was somewhat similar among individuals with different genders, academic qualifications, and years of experience.

The order in jointly-authored articles varied among the different groups though. For instance, females mostly co-published as non-first authors, meaning that their order was second, third, or even last (67%) while males preferred to lead (52%).

Looking at the level of experience revealed that individuals with less than 20% of experience mostly published as second authors while those with more led the process (57%). Additionally, authors with a PhD had a higher proportion of first authorship (55%) compared to those with a BS (25%) or an MS (52%). Overall, this highlights the importance of considering academic degrees in understanding authorship patterns and promoting collaboration in publications.

**Table 3: Distribution of authorship pattern and order**

		Authorship Patter		Order in Jointly Authored Articles	
		Single Authorship	Joint Authorship	First Author	Non-First Author
Gender	Female	6%	94%	33%	67%
	Male	11%	89%	52%	48%
Years of Experience	5 to 10	2%	98%	37%	63%
	10 to 15	11%	89%	38%	63%

	15 to 20	17%	83%	43%	58%
	more than 20	13%	87%	57%	43%
Education Level	BS	6%	94%	25%	75%
	MS	16%	84%	52%	48%
	PhD	13%	88%	55%	45%
	Other	0%	100%	100%	0%

4.2.2 Research Type

Twenty-six percent (26%) of the publications were empirical research, research article, and original research (see Figure 6). Twenty-two percent (22%) were reviews, twenty-one percent (21%) were case studies, nineteen percent (19%) were methods, and thirteen percent (13%) were short reports and letters.

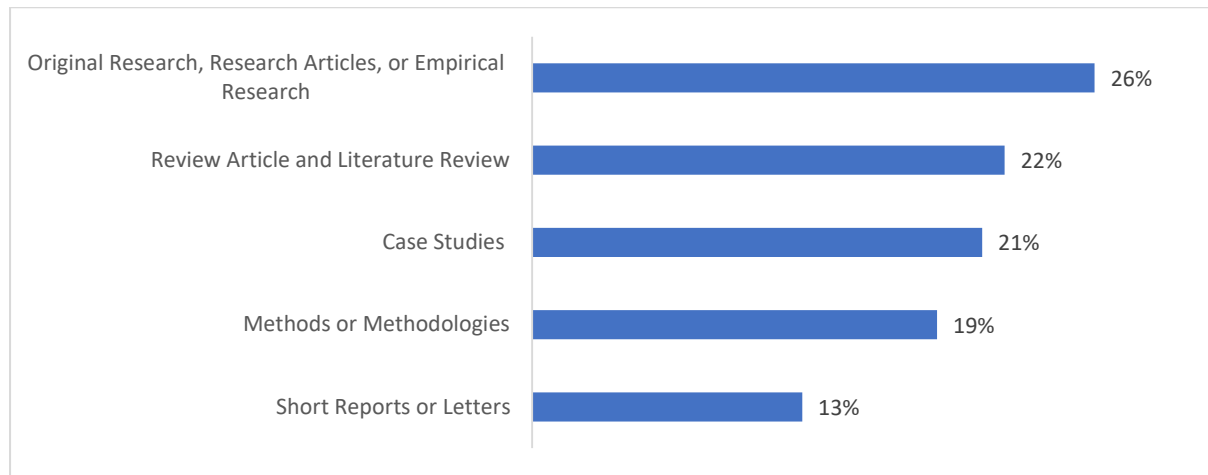


Figure 6: Types of published articles

Table 4 shows the distribution of manuscript type by looking at the responses by each group separately. The groupings were examined by gender, education level, and years of experience.

The findings showed that female authors had a higher share of short reports or letters (16.7%) and review articles/literature reviews (25%) compared to male authors, who had a higher proportion of original research articles or empirical research (27.8%).

Regarding years of experience, authors with 10-15 years had the highest proportion of case studies (33.3%), while those with 15-20 years had the highest proportion of short reports or letters (20%). Moreover, authors with 1-5 years of experience had a higher proportion of original research articles or empirical research (33.3%) compared to those with 5-10 years (26.9%) or more than 20 years (24.2%).

In terms of education level, authors with a Bachelor's Degree had a higher proportion of review articles/literature reviews (28.6%) compared to those with a Master's Degree (15.8%) or a PhD (23.8%). Furthermore, authors with a Master's Degree had the highest proportion of original research articles or empirical research (34.2%), while those with "Other" education level had the highest proportion of short reports or letters (22.2%) and case studies (22.2%).

