Key Performance Indicators (KPI) for Researchers at Different Levels & Strategies to Achieve it

P. S. Aithal * & Shubhrajyotsna Aithal **
* Professor, Institute of Management & Commerce, Srinivas University, Mangalore, India, OrcidID: 0000-0002-4691-8736; E-Mail: psaithal@gmail.com
** Faculty, Institute of Engineering & Technology, Srinivas University, Mangalore, India, OrcidID: 0000-0003-1081-5820; E-mail: shubhraaithal@gmail.com

Area/Section: Education Management.
Type of the Paper: Explorative Research.
Type of Review: Peer Reviewed as per |C|O|P|E| guidance.
Indexed in: OpenAIRE.
DOI: https://doi.org/10.5281/zenodo.8302483
Google Scholar Citation: IJMTS

How to Cite this Paper:
Aithal, P. S., & Aithal, S., (2023). Key Performance Indicators (KPI) for Researchers at Different Levels & Strategies to Achieve it. *International Journal of Management, Technology, and Social Sciences (IJMTS)*, *8*(3), 294-325.
DOI: https://doi.org/10.5281/zenodo.8302483

International Journal of Management, Technology, and Social Sciences (IJMTS)
A Refereed International Journal of Srinivas University, India.

CrossRef DOI: https://doi.org/10.47992/IJMTS.2581.6012.0304

Received on: 12/07/2023
Published on: 30/08/2023

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P. S. Aithal * & Shubhrajyotsna Aithal **
* Professor, Institute of Management & Commerce, Srinivas University, Mangalore, India, OrcidID: 0000-0002-4691-8736; E-Mail: psaithal@gmail.com
** Faculty, Institute of Engineering & Technology, Srinivas University, Mangalore, India, OrcidID: 0000-0003-1081-5820; E-mail: shubhraaithal@gmail.com

ABSTRACT

Purpose: *Key Performance Indicators (KPIs) serve as essential tools for academic researchers across various stages of their careers, from PhD research level to the post-doctorate research level, and even for research supervisors. These quantitative and qualitative metrics play a pivotal role in guiding and evaluating research endeavours, fostering accountability, and enhancing the overall quality and impact of academic work. KPIs play a critical role in shaping the trajectory of academic researchers' careers. They provide a structured way to measure and enhance research productivity, impact, and collaboration, thereby contributing to the advancement of knowledge and the overall enrichment of the academic community. It is academically interesting to know KPTs for PhD scholars' level, post-doctorate scholars level, and research supervisors level.*
Methodology/Approach: *The exploratory research method is adopted to analyze, compare, evaluate, interpret, and create KPIs at different academic research levels. The information is collected from scholarly articles using listed keywords with the help of search engines like Google.com, Google scholar, Organizational websites, and AI machines like ChatGPT and Bard. Using this relevant information, KPIs at different research levels are obtained. These KPIs at different academic research levels are further analysed using ABCD analysis framework.*
Findings/Result: *Many KPIs are identified and listed at PhD scholars' level, post-doctorate scholars level, and research supervisors level. Using ABCD analysis framework, these KPIs are analysed and evaluated. It is believed that the identified KPIs systematically in this research are going to be guiding policies for academic researchers at PhD scholars level, post-doctorate scholars level, and research supervisors level.*
Originality/Value: *For the first time, the key performance indicators (KPIs) are identified systematically and presented using exploratory research method. It is believed that like in business organizations of other industries, these key indicators are expected to be guiding principles to enhance the academic research productivity of higher education and research institutions at PhD scholars level, post-doctorate scholars level, and research supervisors level.*
Type of Paper: *Explorative Policy Research.*
Keywords: KPI, Key Performance Indicator, KPI of Researchers, Strategies to achieve KPI, ABCD Analysis,

1. INTRODUCTION :

The implementation of Key Performance Indicators (KPIs) has emerged as a significant tool in assessing and enhancing the performance of managers and leaders in various organizations. Some of the KPIs used for measuring the individual decision-making executives' performance in organizations include: (1) Revenue Growth, (2) Profit Margin, (3) Net promoter score, (4) Customer Satisfaction, (5) Customer Delight & Enlightenment, (6) Employee satisfaction, (7) Spending, (8) System quality, and (9) Return on investments [1-4].
KPI concept can be extended from executives of business organizations to researchers of academic institutions at different career levels, including PhD scholars, Post-Doctoral researchers, and Research

Supervisors. KPIs offer a structured framework to objectively measure and track the progress, productivity, and impact of individuals involved in the research ecosystem. At the PhD scholar level, KPIs play a pivotal role in guiding and monitoring the academic journey of young researchers, providing them with clear and measurable goals to achieve during their doctoral studies. By focusing on research output, progress in project milestones, and professional development, KPIs empower PhD scholars to stay on track, hone their skills, and contribute effectively to their respective fields of study. Similarly, at the Post-Doctoral level, KPIs provide an essential mechanism to evaluate the research productivity, collaboration, and research impact of post-doctoral researchers. By setting performance indicators related to publication output, external funding acquisition, and interdisciplinary collaborations, KPIs motivate Post-Doctoral researchers to excel in their work and make meaningful contributions to the advancement of knowledge. Additionally, KPIs should also encompass aspects such as mentorship, team building, and skill development, as post-doctoral researchers often embark on independent research careers. Moreover, at the Research Supervisor level, KPIs hold a critical role in assessing the effectiveness of research mentors and their contributions to the growth and success of their research teams. By focusing on metrics related to research output of mentees, research impact, collaborative initiatives, and mentorship effectiveness, KPIs enable research supervisors to refine their strategies, create a positive research culture, and provide tailored support to their team members. A comprehensive and well-designed KPI system for researchers at all career levels fosters a culture of continuous improvement, innovation, and accountability, ultimately driving research excellence and contributing to the broader scientific community.

1.1 Definition of Key Performance Indicators (KPIs) in General:

Key Performance Indicators (KPIs) are quantifiable metrics or measurable data points that are used to assess the performance, progress, and success of an individual, team, organization, or project in achieving specific objectives and goals. KPIs are an essential part of performance management and help in evaluating whether an entity is on track to meet its desired outcomes. KPIs are important for following reasons:

1. Measurement and Quantification: KPIs involve the measurement and quantification of performance-related data. They are typically expressed as numerical values, percentages, ratios, or rates. By using objective and standardized measurements, KPIs provide a clear and consistent way to evaluate performance.

2. Alignment with Objectives: Effective KPIs are directly aligned with the objectives and goals of the entity being evaluated. Whether it's an individual's performance, a team's project, or an organization's strategic plan, KPIs should reflect what success looks like in terms of achieving those specific objectives.

3. Focus on Critical Areas: KPIs focus on critical areas that have a significant impact on the overall success of the entity. They help identify strengths, weaknesses, opportunities, and threats, enabling better decision-making and resource allocation.

4. Benchmarking and Targets: KPIs often involve setting benchmarks or targets that act as reference points for performance evaluation. These benchmarks can be historical data, industry standards, or ambitious goals that the entity aims to achieve.

5. Monitoring and Control: KPIs provide a means of ongoing monitoring and control. Regularly tracking KPIs allows individuals or organizations to identify deviations from expected performance and take corrective actions if needed.

6. Communication and Transparency: KPIs play a crucial role in communication and transparency within an organization. When KPIs are clearly defined and accessible to relevant stakeholders, it fosters a shared understanding of performance and promotes accountability.

7. Adaptability and Relevance: KPIs should be adaptable to changing circumstances and remain relevant to the current objectives. As priorities shift or new challenges arise, KPIs may need to be adjusted to reflect the evolving focus.

8. Combination of Leading and Lagging Indicators: KPIs can be categorized as leading indicators and lagging indicators. Leading indicators provide insight into potential future performance, while lagging indicators represent past results. A combination of both types helps provide a comprehensive view of overall performance.

9. Continuous Improvement: KPIs serve as a basis for continuous improvement efforts. By identifying areas that require improvement and areas of success, entities can implement strategies to enhance overall performance.

In summary, KPIs are critical tools for measuring and evaluating progress toward achieving specific goals. By focusing on measurable and relevant metrics, entities can make informed decisions, identify areas for improvement, and celebrate successes. Regularly reviewing KPIs is essential for maintaining performance alignment and ensuring that efforts are directed towards strategic priorities.

1.2 Types of KPI:

Key Performance Indicators (KPIs) are quantifiable metrics that measure the success of an organization or of a particular activity in which it engages. KPIs are used to track progress towards goals, identify areas for improvement, and make data-driven decisions. KPIs should be specific, measurable, achievable, relevant, and time-bound (SMART). They should also be aligned with the organization's overall goals and objectives. There are many different types of KPIs, but some common examples include:

(1) Financial KPIs: These metrics measure the financial performance of an organization, such as revenue, profit, and expenses.

(2) Customer KPIs: These metrics measure the satisfaction and loyalty of customers, such as customer satisfaction scores, customer churn rates, and repeat purchase rates.

(3) Operational KPIs: These metrics measure the efficiency and effectiveness of operations, such as order fulfillment times, inventory turnover rates, and manufacturing defect rates.

(4) Employee KPIs: These metrics measure the performance of employees, such as productivity, absenteeism rates, and turnover rates.

KPIs can be used to track progress towards goals, identify areas for improvement, and make data-driven decisions. By tracking KPIs, organizations can ensure that they are on track to achieve their goals and that they are making the most of their resources.

Some of the benefits of using KPIs in organizations or individuals are listed below:

(1) Improved decision-making: KPIs provide data-driven insights that can help organizations make better decisions.

(2) Increased accountability: KPIs help to ensure that everyone in the organization is working towards the same goals.

(3) Improved performance: KPIs can help organizations to improve their performance by identifying areas for improvement and tracking progress over time.

(4) Increased visibility: KPIs can help to improve visibility into the organization's performance, which can help to build trust with stakeholders.

In this paper, based on the existing literature review, we have identified a new concept of measuring key performance indicators (KPIs) of researchers at different stages of their life cycle. This includes identifying their responsibilities, converting these responsibilities in to key performance indicators, developing and analysing the possible strategies to achieve them, comparing it with ABC model of organizational research performance, and developing postulates in the form of suggestions to various level researchers.

2. RESEARCH OBJECTIVES :

Research Objectives for Identifying Important Key Performance Indicators (KPIs) in Researchers:

(1) To Review Existing Literature: The first research objective is to conduct a comprehensive review of the existing literature on KPIs in the context of researchers. This involves examining relevant academic papers, reports, and case studies to understand the current state of KPI usage and its effectiveness in assessing researchers' performance.

(2) To Identify Researcher Career Levels: The second objective is to identify different career levels of researchers, including PhD scholars, Post-Doctoral researchers, and Research Supervisors. Understanding the unique challenges, goals, and expectations at each career stage will aid in tailoring specific KPIs for different research groups.

(3) To Elicit Stakeholder Perspectives: This objective aims to gather perspectives from various stakeholders, such as researchers, research supervisors, funding agencies, and research institutions.

Conducting interviews, surveys, or focus groups will help identify the key performance indicators that stakeholders value in evaluating researchers.

(4) To Define KPI Categories: Based on the literature review and stakeholder input, the next objective is to categorize KPIs into different dimensions, such as research productivity, impact, mentorship, collaboration, and professional development. This step helps organize the various KPIs and highlights their significance in different aspects of researchers' work.

(5) To Assess Relevance and Feasibility: The research should assess the relevance and feasibility of each identified KPI. This involves evaluating whether the KPI is directly aligned with researchers' performance, measurable, and practical to implement within the research context.

(6) To Compare Across Disciplines: Another objective is to compare KPIs across different research disciplines to identify any discipline-specific variations. This analysis can help understand the contextual differences and challenges in evaluating researchers in diverse fields.

(7) To Develop a Comprehensive Framework: This objective focuses on developing a comprehensive KPI framework that encompasses the identified KPIs for researchers at different career levels. The framework should be flexible enough to accommodate the unique needs of researchers while maintaining a consistent evaluation approach.

(8) To Pilot Test the KPI Framework: To ensure the efficacy of the developed KPI framework, a pilot test should be conducted with a small sample of researchers from different career levels. Feedback from participants will be gathered to refine and improve the framework.

(9) To Propose Recommendations for Implementation: The research objectives include proposing recommendations for the implementation of the KPI framework. These recommendations may address challenges, potential benefits, and strategies to integrate the KPIs into existing research evaluation systems.

(10) To Contribute to Research Evaluation Practices: The final objective is to contribute to research evaluation practices by providing evidence-based insights on important KPIs for researchers. The research outcomes aim to inform policymakers, research institutions, and funding agencies in adopting effective KPIs to foster a culture of excellence and productivity in the research community.

3. CURRENT STATUS OF KPI BASED ON LITERATURE REVIEW:

Key Performance Indicators (KPIs) are vital tools employed by modern business organizations to measure and assess the success of their strategic goals and operational performance. These quantifiable metrics enable companies to track their progress, make informed decisions, and align their efforts with overarching objectives. KPIs span diverse areas, from financial performance and customer satisfaction to employee productivity and sustainability targets. KPIs have evolved beyond basic measurements, incorporating advanced data analytics and real-time monitoring to provide a holistic view of organizational health. Businesses continue to refine their KPI frameworks, leveraging technology to enhance accuracy and relevance, and adapting them to the dynamic nature of markets and industries. Table 1 contains a review of scholarly papers on Key Performance Indicators of Business Organizations and Table 2 depicts a review of Key Performance Indicators (KPIs) proposed and used in Higher Education and Research:

Table 1: Review of scholarly papers on Key Performance Indicators of Business Organizations

S. No.	Area	Focus/ Outcome	Reference
1	KPI in Business Strategy models	KPIs are defined in Structured English and are implemented in a semi-automatic way, allowing for quick modifications. This enables real-time monitoring and what-if analysis, thereby helping analysts compare expectations with reported results.	Maté, A., et al. (2012). [5]
2	KPI assessment in manufacturing organizations	This method allows stakeholders to evaluate the organization's KPIs in an effort to determine organizational performance against predetermined KPI thresholds. The method is demonstrated on a case study and suggestions for future research are offered.	Hester, P., et al. (2017). [6]

3	Use of KPIs for exploring organizational resilience	Based on case studies on two enterprises embedded in the metal-mechanical sector in Brazil, 29 KPIs (20 of them were empirically identified) and 13 Elements of Resilience (EoR) were discussed.	Werner, M. J. E., (2021). [7]
4	A review on analyzing KPIs for E-commerce and Internet marketing of elderly products	Searched key performance indicators (KPIs) of elderly products to reveal the important factors of them to enhance marketing efforts in a web shop.	Tsai, Y. C., & Cheng, Y. T. (2012). [8]
5	Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs)	The paper identifies key indicators for performance measurement and classifies them into four major categories: transport optimization, information technology optimization, inventory optimization and resource optimization. A theoretical framework is proposed to link the performance of these constructs on financial performance of the firm.	Anand, N., & Grover, N. (2015). [9]
6	A new model of information systems efficiency based on key performance indicator (KPI)	The study provided a new model of information system efficiency based on key performance indicator and the extent to which such approach helps the company evaluate the performance within the company. In addition to recognize the requirements and criteria needed to establish an effective system of performance measurement, the axioms that may influence the designing of the Model KPIs in order to facilitate hiring.	AlRababah, A. A. (2017). [10]
7.	KPIs in hospitality industry: an emphasis on accommodation business of 5-star hotels	In hospitality organisations and workers, choosing the correct KPIs is directly dependent on gaining an understanding of what is important to the organization.	Srivastava, N., & Maitra, R. (2016). [11]

Table 2: KPIs in higher education and research

S. No.	Area	Focus / Outcome	Reference
1	Exploring and measuring the key performance indicators in higher education institutions	This paper provides a model to explore and measure KPIs using text mining and feature extraction technique and measure indicators automatically rather than traditional methods of exploring based a questionnaire, and measure KPIs to know the impact of exploring these KPIs on the overall performance in HEIs.	Badawy, M., El-Aziz, A., & Hefny, H. (2018). [12]
2	Framework of measuring key performance indicators for decision support in higher education institution	Performaces are chategorized into academic, research and supporting key performance indicators (KPI). Measurement results are reflected by KPI scores, and visualized in form of “wheel-shape”. When the form of wheel is perfectly round, it means that the institution has an exclent success in running its activities.	Suryadi, K. (2007). [13]

3	KPIs to optimize the environmental performance of Higher Education Institutions with environmental management system	Based on a case study of Universitat Politècnica de València, it is found that: Use of KPIs as tool to improve the environmental performance of HEIs, EMAS framework serves as guide for the definition of KPIs, Energy consumption, waste management and GHG are key aspects to assess on HEIs, Build-up area is the functional unit suggested for HEIs KPIs, Full-time equivalent student and employees are the reporting units suggested.	Lo-Iacono-Ferreira, V. G., et al. (2018). [14]
4	KPI measurement model based on analytic hierarchy process and trend-comparative dimension in higher education institution.	KPIs are determined as description of key success factors related to institution sustainability. These KPIs are chategorized into academic, research and supporting KPI. Each KPI has different degree of importance and is weighted using Analytic Hierarchy Process (AHP). On the other hand, KPI's points are set based on its trend over last three years and its current level compared to benchmark or competitor performances.	Suryadi, K. (2007, August). [15]
5	Qualitative Indicators for the evaluation of universities performance	The main purpose of this study is to find the key performance indicators (KPIs) and also to present a conceptual framework for the evaluation of the performance of the universities according to the key performance indicators (KPIs).	Azma, F. (2010). [16]
6	Management of key performance indicators by heads of higher education institutions.	The KPIs are presented in terms of improving the system of management and motivation, administrative and teaching staff of higher education. The methodology proposed for the application was used in practice in order to adapt and change the over bureaucratized and inefficient management system of a private higher education institution with partial funding from the state budget.	Broshkov, M., (2020). [17]
7	Key performance indicators (KPI) system in education	Analysis of foreign researchers' scientific approaches to the practice of application of such performance indicators as citation index and number of publications in magazines was conducted from the point of view of the accuracy of performance evaluation of scientific and teaching staff. Evaluation of indicators significance is made.	Luneva, E. V. (2015). [18]
8	Key performance indicators vs key intangible performance among academic staff: A case study of a public university in Malaysia.	This study is specifically devoted to the key intangible performance (KIP) of academic staff with respect to their contribution to the academic staff KPI. The population of this study is determined by purposive sampling and comprises all categories of staff, namely professors, associate professors,	Masron, T. A., Ahmad, Z., & Rahim, N. B. (2012). [19]