Overall, these findings suggest that the types of published articles vary across different groups, highlighting the importance of considering multiple factors in promoting diversity in research.

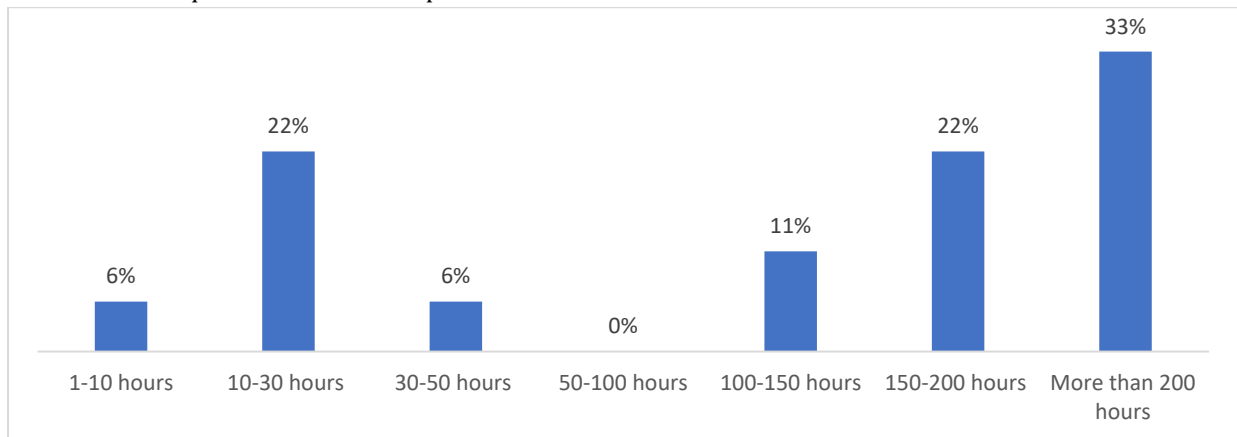


**Table 4: Distribution of manuscript types by gender, education, and years of experience**

Type of Published Article(s)		Original Res./Res. Article/Empirical Res.	Short Reports or Letters	Review Articles/Literature Review	Case Studies	Methods	Total
Gender	Female	20.80%	16.70%	25.00%	20.80%	16.70%	100%
	Male	27.80%	11.10%	20.80%	20.80%	19.40%	100%
Years of Experience	1 - 5	33.30%	11.10%	22.20%	11.10%	22.20%	100%
	5 - 10	26.90%	11.50%	19.20%	23.10%	19.20%	100%
	10 - 15	33.30%	0.00%	33.30%	33.30%	0.00%	100%
	15 - 20	24.00%	20.00%	20.00%	20.00%	16.00%	100%
	>20	24.20%	9.10%	24.20%	21.20%	21.20%	100%
Education Level	BS	17.90%	17.90%	28.60%	17.90%	17.90%	100%
	MS	34.20%	7.90%	15.80%	23.70%	18.40%	100%
	PhD	28.60%	9.50%	23.80%	19.00%	19.00%	100%
	Other	11.10%	22.20%	22.20%	22.20%	22.20%	100%

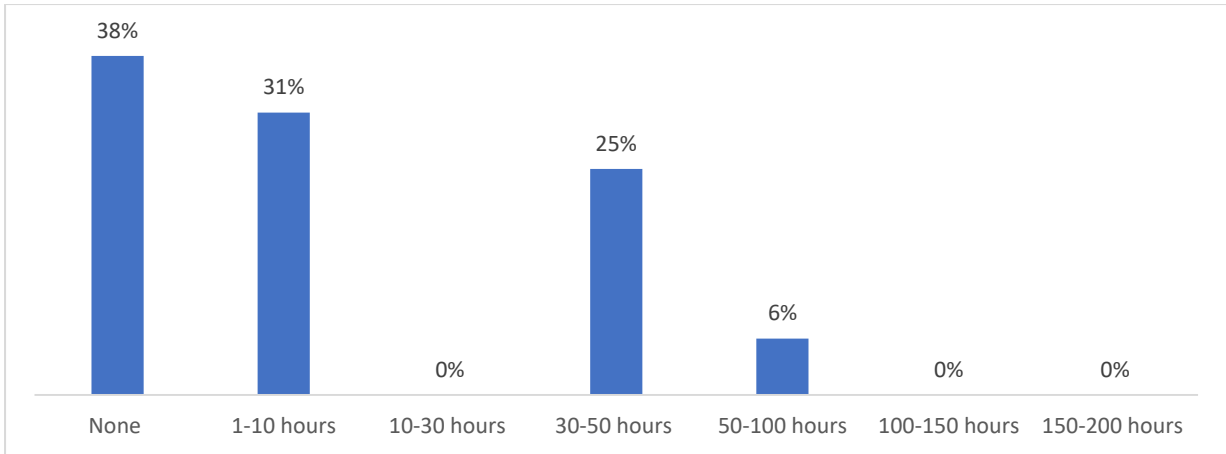
**4.2.3 Time Spent on Developing Paper**

To highlight the amount of time and effort put into publishing, it can be noted that the majority of respondents (33%) spent over 200 hours on their papers during and after working hours, with a good percentage (22%) spending 150 to 200 hours on drafting (see figure 9). These findings are consistent with the literature's median of 177 hours, as discussed in Section I, emphasizing the extensive time commitment required for successful publication.



**Figure 9: Hours spent developing a paper (during and after working hours)**

Notably, a large proportion of authors, 38%, did not allocate any work hours to manuscript drafting, according to Figure 10.



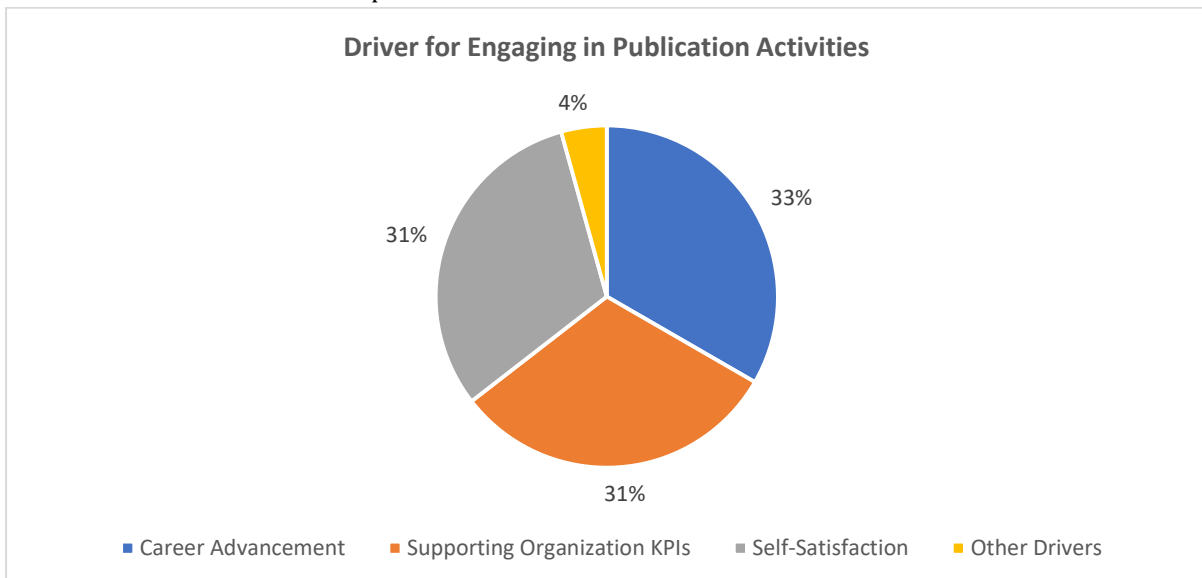
**Figure 10: Working hours spent developing a paper**

These results demonstrate that publishing a scientific paper demands a significant amount of time and effort, with many professionals investing their personal time to complete their research. This highlights the importance of acknowledging and rewarding the dedication and hard work required to produce high-quality scientific publications.

### 4.3 Motives to Participate In Publication

#### 4.3.1 Publication Drivers

The respondents were almost equally divided among three drivers to participate in publication activities, namely (a) for career development (31%), (b) to support their organizations' publication KPI (31%), and (c) for pure self-satisfaction and fulfillment (33%). The remaining 4% stated that they had additional drivers to conduct research. These drivers include sharing their knowledge and experiences with their peers and the younger generation, participating in the national development, and staying informed of the recent trends in their areas of expertise.