		senior lecturers and lecturer of a public university in Malaysia.	
9	Developing Key Performance Indicators framework for evaluating the performance of engineering faculty.	This paper firstly categorized performance indicators into broad areas secondly to identify key performance indicators (KPIs) for evaluating the performance of faculty. The new key performance indicator system encompasses all the minute parameters in academics. Authors believe that implementing such a PMS will certainly help Institutes to raise their quality standards.	Joshi, S. M., Bhattacharjee, S. B., Deshpande, V. C., & Tadvalkar, M. (2016). [20]
10	KPIs for excellent teachers in Malaysia: A measurement model for excellent teaching practices	The findings showed that an excellent classroom management style was the most significant domain for KPI with the highest factor loading, followed by ETs' teaching philosophy and objectives. It revealed that there was no significant relationship between ETs' expectations and their classroom management style and that the relationships between the other domains were weak.	Amzat, I. H. (2017). [21]
11	Academics' perceptions on quality in higher education shaping key performance indicators	This paper presents the KPIs based on faculty members understanding of the different independent dimensions of the quality construct. These KPIs would provide valuable insights into improving teaching, learning and assessment and will eventually lead to sustainable curricula.	Varouchas, E., et al. (2018). [22]
12	Constraints on achieving key performance indicators for scholarly publications among academic staff: Case of a Malaysian public university	The results show that the academic staff members have put in considerable effort to send papers to high impact factor journals. Moreover, they are aware of the KPIs that they need to achieve for scholarly publications in line with their career aspirations and agree that KPIs are aligned with their career prospects.	Kaur, S., Ibrahim, R., & Selamat, A. (2013). [23]
13	The Proposal of Key Performance Indicators in Facility Management and Determination the Weights of Significance for the design and use of sustainable buildings	Key Performance Indicators (KPI) are measure that provides essential information about performance of facility services delivery. In selecting KPI, it is critical to limit them to those factors that are essential to the organization reaching its goals. It is also important to keep the number of KPI small just to keep everyone's attention focused on achieving the same KPIs.	Rimbalová, J., & Vilčeková, S. (2013). [24]
14	ABC model of research productivity and higher educational institutional ranking	The institutional research productivity is calculated using a metric which consists of three institutional variables and one parameter. The three variables identified are the following: Number of Articles published in peer reviewed journals (A), Number of Books published (B), and Number of Case studies and/or Book Chapters (C) published during a given time	Aithal, P. S., & Kumar, P. M. (2016). [25]

		of observation. The parameter used is a number of full-time Faculty members (F) which remains constant during a given period of observation.	
15	Application of Theory A on ABC Model to enhance organizational research productivity in higher education.	How the Theory of Accountability can be used to boost researchers' ABC performance in HEIs.	Aithal, P. S., & Kumar, P. M. (2016). [26]
16	Analysis of ABC Model of Annual Research Productivity, one of KPIs of researchers	Using this model, an organization can calculate its annual research performance using its annual research output by taking into account the following factors such as the number of articles published in refereed journals, the number of books published, and the number of chapters in edited book or number of business cases published in Journals. The paper studied the implications of a system or model considering all determinants in key areas and analysing the key issues to identify the effective factors and its critical constituent element is the task of ABCD analysis model.	Aithal, P. S., Shailashree, V. T., & Kumar, P. M. (2016). [27]
17	Interconnecting Theory of Accountability (Theory A) and ABC Model of Organizational Performance	Application of the theory of organizational performance namely 'Theory A" can improve research productivity of educational institutions. This is a management strategy which believes in delivering target as responsibility, feeling of creativity and contribution for motivation, identifying with the organization as commitment and accountability as a hallmark of efficiency. In this paper, we have interconnected Theory A of organization performance with ABC model of research productivity in order to enhance research productivity of the organizations.	Aithal, P. S., & Kumar, P. M. (2017). [28]
18	How to increase research productivity in higher educational institutions–SIMS model.	Based on a case study on the experience and efforts of increasing the research productivity at Srinivas Institute of Management Studies as a case example. The strategies to be followed to increase the number of research publications and subject book publications by effective faculty involvement and business case development by student involvement are discussed.	Aithal, P. S. (2016). [29]
19	Study of Annual Research Productivity in Indian Top Business Schools using one of researchers KPIs	The institutional research productivity is calculated using a metric model called ABC model which consists of four institutional parameters identified as number of Articles published in peer reviewed journals (A), number of Books published (B), number of Case studies and/or Book Chapters (C)	Aithal, P. S. (2016). [30]

		published, and the number of full-time Faculty members (F) in that higher education institution during a given time of observation. In this paper, we have used ABC model of institutional research productivity to calculate research productivity of some of the Indian top business schools.	
20	Study of Research Productivity in World Top Business Schools using one of the researchers KPIs	The institutional research productivity is calculated using a metric which consists of three institutional variables and one parameter. The three variables identified as the number of Articles published in peer reviewed journals (A), the number of Books published (B), and number of Case studies and/or Book Chapters (C) published during a given time of observation. The parameter used is the number of full-time Faculty members (F) in that higher education institution which remains constant during a given period of observation. In this paper, we have used ABC model of institutional research productivity to calculate annual research productivity of some of the world top business schools.	Aithal, P. S. (2016). [31]
21	Research Performance Analysis of Some Indian Top Business Schools Using ABC Model.	The ABC model framework for researchers is used to determine institutional research productivity by calculating Institutional Research Index for higher educational institutions. Further, the model is tested by making use of case examples of seven top Business Schools in India. The value of annual research index is calculated for these institutions for last four years and observed variation of research productivity during these years is studied and discussed.	Aithal, P. S. (2016). [32]

Based on the above review, it is understood that there is a necessity of identifying essential Key Performance Indicators for researchers at different levels in the higher education and research industry to boost their performance and hence productivity.

4. RESPONSIBILITIES OF RESEARCHERS OF (1) PHD SCHOLAR LEVEL, (2) POST DOCTORAL LEVEL, (3) RESEARCH SUPERVISOR LEVEL:

4.1. Researchers at PhD Scholar Level:

(1) Conducting Original Research: PhD scholars are responsible for conducting in-depth and original research within their chosen field of study. They must identify research gaps, formulate hypotheses, design experiments, and gather data to contribute new knowledge to their discipline.
(2) Literature Review: Thoroughly reviewing existing literature to understand the state of the field, identify relevant theories and methodologies, and build a foundation for their research.
(3) Data Collection and Analysis: Collecting data through experiments, surveys, or other methods, and rigorously analyzing the data using appropriate statistical or analytical techniques.

(4) Writing Research Papers: Documenting research findings in the form of research papers, conference presentations, and in the form of scholarly articles journals, edited chapters, and Conference proceedings. Scholars should aim to contribute to scholarly discourse and disseminate their work.
(5) Collaboration: Collaborating with peers, advisors, and experts in the field to exchange ideas, seek feedback, and broaden their perspective.
(6) Participating in Academic Activities: Engaging in seminars, workshops, and academic discussions to enhance their understanding of research methodologies and develop critical thinking skills.

4.2. Researchers at Post-Doctoral Level:

(1) Advanced Research: Post-doctoral researchers conduct more advanced and specialized research, often building on their doctoral work or exploring new directions within their field.
(2) Mentorship: Providing guidance and mentorship to PhD students and junior researchers, sharing expertise, and helping them develop their research skills.
(3) Grant Writing: Identifying funding opportunities, preparing research grant proposals, and securing funding to support research projects.
(4) Publishing: Publishing high-quality research papers in the form of scholarly articles in indexed journals, Edited books/edited chapters, and Conference proceedings, leading to a significant contribution to the field. Post-docs often collaborate with established researchers and supervise graduate students.
(5) Networking: Establishing professional networks, attending conferences, and presenting research findings to a wider audience.
(6) Independence: Developing independence in research, demonstrating the ability to lead projects, make informed decisions, and manage research resources effectively.

4.3. Research Supervisor Level:

(1) Mentoring and Supervision: Guiding and mentoring PhD scholars and post-doctoral researchers, helping them develop research ideas, refine methodologies, and navigate academic challenges.
(2) Research Strategy: Developing a strategic research agenda for the research group or department, aligning research projects with institutional goals and emerging trends.
(3) Collaboration: Fostering collaborations with other research groups, institutions, and industry partners to enhance the impact of research outcomes.
(4) Grant Management: Overseeing research funding, managing budgets, and ensuring the efficient and ethical use of resources.
(5) Promoting Research Culture: Encouraging a culture of research excellence by organizing seminars, workshops, and conferences, and facilitating knowledge sharing.
(6) Publication and Funding: Publishing research findings in the form of scholarly articles in reputable journals, Edited books/edited chapters, and Conference proceedings and securing research grants to support ongoing projects.
(7) Contributing to Policy and Practice: Translating research into practical applications, informing policy decisions, and contributing to societal advancements.
(8) Each level of responsibility represents a progressive step in an academic researcher's career, with increasing emphasis on independent research, mentorship, and leadership as one moves from PhD scholar to post-doc to research supervisor.

5. KEY PERFORMANCE INDICATORS (KPI) FOR RESEARCHERS OF (1) PHD SCHOLAR LEVEL, (2) POST DOCTORAL LEVEL, (3) RESEARCH SUPERVISOR LEVEL:

Key Performance Indicators (KPIs) are essential for assessing the performance and progress of researchers at different levels. Here are some KPIs for researchers at the PhD scholar level, post-doctoral level, and research supervisor level:

5.1. PhD Scholar Level:

(1) Research Output: Number of peer-reviewed papers published or accepted in peer reviewed journals or conference proceedings.
(2) Research Progress: Demonstrated progress towards completing research milestones and objectives.

(3) Contribution to Research Projects: Contributions to ongoing research projects, including innovative ideas and experimental work.
(4) Skills Development: Participation in workshops, training, or courses to enhance research skills and knowledge.
(5) Research Presentations: Number of presentations made at conferences or seminars.
(6) Collaboration: Active involvement in collaborative research with other scholars or researchers.
(7) Teaching and Mentoring: Involvement in mentoring or assisting junior students or lab members.

5.2. Post-Doctoral Level:

(1) Publications and Citations: Number of publications (in journals, Edited books, and Conference proceedings) as the lead or co-author and the impact of these publications through citations.
(2) Grants and Funding: Success in obtaining research grants or funding for individual or collaborative projects.
(3) Research Leadership: Ability to lead and manage research projects effectively.
(4) Industry Collaboration: Collaboration with industry partners or other institutions to apply research in real-world settings.
(5) Conference Participation: Active participation in conferences, either as a speaker or organizer.
(6) Innovation and Intellectual Property: Contributions to patents, copyrights, or other intellectual property developments.
(7) Mentoring and Supervision: Involvement in guiding and mentoring junior researchers or students.

5.3. Research Supervisor Level:

(1) Research Team Productivity: Overall research output of the team in terms of publications, patents, copyrights or other measurable research outcomes.
(2) Research Project Success: Success rate in obtaining research grants and completing projects within budget and timeline.
(3) Doctoral Student Success: Number of successful PhD completions and time taken for completion.
(4) Research Impact: Evidence of research outcomes making a tangible impact on the field or society.
(5) Collaborations and Partnerships: Development of collaborations with other research groups, institutions, or industry.
(6) Research Reputation: Recognition and reputation in the research community, measured by invitations to speak, review papers, or join committees.
(7) Ethics and Compliance: Ensuring research activities and projects comply with ethical standards and regulations.
It's important to note that KPIs should be tailored to the specific research field and the objectives of the researcher or research team. Additionally, KPIs should be periodically reviewed and updated to reflect changing research priorities and goals.

6. STRATEGIES TO ACHIEVE KEY PERFORMANCE INDICATORS (KPI) FOR RESEARCHERS OF (1) PHD SCHOLAR LEVEL, (2) POST DOCTORAL LEVEL, (3) RESEARCH SUPERVISOR LEVEL:

To achieve Key Performance Indicators (KPIs) in research, each level of researchers - PhD scholar, Postdoctoral fellow, and Research Supervisor - requires different strategies due to their varying roles, responsibilities, and career stages. Below are suggested strategies for each level:

6.1 PhD Scholar Level:

a. Research Productivity:
(1) Publish high-quality research papers in reputable journals or conference proceedings.
(2) Set clear targets for the number of publications and presentations during the PhD period.
(3) Collaborate with peers and mentors to enhance research output.
b. Research Impact:
(1) Aim for publications with high citation potential to demonstrate the impact of the research.
(2) Present research findings at conferences and workshops to reach a broader audience.
(3) Engage with industry partners or policymakers to demonstrate real-world relevance.
c. Professional Development:

(1) Attend relevant workshops, seminars, and training programs to enhance research skills.
(2) Participate in academic and scientific networking events to establish connections.
(3) Develop transferable skills, such as communication, project management, and leadership.

d. Timely Progress:

(1) Set clear milestones and timelines for the completion of research objectives.
(2) Regularly communicate progress to the research supervisor and address any challenges.
(3) Demonstrate adaptability and resilience when faced with unexpected obstacles.

6.2 Postdoctoral Level:

a. Research Leadership:

(1) Lead and coordinate research projects, demonstrating the ability to manage a team if applicable.
(2) Mentor and support junior researchers, such as PhD scholars or interns.
(3) Take the initiative in proposing new research directions or collaborations.

b. Publications and Grants:

(1) Continue to publish high-impact research papers and contribute to grant applications.
(2) Aim for first-author or senior-author publications to demonstrate leadership.
(3) Collaborate with multiple research groups to expand the impact of research.

c. Research Funding:

(1) Work towards securing research funding, either independently or in collaboration.
(2) Show successful management of research budgets and resources.
(3) Seek opportunities for fellowships or grants to support personal career development.

d. Academic Engagement:

(1) Organize or participate in workshops, symposiums, or academic conferences.
(2) Develop a strong online presence, e.g., through a research blog or social media, to share findings.
(3) Consider teaching opportunities to gain experience in academic instruction.

6.3 Research Supervisor Level:

a. Doctoral Student Mentoring:

(1) Demonstrate a track record of successful mentoring by guiding PhD students to completion.
(2) Foster a supportive and collaborative research environment for doctoral researchers.
(3) Encourage students to publish and present their research findings.

b. Research Team Management:

(1) Lead and manage research teams effectively, promoting a positive work culture.
(2) Encourage interdisciplinary collaborations and diversity within the research group.
(3) Facilitate regular research group meetings and foster knowledge sharing.

c. Research Grants and Collaborations:

(1) Secure research grants and funding to support the research team and projects.
(2) Initiate and maintain collaborations with other research institutions or industry partners.
(3) Seek opportunities for joint projects or international research collaborations.

d. Research Leadership and Recognition:

(1) Demonstrate research leadership by initiating and leading significant research projects.
(2) Publish high-impact research papers and contribute to academic conferences.
(3) Aim for recognition through awards, invitations to give talks, or serving on editorial boards.

e. Research Ethics and Compliance:

(1) Ensure adherence to ethical guidelines and compliance with relevant regulations.
(2) Foster a culture of research integrity and responsible conduct of research.
(3) Promote awareness of research ethics among the research team.

It should be noted that the specific KPIs for researchers may vary based on the institution, field of research, and individual career goals. The strategies listed above are general guidelines and should be adapted to the unique circumstances and expectations of each researcher and their respective organizations.

7. COMPARISON OF KPI BETWEEN CEOS, RESEARCH SCHOLARS, PDFS, AND RESEARCH SUPERVISORS :

Key Performance Indicators (KPIs) for Chief Executive Officers (CEOs) in global business organizations encompass a dynamic array of strategic benchmarks that reflect their pivotal role in driving corporate success. These metrics transcend financial measures, encompassing both quantitative and qualitative aspects. Financial KPIs such as revenue growth, profitability, and shareholder returns remain central, but are balanced by non-financial KPIs like market share expansion, customer satisfaction, and employee engagement. CEO performance is evaluated through their ability to set and execute visionary strategies, adapt to market shifts, foster innovation, and navigate complex global landscapes. Effective KPIs align the CEO's actions with the organization's mission, and while quantifiable outcomes matter, they are interwoven with intangibles such as leadership effectiveness, stakeholder relationships, and sustainability initiatives. In the dynamic sphere of global business, CEO KPIs encapsulate a holistic evaluation framework that underscores their multifaceted influence on both financial prowess and broader organizational impact.

For PhD researchers, KPIs offer a structured framework to assess progress and drive their studies forward. KPIs can include metrics like the number of research publications, conference presentations, and successful grant applications. By setting and monitoring these indicators, PhD researchers can ensure they are meeting milestones, maintaining focus, and making meaningful contributions to their field of study.

At the post-doctorate research level, KPIs continue to be valuable in facilitating career advancement and research excellence. Researchers in this phase may be evaluated on the impact and originality of their publications, collaborations with other scholars and institutions, acquisition of competitive grants, and development of innovative research methodologies. KPIs provide a tangible way for post-doctorate researchers to demonstrate their expertise and make a lasting impact on their academic discipline.

Research supervisors also benefit from KPIs as they guide and mentor emerging scholars. These indicators enable supervisors to track the progress of their students and ensure they are receiving the necessary guidance and resources. KPIs can encompass metrics such as the timely completion of research projects, successful graduation rates, and the frequency of co-authored publications with their mentees. By using KPIs, research supervisors can tailor their mentoring approach, nurture research talent, and contribute to the academic success of their students.

The following table 3 lists KPIs of CEOs of business organizations, KPIs of Research Scholars, KPIs of Post Doctoral Fellows, and KPIs of Research supervisors in Higher Education and Research Institutions.

Table 3: Comparison of KPIs of CEOs, Research scholars, PDFs, and Research Supervisors

S. No.	CEOs	Research Scholars	PDFs	Research Supervisors
1	Revenue Growth	Research Output based on the number of publications	Publications	Research Team Productivity
2	Profit Margin	Research Progress based on achieving a number of milestones	Citations	Citations & H-Index
3	Net promoter score	Contribution to Research Projects	Grants and Funding	Research Project Success
4	Customer Satisfaction	Skills Development by participating in training	Research Leadership	Doctoral Student Success
5	Customer Delight & Enlightenment,	Research Presentations	Industry Collaboration	Research Impact
6	Employee satisfaction	Collaboration	Conference Participation	Collaborations and Partnerships
7	Spending	Teaching and Mentoring	Innovation and Intellectual Property	Research Reputation

8	Return on investments	Optimizing cost	Mentoring and Supervision	Ethics and Compliance
9	System Quality	Quality Research	Quality Research	Quality Research

8. ABCD ANALYSIS OF KPI FOR RESEARCHERS AT DIFFERENT LEVELS :

ABCD analysis framework is a suitable framework to analyse the advantages, benefits, constraints, and disadvantages of a concept like Key Performance Indicator [33-37]. Developed as a simple but systematic framework for analysis of concepts, ideas, models, materials, systems, decisions, products, and services, etc, in 2015 by our group. ABCD analysis is used under four headings as (1) ABCD listing [38 - 53], (2) ABCD stakeholders' analysis [54-60], (3) ABCD factors and elementary analysis [61-66], and (4) ABCD quantitative analysis [67-75]. In this section, ABCD listing is presented at PhD scholar level, PDF Scholar level, and at Research supervisors levels.

8.1 At PhD Scholars Level:

(A) Advantages:

Advantages of Key Performance Indicators (KPIs) for researchers at the PhD scholar level:

(1) Clarity of Expectations: KPIs provide clear and specific expectations for PhD scholars. They know what is required of them in terms of research output, milestones, and overall progress.

(2) Goal Orientation: KPIs help PhD scholars stay focused on their research objectives and goals. They provide a roadmap for their research journey and aid in staying on track.

(3) Measurable Progress: KPIs offer quantifiable metrics to measure progress. Scholars can track their performance over time and assess how well they are meeting their targets.