**Figure 7: Drivers for publishing**

The drivers for publications were further examined by each group of gender, years of experience, and education level (see Table 5). The key drivers for each group are highlighted in grey in the Table below. For female authors, the most common driver for publishing was to support their organization's KPI (33.3%), followed by advancing in their career (20%) and self-satisfaction (20%). Male authors were more evenly divided between supporting their organization's KPI (30.5%), advancing in their career

(31.7%), and self-satisfaction (6.1%). Also, one of the interesting observations is that while 31.7% of the males' driver for publishing was self-satisfaction, only 20% of the females had the same driver.

Regarding years of experience, authors with 10-15 years were primarily motivated by advancing in their career (66.7%), while those with 1-5 years were driven by supporting their organization's KPI (33.3%) and self-satisfaction (22.2%). Authors with more than 20 years of experience were more evenly divided between supporting their organization's KPI (32.4%), advancing in their career (32.4%), and self-satisfaction (5.4%).

In terms of education level, authors with a Bachelor's Degree were driven by supporting their organization's KPI (29%), advancing in their career (29%), and self-satisfaction (9.7%). Authors with a Master's Degree and a PhD were more evenly divided between supporting their organization's KPI and advancing in their career, with self-satisfaction being a less common driver. Finally, authors with "Other" education level were motivated by supporting their organization's KPI (50%) and advancing in their career (25%) while self-satisfaction and "Other" drivers were less common.

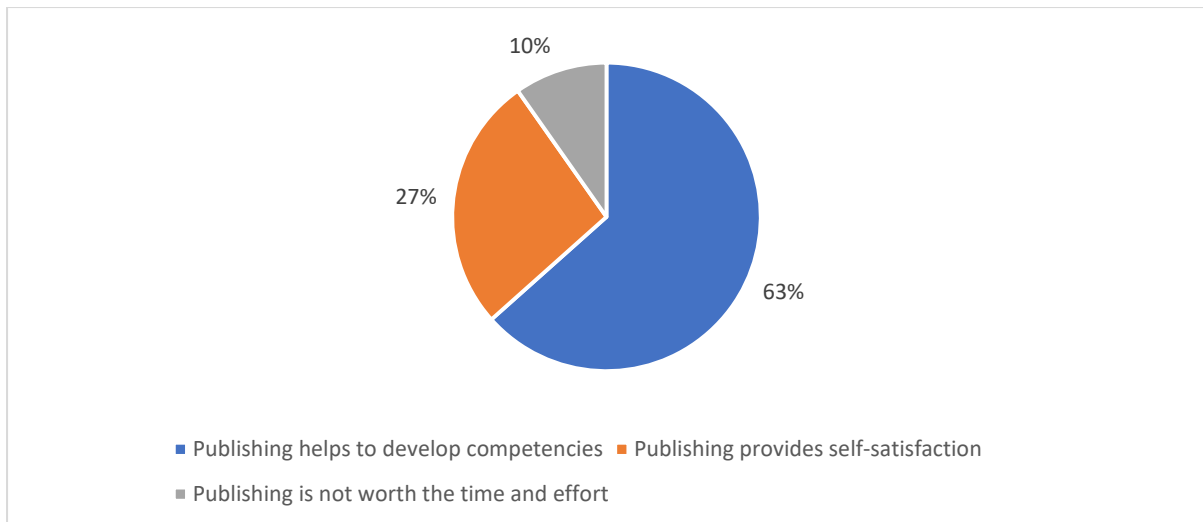
Overall, these findings suggest that the drivers for publishing differ across different groups, highlighting the importance of understanding the motivations and goals of authors in promoting scientific publication.

**Table 5: Drivers for publication by gender, years of experience, and education level**

Driver to publish		Support organization KPI	Advance in career	Self-satisfaction	Other
Gender	Female	26.70%	33.30%	20.00%	20.00%
	Male	30.50%	31.70%	31.70%	6.10%
Years of Experience	1 - 5	33.30%	33.30%	11.10%	22.20%
	5 - 10	32.30%	29.00%	32.30%	6.50%
	10 - 15	0.00%	33.30%	66.70%	0.00%
	15 - 20	23.50%	41.20%	23.50%	11.80%
	>20	32.40%	29.70%	32.40%	5.40%
Education Level	BS	32.30%	29.00%	29.00%	9.70%
	MS	30.00%	32.50%	32.50%	5.00%
	PhD	31.80%	31.80%	27.30%	9.10%
	Other	0.00%	50.00%	25.00%	25.00%

#### 4.3.2 Publication Impact

The majority of respondents (63%) indicated that their publication experience helped them develop their competencies, while the remaining (27%) indicated that it was a fulfilling experience. Only 10% of the respondents did not believe in the importance of publication since they indicated that engaging in publication activities was not worth the time and effort (see Figure 8).



**Figure 8: Participants' views on publishing**

Table 6 summarizes the publishing impact by group of gender, education level, and years of experience. The majority for each group is highlighted in grey.

The findings indicate that publishing scientific papers can help professionals develop their competencies, with the majority of male respondents (67.6%) and female respondents (42.9%) agreeing on this. However, a small percentage of male respondents (8.8%) and even fewer female respondents (14.3%) indicated that publishing scientific papers was not worth the time and effort. Interestingly, a significant percentage of female respondents (42.9%) cited self-satisfaction as a driver for publishing.

In terms of years of experience, the majority of respondents across all groups believed that publishing scientific papers helped develop competencies, with the highest percentage of agreement coming from those with 1-5 years of experience (75%) and 5-10 years of experience (75%).

Regarding educational level, respondents with a Bachelor's degree showed the highest agreement that publishing scientific papers helps to develop competencies (78.6%), followed by those with a Master's degree (61.1%) and a Ph.D. (57.1%).

Overall, these findings suggest that publishing is generally seen as a valuable activity that helps to develop competencies and provides self-satisfaction, particularly among male authors and those with more experience and higher levels of education. However, a small percentage of authors across all groups still indicate that it is not worth the time and effort.

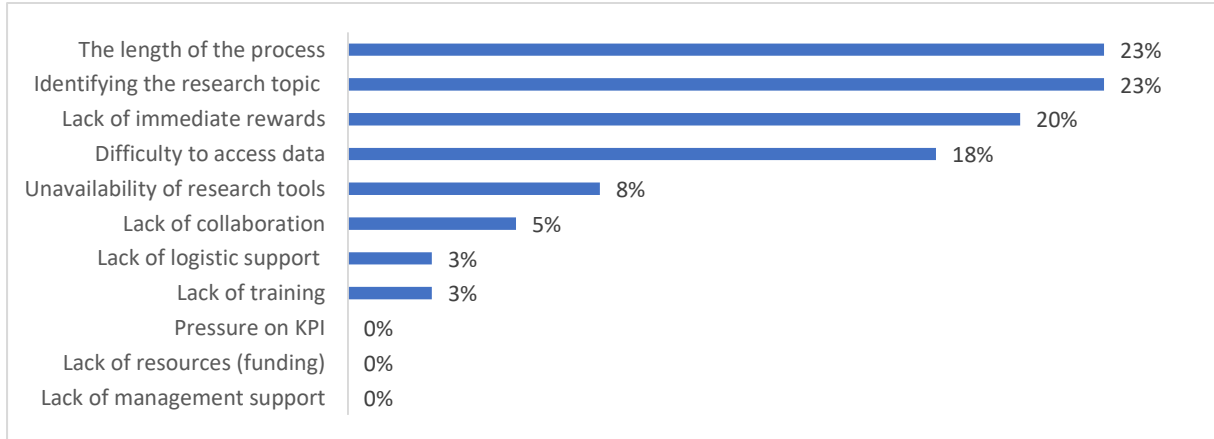
**Table 6: Publishing impact by gender, education level, and years of experience**

Impact of Publishing		Helps to develop competencies	It is not worth the time and effort	Provides self-satisfaction
Gender	Female	42.9%	14.3%	42.9%
	Male	67.6%	8.8%	23.5%
Years of Experience	1 - 5	75.0%	0.0%	25.0%
	5 - 10	75.0%	8.3%	16.7%
	10 - 15	50.0%	50.0%	0.0%
	15 - 20	50.0%	12.5%	37.5%
	>20	60.0%	6.7%	33.3%
Educational Level	BS	78.6%	7.1%	14.3%
	MS	61.1%	11.1%	27.8%
	PhD	57.1%	0.0%	42.9%
	Other	0.0%	100.0%	0.0%

## 4.4 Obstacles Faced by the Authors

### 4.4.1 Publication Challenges

The respondents indicated that the top two challenges in publishing were identifying a suitable topic and having time constraints, at 23% each (see Figure 11). Twenty percent (20%) of the responses indicated that the lack of reward was also among the major challenge followed by the difficulty to access data (18%). Also, some authors faced challenges with identifying research tools, finding research partners, having logistical support, and getting trained. The analysis also depicts that none of the authors faced issues with management support, funding, nor feeling pressure by KPIs.