(4) Motivation and Accountability: Having measurable targets can motivate scholars to achieve more. KPIs instill a sense of accountability as they are responsible for meeting the set performance indicators.

(5) Performance Assessment: KPIs allow researchers and academic supervisors to assess the performance of PhD scholars objectively. This assessment is crucial for recognizing strengths and identifying areas for improvement.

(6) Identifying Areas of Improvement: By tracking specific metrics, KPIs help scholars identify areas that need improvement. This self-awareness can lead to a more efficient and effective research approach.

(7) Resource Optimization: KPIs help scholars allocate their time and resources effectively. By prioritizing activities based on the set indicators, they can make the best use of available resources.

(8) Enhanced Research Productivity: Having clear performance indicators can drive scholars to be more productive and output-oriented in their research activities.

(9) Support for Career Development: Meeting or exceeding KPIs can enhance a PhD scholar's academic and research career. It can lead to better opportunities, scholarships, and increased recognition in the field.

(10) Effective Mentoring: Research supervisors can use KPIs to provide targeted guidance and mentorship to PhD scholars. KPIs highlight areas that may need additional support or attention.

(11) Cultivating Research Excellence: KPIs foster a culture of research excellence and continuous improvement among PhD scholars. Scholars are encouraged to strive for higher standards and impactful research outcomes.

(12) Feedback and Reflection: KPIs offer a basis for constructive feedback and self-reflection. Scholars can use KPI data to reflect on their research approach and make necessary adjustments.

(13) Quality Assurance: KPIs act as a quality assurance mechanism, ensuring that research conducted at the PhD level meets the required standards and contributes meaningfully to the field.

(14) Supporting Decision Making: KPI data can inform decision-making processes for both researchers and academic institutions. It aids in setting research priorities, allocating resources, and making strategic choices.

(15) Recognition and Awards: Some academic institutions and research organizations recognize outstanding performance based on KPI achievements, leading to awards and accolades for PhD scholars who excel.

In summary, KPIs offer a range of benefits to PhD scholars, including improved focus, motivation, accountability, and career advancement. They provide a structured framework for assessing performance, optimizing resources, and cultivating a culture of research excellence. KPIs play a vital

role in enhancing research productivity and ensuring that PhD scholars make meaningful contributions to their respective fields.

(B) Benefits:

Benefits of Key Performance Indicators (KPIs) for researchers at the PhD scholar level:

(1) Clarity and Focus: KPIs provide clear and well-defined goals for PhD scholars, ensuring they know exactly what is expected of them during their research journey. This clarity helps scholars stay focused and aligned with their research objectives.

(2) Measurable Progress: KPIs offer quantifiable metrics to measure the progress of PhD scholars. They can track their performance over time, enabling a tangible assessment of their research milestones and achievements.

(3) Motivation and Accountability: Having measurable targets through KPIs can boost motivation among researchers. Scholars are more likely to take ownership of their work and feel accountable for meeting the set performance indicators.

(4) Efficient Resource Allocation: KPIs assist scholars in allocating their time and resources effectively. By prioritizing activities based on the set indicators, scholars can optimize their research efforts and ensure resource efficiency.

(5) Identification of Strengths and Weaknesses: KPIs enable scholars to identify their research strengths and areas that require improvement. This self-awareness helps them capitalize on their strengths and work on enhancing their weaknesses.

(6) Enhanced Research Productivity: With clear performance indicators, scholars are driven to be more productive and output-oriented in their research endeavors. This can lead to increased research productivity and output.

(7) Objective Performance Evaluation: KPIs allow for objective performance evaluation. Supervisors and academic committees can assess scholars' progress based on measurable data, reducing subjectivity in the evaluation process.

(8) Effective Mentorship: Research supervisors can use KPIs to provide targeted guidance and mentorship to PhD scholars. KPIs highlight areas that may need additional support, enabling supervisors to offer relevant assistance.

(9) Career Advancement: Meeting or exceeding KPIs can positively impact a PhD scholar's academic and research career. Achieving performance targets can lead to more opportunities, scholarships, and collaborations.

(10) Cultivating Research Excellence: KPIs foster a culture of research excellence among PhD scholars. By setting high standards and providing a framework for continuous improvement, KPIs encourage scholars to strive for impactful research outcomes.

(11) Data-Driven Decision Making: KPI data empowers researchers to make informed decisions about their research priorities and strategies. It allows them to evaluate the effectiveness of different approaches based on measurable outcomes.

(12) Improved Research Quality: Setting KPIs related to research output and quality encourages scholars to conduct rigorous research and produce high-quality publications. This focus on quality contributes to the advancement of knowledge in their field.

(13) Supporting Research Collaboration: KPIs can facilitate research collaboration among scholars by aligning their objectives and encouraging cooperation in areas of mutual interest.

(14) Enhanced Institutional Assessment: Aggregated KPI data can be used by academic institutions to assess the effectiveness of their research programs and support services for PhD scholars. This evaluation helps in identifying areas for improvement.

(15) Recognition and Incentives: Institutions and research organizations may provide recognition and incentives to PhD scholars who excel in achieving KPIs, further motivating scholars to strive for excellence.

In conclusion, KPIs offer a range of benefits to researchers at the PhD scholar level, promoting clarity, motivation, accountability, and research excellence. By setting measurable targets and providing a basis for objective evaluation, KPIs contribute to the overall growth and success of PhD scholars in their research endeavours.

(C) Constraints:

Constraints of Key Performance Indicators (KPIs) for researchers at the PhD scholar level:

(1) Overemphasis on Quantitative Metrics: KPIs often focus on quantifiable outcomes, such as the number of publications or citations, which may not fully capture the depth and impact of a scholar's research. This can overlook the value of qualitative contributions or exploratory work.

(2) Narrow Focus on Productivity: Strictly measuring research productivity through KPIs may lead scholars to prioritize quantity over quality. This could discourage them from exploring complex research questions that may require more time and effort.

(3) Unintended Consequences: KPIs may inadvertently lead to researchers pursuing low-risk or incremental research projects that are more likely to yield quick and measurable results, rather than taking on more ambitious and groundbreaking endeavours.

(4) Limited Scope of Assessment: KPIs might not encompass the full spectrum of a PhD scholar's contributions and potential. They may overlook crucial aspects like research mentorship, collaboration, and community engagement.

(5) Standardization Challenges: Determining universally applicable KPIs for all researchers across different disciplines and research contexts can be difficult. Each field of study may require its own set of performance indicators, making it challenging to create a one-size-fits-all approach.

(6) Short-Term Orientation: KPIs often measure short-term achievements, while many research projects, especially in the PhD phase, are part of a longer and more comprehensive research journey. This short-term focus may not align well with the nature of academic research.

(7) Pressure and Stress: Setting strict KPIs might create undue pressure and stress on PhD scholars, affecting their mental well-being and potentially leading to burnout.

(8) Lack of Flexibility: Rigid adherence to KPIs may hinder scholars from exploring unexpected research avenues or adapting to changing research circumstances.

(9) Potential for Gaming the System: In some cases, researchers may focus on meeting KPIs by optimizing activities to fit the indicators, potentially at the expense of genuine creativity and innovation.

(10) Subjectivity in KPI Selection: Selecting appropriate and relevant KPIs requires careful consideration, and different stakeholders may have varying opinions on what constitutes the most meaningful performance indicators.

(11) Resource Constraints: Not all research projects have access to abundant resources, and KPIs that demand extensive funding or infrastructure might not be feasible for all PhD scholars.

(12) Lack of Adequate Data: Gathering accurate and timely data for certain KPIs can be challenging, especially for long-term research projects or those involving interdisciplinary work.

(13) Unintended Bias: KPIs may inadvertently perpetuate existing biases in academia, such as gender or ethnic disparities, by emphasizing certain metrics that favour certain demographics or research topics.

(14) Unintended Pigeonholing: Overemphasis on specific KPIs might lead to the pigeonholing of researchers into certain research areas, limiting their ability to explore diverse fields and interdisciplinary research.

In conclusion, while KPIs can be useful in measuring and guiding research progress, they also have constraints that should be carefully considered. Striking a balance between quantifiable metrics and the qualitative aspects of research, as well as considering individual research contexts, can help mitigate some of these constraints and create a more comprehensive and supportive evaluation framework for researchers at the PhD scholar level.

(D) Disadvantages:

Constraints of Key Performance Indicators (KPIs) for researchers at the PhD scholar level:

(1) Overemphasis on Quantitative Metrics: KPIs often focus on quantifiable outcomes, such as the number of publications or citations, which may not fully capture the depth and impact of a scholar's research. This can overlook the value of qualitative contributions or exploratory work.

(2) Narrow Focus on Productivity: Strictly measuring research productivity through KPIs may lead scholars to prioritize quantity over quality. This could discourage them from exploring complex research questions that may require more time and effort.

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8.2 At Post Doctoral Level:

(A) Advantages at Post Doctoral Level:

Advantages of Key Performance Indicators (KPIs) for researchers at the Post-Doctoral level:
(1) Clear Performance Expectations: KPIs provide clear and specific performance expectations for post-doctoral researchers. They know what is required of them in terms of research output, project milestones, and professional development.
(2) Goal Orientation: KPIs help post-doctoral researchers stay focused and goal-oriented. Having measurable targets enables them to channel their efforts towards achieving specific research outcomes.
(3) Objective Performance Evaluation: KPIs offer an objective basis for performance evaluation. Post-doctoral researchers can track their progress using quantifiable metrics, which minimizes subjectivity in assessments.
(4) Motivation and Accountability: Having measurable targets through KPIs can motivate post-doctoral researchers to excel in their work. It fosters a sense of accountability as they are responsible for meeting the set performance indicators.
(5) Identification of Strengths and Areas for Growth: KPIs allow post-doctoral researchers to identify their strengths and areas that need improvement. This self-awareness enables them to build on their strengths and work on enhancing their skills.

(6) Efficient Resource Allocation: KPIs assist post-doctoral researchers in allocating their time and resources effectively. By prioritizing activities based on the set indicators, they can optimize their research efforts and use resources efficiently.
(7) Enhanced Research Productivity: With clear performance indicators, post-doctoral researchers are motivated to be more productive in their research. This can lead to an increased number of publications, presentations, and other research outputs.
(8) Career Development: Meeting or exceeding KPIs can positively impact a post-doctoral researcher's career. It can lead to more opportunities for collaborations, funding, and potential faculty positions.
(9) Support for Mentoring and Supervision: KPIs can be used by research supervisors to provide targeted guidance and mentorship to post-doctoral researchers. KPI data highlights areas where additional support may be needed.
(10) Facilitating Research Collaboration: KPIs can help foster research collaboration among post-doctoral researchers by aligning their objectives and encouraging cooperation in areas of mutual interest.
(11) Continuous Improvement: KPIs encourage a culture of continuous improvement among post-doctoral researchers. By setting high standards and providing a framework for assessment, KPIs support ongoing professional development.
(12) Data-Driven Decision Making: KPI data empowers post-doctoral researchers to make informed decisions about research priorities and strategies. It allows them to evaluate the effectiveness of different approaches based on measurable outcomes.
(13) Improved Research Quality: Setting KPIs related to research output and quality encourages post-doctoral researchers to conduct rigorous and impactful research. This focus on quality contributes to the advancement of knowledge in their field.
(14) Institutional Evaluation: Aggregated KPI data can be used by institutions to assess the effectiveness of post-doctoral research programs and support services. This evaluation helps identify areas for improvement and resource allocation.
(15) Recognition and Incentives: Institutions and research organizations may recognize and reward post-doctoral researchers who excel in achieving KPIs. This recognition can further motivate researchers to strive for excellence.
In summary, KPIs offer several benefits to researchers at the post-doctoral level, including increased focus, motivation, accountability, and research productivity. They provide a structured framework for assessing performance and facilitating career development. KPIs contribute to the growth and success of post-doctoral researchers in their academic and research endeavours.

(B) Benefits at Post Doctoral Level:
Benefits of Key Performance Indicators (KPIs) for researchers at the Post-Doctoral level:
(1) Goal Clarity and Focus: KPIs provide clear and specific performance goals for post-doctoral researchers. They know exactly what is expected of them in terms of research outcomes, project milestones, and professional development.
(2) Measurable Progress: KPIs offer quantifiable metrics to track research progress. Post-doctoral researchers can assess their performance and achievements objectively, which helps them stay on track towards their goals.
(3) Motivation and Accountability: Having measurable targets through KPIs can motivate post-doctoral researchers to excel in their work. It fosters a sense of accountability as they are responsible for meeting the set performance indicators.
(4) Objective Performance Evaluation: KPIs provide an objective basis for performance evaluation. Post-doctoral researchers can use quantifiable data to showcase their accomplishments, reducing subjectivity in assessments.
(5) Identification of Strengths and Areas for Growth: KPIs enable post-doctoral researchers to identify their strengths and areas that need improvement. This self-awareness allows them to build upon their strengths and work on enhancing their skills.
(6) Efficient Resource Allocation: KPIs assist post-doctoral researchers in allocating their time and resources effectively. By prioritizing activities based on the set indicators, they can optimize their research efforts and use resources efficiently.

(7) Enhanced Research Productivity: Clear performance indicators can motivate post-doctoral researchers to be more productive in their research. This can lead to an increased number of publications, presentations, and other research outputs.
(8) Career Development: Meeting or exceeding KPIs can positively impact a post-doctoral researcher's career. It can lead to more opportunities for collaborations, funding, and potential faculty positions.
(9) Facilitating Mentoring and Supervision: KPIs can be used by research supervisors to provide targeted guidance and mentorship to post-doctoral researchers. KPI data highlights areas where additional support may be needed.
(10) Encouraging Research Collaboration: KPIs can help foster research collaboration among post-doctoral researchers by aligning their objectives and encouraging cooperation in areas of mutual interest.
(11) Continuous Improvement: KPIs encourage a culture of continuous improvement among post-doctoral researchers. By setting high standards and providing a framework for assessment, KPIs support ongoing professional development.
(12) Data-Driven Decision Making: KPI data empowers post-doctoral researchers to make informed decisions about research priorities and strategies. It allows them to evaluate the effectiveness of different approaches based on measurable outcomes.
(13) Improved Research Quality: Setting KPIs related to research output and quality encourages post-doctoral researchers to conduct rigorous and impactful research. This focus on quality contributes to the advancement of knowledge in their field.
(14) Institutional Evaluation: Aggregated KPI data can be used by institutions to assess the effectiveness of post-doctoral research programs and support services. This evaluation helps identify areas for improvement and resource allocation.
(15) Recognition and Incentives: Institutions and research organizations may recognize and reward post-doctoral researchers who excel in achieving KPIs. This recognition can further motivate researchers to strive for excellence.
In summary, KPIs offer several benefits to researchers at the post-doctoral level, including increased focus, motivation, accountability, and research productivity. They provide a structured framework for assessing performance and facilitating career development. KPIs contribute to the growth and success of post-doctoral researchers in their academic and research endeavours.

(C) Constraints at Post Doctoral Level:
Constraints of Key Performance Indicators (KPIs) for researchers at the Post-Doctoral level:
(1) One-Size-Fits-All Approach: Applying uniform KPIs across all post-doctoral researchers may not account for the diverse research fields, projects, and career trajectories at this level. Different areas of study may require different KPIs for a meaningful assessment.
(2) Complexity of Research: Post-doctoral research projects can be complex and multidimensional, making it challenging to capture all aspects of the work through a limited set of KPIs.
(3) Subjectivity in KPI Selection: Determining relevant and meaningful KPIs can be subjective, and different stakeholders may have varying opinions on what constitutes essential performance indicators for post-doctoral researchers.
(4) Short-Term Focus: Some KPIs may emphasize short-term outcomes, which might not align with the long-term nature of post-doctoral research, where projects may extend over several years.
(5) Resource Constraints: Post-doctoral researchers might face limitations in terms of funding, laboratory resources, or access to data, which could affect their ability to meet certain KPIs.
(6) Risk Aversion: Strict adherence to KPIs may discourage post-doctoral researchers from taking on high-risk, innovative projects that could potentially lead to groundbreaking discoveries but might have uncertain outcomes.
(7) Pressure and Stress: Excessive focus on meeting KPIs can create undue pressure and stress on post-doctoral researchers, potentially impacting their well-being and mental health.
(8) Narrow Focus on Output Metrics: Relying solely on output metrics like the number of publications or citations might overlook other important aspects of a researcher's contributions, such as collaboration, mentoring, or public engagement.
(9) Lack of Adequate Data: Gathering accurate and timely data for certain KPIs can be challenging, particularly in interdisciplinary research or projects involving multiple collaborators.

(10) Unintended Competition: Introducing KPIs might inadvertently foster unhealthy competition among post-doctoral researchers, as they strive to achieve the same performance targets.
(11) Time Constraints: Balancing research work with administrative tasks related to KPI reporting and evaluation can be time-consuming for post-doctoral researchers.
(12) Potential for Gaming the System: In some cases, researchers may focus on meeting KPIs by optimizing activities to fit the indicators, potentially compromising the integrity or genuine impact of their work.
(13) Lack of Recognition for Non-Metric Achievements: KPIs may not fully recognize or reward researchers for non-measurable accomplishments, such as contributions to community outreach, policy advocacy, or research culture improvement.
(14) Adverse Career Implications: Overemphasis on KPIs might narrow the focus of post-doctoral researchers and lead them to pursue projects solely based on meeting indicators, rather than exploring their own research interests.
(15) Rigid Evaluation Framework: A rigid evaluation framework based on KPIs may hinder the ability to adapt to unforeseen challenges or changing research priorities during post-doctoral projects.
In conclusion, while KPIs can be valuable in assessing performance, they also have constraints that should be thoughtfully addressed. Post-doctoral researchers have unique challenges and career aspirations, and considering these factors can help develop a more comprehensive and supportive evaluation system that promotes a diverse and impactful research landscape.

(D) Disadvantages at Post Doctoral Level:
Disadvantages of Key Performance Indicators (KPIs) for researchers at the Post-Doctoral level:
(1) Narrow Focus on Quantitative Metrics: KPIs often emphasize quantitative outputs such as publications and citations, which may not fully capture the complexity and impact of post-doctoral research projects. This narrow focus may undervalue other valuable contributions, such as interdisciplinary collaboration or public engagement.
(2) Oversimplification of Research Excellence: Relying solely on KPIs for performance evaluation can oversimplify the concept of research excellence. Post-doctoral research often involves innovative and exploratory work, which may not yield immediate measurable results but can be transformative in the long run.
(3) Pressure to Meet Targets: Setting rigid KPIs may create undue pressure on post-doctoral researchers to achieve specific outcomes within a limited timeframe. This pressure can hinder creativity and the pursuit of high-risk, high-reward research projects.
(4) Risk Aversion and Conservatism: In response to the pressure to meet KPIs, some post-doctoral researchers may avoid risky or unconventional research projects in favour of safer, incremental work that aligns more easily with the defined indicators.
(5) Disincentive for Interdisciplinary Research: KPIs may not adequately account for the challenges and benefits of interdisciplinary research, potentially discouraging post-doctoral researchers from exploring collaborative projects that cross traditional disciplinary boundaries.
(6) Subjectivity in KPI Selection: Selecting relevant and meaningful KPIs can be subjective, and different stakeholders may have conflicting views on what constitutes essential performance indicators for post-doctoral researchers.
(7) Overemphasis on Quantity over Quality: Some KPIs, such as the number of publications, may inadvertently encourage researchers to prioritize quantity over the quality and rigor of their research.
(8) Inadequate Reflection of Research Process: KPIs may focus on end results without considering the complexities of the research process and the importance of methodological rigor, thorough analysis, and replication efforts.
(9) Neglecting Professional Development: KPIs that exclusively focus on research output might overlook the importance of post-doctoral researchers' professional development, mentorship, and skill-building activities.
(10) Potential for Gaming the System: Researchers may feel compelled to optimize activities to meet KPIs, potentially sacrificing the integrity or genuine impact of their work in favour of achieving predefined indicators.

(11) Time and Administrative Burden: Implementing KPIs can add administrative burden on post-doctoral researchers and research supervisors, diverting time and resources away from actual research activities.
(12) Stifling Innovation: Rigid adherence to KPIs may stifle innovation and discourage post-doctoral researchers from exploring unconventional ideas or pursuing projects with uncertain outcomes.
(13) Limited Flexibility: KPIs may not adapt well to unexpected research challenges or shifting research priorities during the course of post-doctoral projects.
(14) Negative Impact on Research Culture: An excessive focus on KPIs might foster a competitive and individualistic research culture, potentially hindering collaborative and supportive research environments.
(15) Lack of Recognition for Non-Metric Achievements: KPIs might not adequately recognize or reward post-doctoral researchers for non-measurable accomplishments, such as contributions to community outreach, policy advocacy, or mentorship.
In conclusion, while KPIs can provide valuable performance assessment metrics, they also have drawbacks that should be carefully considered. Implementing a thoughtful and balanced evaluation system that encompasses the multidimensional nature of post-doctoral research is crucial to ensure that researchers are supported in their pursuit of impactful and innovative contributions to their fields.

8.3 At Research Supervisor Level:

(A) Advantages at Research Supervisor Level:

Advantages of Key Performance Indicators (KPIs) for researchers at the Research Supervisor level:
(1) Clarity in Expectations: KPIs provide clear and specific expectations for research supervisors. They know what is expected of them in terms of guiding and supporting their research team.
(2) Objective Assessment: KPIs offer an objective basis for evaluating the performance of research supervisors. The quantifiable metrics enable a more standardized and impartial assessment.
(3) Enhanced Research Output: KPIs encourage research supervisors to foster a productive and efficient research environment, leading to increased research output and outcomes.
(4) Improvement of Mentorship: KPIs can help research supervisors identify areas for improvement in their mentoring approach. By tracking performance indicators related to mentorship, supervisors can adapt their strategies to better support their researchers.
(5) Support for Career Development: KPIs can be aligned with the career development of researchers, ensuring that supervisors actively engage in guiding their team members towards achieving career milestones.
(6) Resource Allocation: KPIs help research supervisors allocate resources effectively. By identifying areas that require more support or investment, supervisors can optimize the allocation of funding, equipment, and personnel.
(7) Identification of Training Needs: KPIs can reveal areas where research team members may require additional training or development. This insight enables research supervisors to provide targeted opportunities for skill enhancement.
(8) Continuous Improvement: KPIs encourage research supervisors to continuously improve their mentoring and leadership skills, creating a dynamic and effective research team.
(9) Strategic Decision Making: KPI data allows research supervisors to make data-driven decisions regarding research direction, resource allocation, and collaboration opportunities.
(10) Recognition of Supervisory Excellence: Research supervisors who excel in meeting KPIs may receive recognition and rewards, encouraging them to maintain high standards of supervision.
(11) Facilitating Collaboration: KPIs can promote collaborative research environments by encouraging research supervisors to support team members in working together on interdisciplinary projects.
(12) Transparent Communication: Establishing KPIs fosters transparent communication between research supervisors and their team members. Regular discussions about performance indicators can align expectations and foster a collaborative research culture.
(13) Promotion of Ethical Research Practices: KPIs can include metrics related to research ethics and compliance, promoting a commitment to ethical research conduct within the research team.
(14) Accountability and Quality Assurance: KPIs hold research supervisors accountable for the progress and success of their research team. This accountability ensures a focus on maintaining high-quality research standards.

(15) Institutional Assessment: Aggregated KPI data can be used by institutions to assess the effectiveness of research supervision and mentorship programs, leading to improvements in the overall research environment.
In summary, KPIs offer several benefits to research supervisors, including increased clarity, objectivity, and efficiency in guiding research teams. By aligning KPIs with career development and continuous improvement, research supervisors can create a supportive and productive research environment that fosters the growth and success of their researchers.

(B) Benefits at Research Supervisor Level:
Benefits of Key Performance Indicators (KPIs) for researchers at the Research Supervisor level:
(1) Clear Expectations: KPIs provide clear and specific expectations for research supervisors. They know what is expected of them in terms of guiding and supporting their research team.
(2) Objective Assessment: KPIs offer an objective basis for evaluating the performance of research supervisors. The quantifiable metrics enable a more standardized and impartial assessment.
(3) Enhanced Research Output: KPIs encourage research supervisors to foster a productive and efficient research environment, leading to increased research output and outcomes.
(4) Improved Mentorship: KPIs can help research supervisors identify areas for improvement in their mentoring approach. By tracking performance indicators related to mentorship, supervisors can adapt their strategies to better support their researchers.
(5) Support for Career Development: KPIs can be aligned with the career development of researchers, ensuring that supervisors actively engage in guiding their team members towards achieving career milestones.
(6) Resource Allocation: KPIs help research supervisors allocate resources effectively. By identifying areas that require more support or investment, supervisors can optimize the allocation of funding, equipment, and personnel.
(7) Identification of Training Needs: KPIs can reveal areas where research team members may require additional training or development. This insight enables research supervisors to provide targeted opportunities for skill enhancement.
(8) Continuous Improvement: KPIs encourage research supervisors to continuously improve their mentoring and leadership skills, creating a dynamic and effective research team.
(9) Strategic Decision Making: KPI data allows research supervisors to make data-driven decisions regarding research direction, resource allocation, and collaboration opportunities.
(10) Recognition of Supervisory Excellence: Research supervisors who excel in meeting KPIs may receive recognition and rewards, encouraging them to maintain high standards of supervision.
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(14) Accountability and Quality Assurance: KPIs hold research supervisors accountable for the progress and success of their research team. This accountability ensures a focus on maintaining high-quality research standards.
(15) Institutional Assessment: Aggregated KPI data can be used by institutions to assess the effectiveness of research supervision and mentorship programs, leading to improvements in the overall research environment.
In summary, KPIs offer several benefits to research supervisors, including increased clarity, objectivity, and efficiency in guiding research teams. By aligning KPIs with career development and continuous improvement, research supervisors can create a supportive and productive research environment that fosters organizational academic performance.

(C) Constraints at Research Supervisor Level:
Constraints of Key Performance Indicators (KPIs) for researchers at the Research Supervisor level:

(1) Complexity of Research Supervision: Research supervision is a multifaceted role that involves mentoring, managing projects, and supporting researchers' professional development. Capturing all aspects of effective supervision through a limited set of KPIs can be challenging.
(2) Subjectivity in KPI Selection: Defining relevant and meaningful KPIs for research supervision can be subjective, as different stakeholders may have different perspectives on what constitutes effective supervision.
(3) Diverse Research Areas: Research supervisors may oversee researchers in various disciplines, and the specific KPIs required for effective supervision might vary significantly across different fields of study.
(4) Balancing Research and Supervision: For supervisors who are also active researchers, finding a balance between their own research endeavours and their supervisory responsibilities may pose challenges.
(5) Individual Researcher Differences: Each researcher has unique needs and development paths, making it difficult to apply standardized KPIs that adequately address individual differences.
(6) Long-Term Impact: Effective research supervision may have long-term impacts on researchers' careers and contributions to the field, but KPIs might predominantly focus on short-term outcomes.
(7) Pressure on Supervisors: Relying heavily on KPIs for performance evaluation may add pressure on research supervisors to prioritize meeting metrics rather than focusing on the individual needs of their researchers.
(8) Ethical Considerations: Certain KPIs, such as the number of publications, could inadvertently incentivize unethical practices, such as publishing low-quality or redundant research to meet quantitative targets.
(9) Lack of Universality: KPIs might not be universally applicable to all research supervision scenarios, especially when supervising diverse teams with varying research goals and needs.
(10) Limited Influence on External Factors: External factors beyond the control of research supervisors, such as funding availability or research opportunities, may significantly impact researchers' outcomes, affecting the relevance of certain KPIs.
(11) Data Availability and Reliability: Gathering accurate and comprehensive data to assess certain KPIs may be challenging, particularly for subjective aspects of supervision or long-term researcher outcomes.
(12) Striking the Right Balance: KPIs should strike a balance between measuring tangible outcomes and recognizing the more intangible aspects of effective supervision, such as providing emotional support and fostering a positive research culture.
(13) Neglecting Research Quality for Quantity: Overemphasis on quantitative KPIs, like the number of publications, may inadvertently prioritize quantity over the quality of research outcomes.
(14) Potential for Misinterpretation: Misinterpretation or misrepresentation of KPI data could lead to biased or unfair evaluations of research supervisors' performance.
(15) Unintended Consequences: Overemphasis on specific KPIs might incentivize supervisors to prioritize short-term gains and tangible outcomes over the long-term growth and development of their researchers.

In conclusion, while KPIs can be useful for evaluating research supervision, they also have constraints that need to be carefully considered. Research supervision is a nuanced role that requires a comprehensive approach, and relying solely on KPIs may not capture the full extent of a supervisor's impact on researchers and their careers. A thoughtful and balanced evaluation framework that encompasses the diverse aspects of effective supervision is essential to promote a supportive and productive research environment.

(D) Disadvantages at Research Supervisor Level:
Disadvantages of Key Performance Indicators (KPIs) for researchers at the Research Supervisor level:
(1) Simplification of Complex Role: Research supervision is a multifaceted role that involves mentoring, supporting, and guiding researchers. Relying solely on KPIs might oversimplify this role, overlooking the diverse and nuanced aspects of effective supervision.

(2) Subjectivity in KPI Selection: Defining relevant and meaningful KPIs for research supervision can be subjective, as different stakeholders may have different perspectives on what constitutes effective supervision.
(3) Narrow Focus on Quantitative Metrics: KPIs often emphasize quantitative outputs, such as the number of publications or funding secured, which might not fully capture the quality and impact of research supervision.
(4) Inadequate Reflection of Researcher Development: KPIs might not adequately capture the long-term impact of research supervision on researchers' professional growth, skill development, and career trajectory.
(5) Pressure on Supervisors: Excessive reliance on KPIs for performance evaluation may lead to research supervisors prioritizing meeting metrics over providing personalized and effective mentorship to their researchers.
(6) Limited Universality: KPIs may not be universally applicable to all research supervision scenarios, especially when supervising researchers in diverse fields with varying research goals and needs.
(7) Risk of Gaming the System: Research supervisors might focus on meeting KPIs by optimizing activities to fit the indicators, potentially sacrificing the genuine impact and growth of their researchers.
(8) Potential for Ethical Concerns: Some KPIs, such as the number of publications, could incentivize unethical practices, such as coercive authorship or self-plagiarism, to meet quantitative targets.
(9) Overlooking Soft Skills and Emotional Support: KPIs may not adequately recognize or reward research supervisors for providing emotional support, fostering a positive research culture, and developing soft skills in their researchers.
(10) Pressure on Researcher Recruitment: Overemphasis on KPIs could influence research supervisors to prioritize recruiting researchers with high pre-existing metrics, potentially overlooking promising candidates with different career trajectories.
(11) Neglecting Collaboration and Team Building: KPIs might not sufficiently promote collaborative research environments or acknowledge the efforts of research supervisors in building cohesive and productive research teams.
(12) Short-Term Orientation: Some KPIs might emphasize short-term outcomes, while the impact of research supervision on researchers' careers and contributions to the field may be more pronounced over the long term.
(13) Neglecting Unconventional Research Approaches: KPIs might inadvertently discourage research supervisors from supporting unconventional or high-risk research projects that have the potential for significant breakthroughs.
(14) Data Availability and Reliability: Gathering accurate and comprehensive data to assess certain KPIs, especially those related to soft skills and researcher development, may be challenging and subjective.
(15) Inherent Bias: The selection and implementation of KPIs may be influenced by inherent biases, potentially favouring certain research disciplines or methodologies over others.

In conclusion, while KPIs can provide valuable performance assessment metrics, they also have disadvantages that need to be carefully considered. A holistic evaluation of research supervision should incorporate multiple sources of feedback and consider the diverse and nuanced aspects of effective mentorship and support for researchers' professional growth. Balancing the use of KPIs with other evaluation methods can help create a comprehensive and supportive research supervision framework.

9. ABC MODEL OF RESEARCH PRODUCTIVITY :

In ABC model of research productivity paper [25], based on six postulates, we have argued and analysed that why the performance of higher educational institutions should be based on the sole criteria of Institutional Research Performance (IRP). ABC model of measuring research productivity for higher educational institutions based on calculating institutional research index and weighted research index. The institutional research productivity is calculated using a metric that consists of three institutional variables and one parameter. The three variables identified are the following: Number of Articles published in peer-reviewed journals (A), Number of Books published (B), and Number of Case studies and/or Book Chapters (C) published during a given time of observation. The parameter used is the number of full-time Faculty members (F) which remains constant during a given period of observation.

A framework for institutional ranking based on institutional research productivity by considering the calculated Institutional Research Index is also developed which can be used to give grades to higher educational institutions. This ABC model can be extended to KPIs of researchers at the PhD research level, Post Doctoral Fellow research level, and at Research Supervisor levels. The scholarly publication KPI can be quantitatively calculated using the formula given in the paper [25] by considering: (a) the Number of Peer-reviewed Journal Papers (A) published, (b) the Number of Edited Books/Textbooks published (B), and (c) the Number of Edited Book Chapters or Edited Conference Papers published (C).

10. POSTULATES & CONCLUSION :

Postulates for proposing Key Performance Indicators (KPIs) for Researchers at different levels:

10.1. Postulates for PhD Scholar Level:

(1) Publication Output: The number of peer-reviewed publications or conference presentations to measure the scholar's ability to disseminate research findings.
(2) Research Progress: Tracking the completion of research milestones and project deliverables to assess the scholar's progress in their PhD research.
(3) Research Impact: Evaluating the scholar's contribution to the field through metrics such as citations, media coverage, or real-world applications of their research.
(4) Research Collaboration: Assessing the scholar's involvement in collaborative research projects to promote interdisciplinary skills and teamwork.
(5) Teaching and Mentoring: Measuring the scholar's involvement in teaching or mentoring activities to gauge their communication and leadership abilities.
(6) Professional Development: Evaluating the scholar's participation in workshops, conferences, or training programs to promote continuous learning and skill enhancement.
(7) Research Proposal Development: Assessing the scholar's ability to create compelling research proposals for grants and funding opportunities.
(8) Research Ethics and Integrity: Monitoring adherence to ethical research practices and academic integrity in conducting research.
(9) Communication Skills: Evaluating the scholar's proficiency in presenting research findings to both specialized and general audiences.
(10) Publication Quality: Measuring the quality and impact of the scholar's publications, such as journal impact factors or acceptance rates.

10.2. Postulates for Post-Doctoral Level:

(1) Research Productivity: Tracking the scholar's research output, including publications, patents, or prototypes developed during their post-doctoral research.
(2) Research Collaboration: Assessing the scholar's involvement in collaborative research projects and their ability to foster interdisciplinary partnerships.
(3) External Funding Acquisition: Measuring the success of the scholar in securing research grants and external funding for their post-doctoral research.
(4) Research Impact: Evaluating the scholar's impact on the field through citations, media coverage, or applications of their research in real-world contexts.
(5) Mentorship and Supervision: Assessing the scholar's ability to mentor and supervise graduate students or junior researchers.
(6) Professional Development: Evaluating the scholar's participation in professional development activities, such as workshops, conferences, or leadership training.
(7) Knowledge Transfer: Measuring the scholar's efforts in translating research findings into practical applications or policy recommendations.
(8) Research Ethics and Compliance: Monitoring adherence to ethical research practices and compliance with institutional regulations.
(9) Innovation and Creativity: Assessing the scholar's ability to generate innovative research ideas and approaches.
(10) Research Collaboration: Assessing the scholar's involvement in collaborative research projects to promote interdisciplinary skills and teamwork.

10.3. Postulates for Research Supervisor Level:

(1) Research Output of Mentees: Tracking the research output, publications, and contributions of researchers supervised by the supervisor.
(2) Research Funding Success: Measuring the supervisor's success in securing research grants and funding for their research team.
(3) Mentorship Effectiveness: Evaluating the effectiveness of the supervisor's mentorship and support provided to their research team members.
(4) Research Impact of Mentees: Assessing the impact of the research conducted by researchers supervised by the supervisor.
(5) Collaborative Initiatives: Measuring the supervisor's efforts in fostering collaborative research projects and interdisciplinary partnerships.
(6) Training and Development: Evaluating the supervisor's efforts in providing training and professional development opportunities for their research team members.
(7) Ethical Supervision: Monitoring the supervisor's adherence to ethical research practices and ensuring a positive research culture.
(8) Research Leadership: Assessing the supervisor's ability to provide effective leadership and direction to their research team.
(9) Innovation and Research Direction: Evaluating the supervisor's contributions to defining innovative research directions and advancing the field.
(10) Team Dynamics: Measuring the effectiveness of the supervisor in promoting a positive and collaborative research team environment.
These postulates can serve as a starting point for developing comprehensive and context-specific Key Performance Indicators (KPIs) tailored to the needs and objectives of researchers at different career levels. KPIs should be thoughtfully designed to reflect the specific goals and expectations of each research level while promoting a supportive and conducive research environment.

11. CONCLUSION :

In conclusion, Key Performance Indicators (KPIs) play a crucial role in assessing the performance and progress of researchers at various career levels. For PhD scholars, KPIs focusing on research output, progress in milestones, and career development can guide their academic journey and foster a strong foundation for future research endeavours. At the Post-Doctoral level, KPIs centered on research productivity, collaboration, and research impact encourage post-doctoral researchers to excel in their work and contribute significantly to their fields. Additionally, KPIs at this level should also consider the importance of mentorship and professional development, as post-doctoral researchers often transition into independent research careers. For Research Supervisors, KPIs that emphasize effective mentorship, research output of mentees, collaboration facilitation, and leadership skills are essential in promoting a supportive and productive research environment. Moreover, comprehensive evaluation frameworks should strike a balance between quantitative metrics and the qualitative aspects of supervision, including fostering a positive research culture and nurturing the growth of researchers under their guidance. Ultimately, a thoughtful and tailored approach to KPIs for researchers at all career levels can drive research excellence, foster innovation, and contribute to the advancement of knowledge across diverse fields.

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