**Figure 11: Major publishing challenges**

The publication challenges were further analyzed by gender, years of experience, and education level (see Table 7). The top challenge identified by each group is highlighted in grey in the Table below.

The key findings from analyzing the data by each gender group revealed that the most common challenges reported by female participants were the process length (43%) and lack of rewards (29%), while male participants reported identifying the topic as the most significant challenge (24%). Both male and female participants reported that the pressure of KPI was not a challenge.

Among the individuals with different levels of experience, it can be noticed that those with 5-10 years of experience reported the process length (33%) and identifying the topic (33%) as the most significant challenges. On the other hand, participants with more than 20 years of experience reported difficulty accessing data (20%) and lack of rewards (40%) as their biggest challenges.

For the educational level, participants with a Bachelor's degree reported the process length (33%) as their most significant challenge. Master's degree holders reported identifying the topic (29%) and the process length (22%) as their biggest challenges. While PhD holders reported the process length (43%) and difficulty accessing data (67%) as their main challenges. Other participants reported having trouble accessing data (33%) and a lack of research tools (33%) as their biggest challenges.

In summary, the study revealed that the challenges of publishing vary by gender, years of experience, and educational level, with identifying the topic and process length being the most commonly reported challenges.

**Table 7: Major publishing challenges by gender, years of experience, and education level**

Challenges of Publishing	Gender		Years of Experience				Educational Level			
	Female	Male	5 - 10	10 - 15	15 - 20	> 20	BS	MS	PhD	Other
Identifying the topic	29%	24%	33%	33%	33%	0%	26%	29%	0%	100%
Process length	43%	21%	33%	17%	0%	33%	22%	43%	0%	0%
Lack of training	0%	0%	0%	17%	0%	0%	4%	0%	0%	0%
Lack of collaboration	0%	7%	17%	0%	0%	0%	4%	0%	0%	0%
Lack of management support	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lack of resources	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lack of rewards	29%	21%	17%	0%	40%	33%	19%	14%	0%	0%
Difficulty to access data	0%	17%	0%	17%	20%	33%	15%	14%	67%	0%
Unavailability of research tools	0%	7%	0%	17%	0%	0%	7%	0%	33%	0%
Pressure on KPI	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Lack of logistic support	0%	3%	0%	0%	7%	0%	4%	0%	0%	0%
Other	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

## V. Conclusions

Scientific publication from industry has become increasingly important, as many major corporations have embraced “the publish or perish” culture. However, there is still a need to study the impact of scientific publication from industry on the academic community. To address this issue, this paper analyzed a case study of a company in Saudi Arabia that launched an initiative to promote scientific publication among its professionals. The company introduces a KPI for scientific publications, which led to a significant increase in the number of published scientific papers from 160 papers the year before launching the KPI to 540 papers. This clearly demonstrates the important role that leadership can play in improving scientific publications.

The study aimed to answer three key questions about scientific publication in industry: (a) What are the drivers for publishing journal papers by authors from the industry? (b) Are publication activities worth the time and effort? and (c) What are the challenges faced while working on a research paper? To answer these questions, a questionnaire was sent to 170 authors from the case company, with 41 respondents. The respondents authored a total of 324 scientific papers since they started engaging in publication activities, in both single-authorship and joint-authorship patterns. Interestingly, 11% of the manuscripts were published in a single-authorship pattern, and 46% were jointly authored. When authors jointly developed research papers, they were the first authors in 51% of the manuscripts.

Further analysis of the published papers showed that 26% of the publications were empirical research, research articles, and original research. Twenty-two percent (22%) were reviews, 21% were case studies, 19% were methods, and 13% were short reports and letters. This shows the diversity of the published works and highlights the range of topics that industry professionals are interested in and working on.

The survey revealed that the majority of respondents (33%) spent, on average, more than 200 hours on their papers during and after working hours, with an additional 22% spending 150 to 200 hours to draft their articles. These results demonstrate that publishing a scientific paper demands a significant amount of time and effort, with many professionals investing their personal time to complete their research. This highlights the importance of acknowledging and rewarding the dedication and hard work required to produce high-quality scientific publications.

The respondents were almost equally divided among three drivers to participating in publication activities, namely: (a) for career development (31%), (b) to support their organizations’ publication KPI (31%), and (c) for pure self-satisfaction and self-fulfilment (33%).

Furthermore, the majority of respondents (63%) believed that scientific publication helped them develop their competencies, while only 10% indicated that scientific publication is not worth its time and effort. Therefore, publishing scientific papers could be an effective means of developing professional competencies while contributing to the academic community.

The survey also highlighted several challenges faced by industry professionals when publishing research. These included identifying a topic (22%), time constraints (21%), lack of incentives (13%), lack of resources (13%), accessing data (12%), lack of financial resources (11%), and lack of management support (5%).

Moreover, the findings from this study demonstrate that the drivers and challenges of publishing scientific papers are not universal and differ among different demographic groups, including gender, years of experience, and academic level. For instance, those with 10-15 years of experience were primarily motivated by career advancement, while those with 1-5 years were driven by supporting their organization's KPI and self-satisfaction. Also, female participants reported process length and lack of rewards as the most significant challenges, while male participants reported identifying the topic. These findings highlight the importance of understanding the unique motivations and goals of professionals in different groups to effectively promote and incentivize scientific publication within an organization.

It is important to note that the experience of researchers in industry is different from that of those who come from academia. Therefore, more studies should be conducted to compare the quality and impact of

scientific papers from both academia and industry. By doing so, scientific publication from industry could further enrich human knowledge.

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## Appendix A Questionnaire

If you were not an author of a peer-reviewed publication in 2020/2021, please discard this questionnaire.

The objective of this questionnaire is to learn from your experience in publishing a peer-reviewed paper.

Please be assured that your answers will be kept confidential. Your data will not be associated with your personal information and will not be shared with other parties. Only the summary of results will be reported.

### A. Demographic Information

1. Gender:
  - Male
  - Female
2. Years of Experience:
  - 1–5
  - 5–10
  - 10–15
  - 15–20
  - More than 20 years
3. Education Level
  - BS
  - MS
  - PhD
  - Other

**B. Efforts Needed to Produce a Manuscript**

4. Number of peer-reviewed manuscripts published in a single-authorship pattern
5. Number of peer-reviewed manuscripts published in a joint-authorship pattern
6. Number of peer-reviewed publications as the first author (among joint-authorship publications)
7. Number of publications as second author or any order other than first (among joint-authorship publications)
8. Type of published article(s)
  - Original Research/Research Article/Empirical Research
  - Short Reports or Letters
  - Review Articles/Literature Review
  - Case Studies
  - Methodologies or Methods
9. On average, how many hours did you allocate to write and publish your journal paper (in total, during and after working hours)?
  - 1–10 hours
  - 10–30 hours
  - 30–50 hours
  - 50–100 hours
  - 100–150 hours
  - 150–200 hours
  - More than 200 hours
10. On average, how many working hours did you spend on writing your journal paper (during working hours only)?
  - 10 hours
  - 10–30 hours
  - 30–50 hours
  - 50–100 hours
  - 100–150 hours

**C. Motives to Participate In Publication**

11. Your driver to publish a peer-reviewed paper in 2021 was:
  - To support your organization in meeting publication KPI
  - To advance in your career
  - For self-satisfaction
  - Other: please specify
12. Please choose the statement most applicable to you:
  - Publishing a scientific peer-reviewed paper helped to develop my competencies
  - Publishing a scientific peer-reviewed paper provided me with self-satisfaction
  - Publishing a scientific peer-reviewed paper is not worth the time and effort

**D. Obstacles Faced by the Authors**

13. What is the major challenge in publishing a peer-reviewed paper?
  - Identifying the research topic and finding a project that can be reported as a scientific paper
  - The length of the process
  - Lack of training

- Lack of collaboration
- Lack of management support
- Lack of resources (funding)
- Lack of immediate reward
- Difficulty to access to data
- Non-availability of research tools
- Pressure on KPI
- Lack of logistic support (editing services, manuscript submittal etc.)
- Other: please specify

Please feel free to share any additional comments: