Reshaping Research Ecosystems: Recommendations for Equitable Recognition of Non-STEM Research in Higher Institution Management

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ABSTRACT

Historically, the trend in academia towards measurable measures has marginalised non-STEM, arts, and humanities subjects, often at the price of their inherent academic principles and capabilities. This review of the literature explores the shift in university policies and practises, emphasising the need for a more compassionate and inclusive approach to research administration. This study analyses a variety of scientific articles using an extensive keyword search on Lens.org to evaluate the obstacles and recommendations for equal career progression in non-STEM disciplines. The findings indicate a rising appreciation for the multifaceted nature of knowledge and the significance of varied academic contributions. The study highlights the importance of widening the concept of research impact, including qualitative evaluations, and embracing interdisciplinary approaches. It also discusses the impact of university rankings and the incorporation of SDGs in reframing the value of non-STEM disciplines. In addition, the study suggests practical methods for university administrators, such as the creation of customised appraisal forms, customised career trajectories, and equal resource allocation. The study finishes by considering the future role of the arts and humanities in an increasingly automated and technologically driven world, emphasising the relevance of human values and ethical considerations in societal growth. This study adds to the discussion about developing a balanced and human-centred approach to research management, calling for the recognition and support of all academic disciplines in the changing landscape of higher education.

Keywords: Empathy in Academia, Non-STEM Recognition, Research Management, Academic Equity, Interdisciplinary Approaches, University Rankings Impact, Arts and Humanities in Higher Education

1. Introduction

The bias in academia towards quantifiable metrics, particularly in research and teaching, can be traced back to several historical developments, with the Humboldt model of higher education serving as a significant turning point (Rouse 2016) Wilhelm von Humboldt's integration of research and teaching advocated for the integration of research and teaching in universities. It emphasised knowledge creation through research as a critical component of higher education. The Humboldtian model, which initially supported a wide range of disciplines, including the arts and humanities, valued academic freedom and the pursuit of knowledge for its own sake.

The Humboldt model's emphasis on research and the creation of new knowledge laid the foundation for the modern research university. However, as the model evolved and was adopted by universities worldwide, including those in Malaysia, it inadvertently contributed to the development of biases favouring quantifiable metrics and research outputs. The Humboldtian ideal of the unity of research and teaching gradually gave way to a greater emphasis on research productivity, which could be more easily measured and compared across institutions.

In the Malaysian context, the influence of the Humboldt model can be seen in the establishment of research universities and the increasing focus on research performance. The Malaysian government's strategic plans for higher education, such as the National Higher Education Strategic Plan Beyond 2020, set ambitious targets for research output and university rankings. These targets have led to the prioritization of STEM disciplines, which are perceived to be more aligned with the nation's economic development goals and more readily produce quantifiable research outputs.

While the Humboldt model's original vision encompassed a wide range of disciplines, including the arts and humanities, its modern interpretation has contributed to the marginalization of these fields. The pressure to perform in global university rankings and to demonstrate research productivity has led to an imbalance in resource allocation and recognition, favouring STEM disciplines over non-STEM fields. This bias has had significant implications for the career progression and wellbeing of academics in the arts, humanities, and social sciences in Malaysian universities.

With the rise of the 'knowledge economy' in the late twentieth century, we see a shift towards quantifiable metrics. With the advent of the knowledge economy in the late twentieth century, there was a growing emphasis on the economic and practical utility of university research. Following that was a period in which universities were increasingly viewed as engines of economic growth rather than institutions of pure learning and knowledge dissemination. Governments and funding agencies began to use performance-based funding models, emphasising measurable outcomes such as research publications, citations, and grants.

In Malaysia, these developments favoured STEM disciplines, which more readily produce quantifiable outputs and are often more directly linked to economic benefits. As a result, the arts and humanities began to be seen as less valuable in this new paradigm, given their more qualitative, interpretive, and less immediately economically quantifiable nature. With the goal of bolstering Malaysian research universities even more, the National Higher Education Strategic Plan Beyond 2020 projects that two

Malaysian universities will rank among the top 100 in the world. The University of Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM), and Universiti Teknologi Malaysia (UTM) are the five research universities that currently exist in Malaysia. It is anticipated that these research-driven institutions will see an increase in both the number and quality of researchers, postgraduates, and research (Sheriff, 2017). The introduction of global university rankings can indeed be seen as a significant factor that further entrenched the bias towards quantifiable metrics in academia (Wan, 2016), affecting the perception and valuation of different disciplines, especially non-STEM fields like the arts and humanities. It contributed to the amplification of quantifiable metrics favoured by rankings. University rankings typically rely heavily on quantifiable metrics such as research output, citation counts, funding amounts, and faculty qualifications, resulting in an emphasis on research and publication during promotion assessment (Sidek, 2012). These metrics inherently favour STEM disciplines, which tend to produce more frequent publications and receive more citations and research funding. To improve their rankings, Malaysian universities often adjust their policies and resource allocations to align with the metrics used in these rankings. This can lead to a disproportionate allocation of resources towards STEM departments and research areas that are more likely to boost ranking metrics.

Significant consequences for non-STEM disciplines are now evident. The emphasis on metrics that favour STEM disciplines can lead to the undervaluing of the arts and humanities, which often have different research outputs and impacts. Non-STEM departments may face pressure to align their research and teaching practises with these metrics, potentially at the expense of their intrinsic academic values and strengths. The introduction of university rankings can be seen as a culmination of the trends towards marketization, quantification, and economic utility in higher education. Rather than introducing a new bias, rankings reinforced and gave a more formal and globally visible structure to existing biases towards quantifiable, STEM-oriented metrics. There is increasing criticism of the over-reliance on university rankings and their impact on academic diversity and quality. This has led to calls for more comprehensive and nuanced approaches to evaluating and ranking universities, taking into account the diverse contributions of all academic disciplines. In recent years, there has been a growing critique of the overemphasis on quantifiable metrics and its impact on non-STEM fields. There is an increasing call for a more holistic approach to evaluating academic contributions, recognising the value of diverse disciplines and the limitations of purely quantitative assessments.

In this literature review, we examine if issues of performance recognition in non-STEM fields such as social sciences, arts, and humanities have been discussed and what recommendations have been laid out so that university administrators can be more empathetic to the welfare and career progression of their faculty members.

2. Methodology

This literature review utilised a systematic approach to identify, select, and analyse relevant research papers. The search was conducted using Lens.org, a comprehensive and open research platform that aggregates data from various sources, including scholarly publications, patents, and datasets. Lens.org is used to search for literature in reviews because it provides a reliable search strategy for finding review papers, systematic reviews, and meta-analysis. The Lens database provides an accessible and cost-free

platform for accessing patents and scholarly literature. Patent Lens, which was established in 1998, initially aimed to offer a more transparent means of accessing patent literature. According to the Lens *About* page, they anticipate that they will have the capacity to store over 95% of the global patent literature within a span of two years. More recently, scholarly literature has been incorporated into the database (Jeffersons, 2019). This literature has been obtained from multiple providers, with PubMed, CrossRef, and Microsoft Academic Graph being the main sources. This index, which contains more than 200 million academic publications, is one of the largest indexes currently available (Tay, 2018). By incorporating both scholarly and patent information, this tool becomes highly effective in examining the relationship between research and invention. It also offers added benefits such as research metrics and citation impact, which can be used to assess an organisation's research output (Penfold, 2020).

The initial search strategy involved using a combination of keywords and phrases relevant to the research question. These terms were derived from an initial scoping review of the existing literature and through consultation with subject experts. The initial search terms included: "academic career," "faculty," "non-STEM," "arts and humanities," "social sciences," "university rankings," "research assessment," "performance appraisal," "promotion criteria," "interdisciplinary research," and "research impact." Boolean operators (AND, OR) were used to combine these terms and refine the search results.The subsequent search used the Boolean terms "career AND (Malaysia AND (faculty AND lecturer))" to narrow down the scope to articles associated with higher education in Malaysia. To further refine the results, the built-in filter function on Lens.org was used, setting the field of study to "higher education." After applying this exclusion criterion and removing duplicates where some publications were published in both journals and proceedings.

The inclusion criteria for the selected articles were:

i) Relevance to the research objective, focusing on issues of performance recognition in non-STEM fields and recommendations for fostering inclusivity in research management
ii) Publication in peer-reviewed journals or conference proceedings
iii) English language publications

The exclusion criteria were:

i) Articles not directly related to the Malaysian higher education context
ii) Articles focusing solely on STEM disciplines without addressing non-STEM research outputs or career progression
iii) Duplicate publications or preprints

The literature was further categorised using Lens.org's integrated reference management tool, enabling efficient retrieval and analysis. The platform's data visualisation features such as word cloud were used to analyse trends and patterns in the research landscape. The insights gained from this systematic review were used to formulate practical recommendations for university administrators in Malaysia to promote equity and support for non-STEM faculty members.

3. Results and Discussion

The initial search produced 313 articles covering the period from 1950 to 2023. After implementing the inclusion and exclusion criteria and eliminating duplicate articles, a total of 65 papers were considered appropriate for further study. These publications underwent a systematic evaluation, during which major themes and findings were extracted and synthesized. The analysis primarily aimed to uncover the obstacles encountered by non-STEM academics in terms of advancing their careers and receiving recognition, while also providing suggestions for promoting a more inclusive and empathetic research management strategy.

When examining the patterns of published research related to academic career, particularly among academics and lecturers, the data obtained from Lens.org offers valuable insights into how these tendencies have changed over time. The keyword search conducted using Lens.org yielded 313 publications spanning from 1950 to 2023 (see Figure 1), revealing a substantial rise in the volume of literature, especially in the last two decades. This increase is a clear indication of the growing interest and expanding research in the field of academic career development.
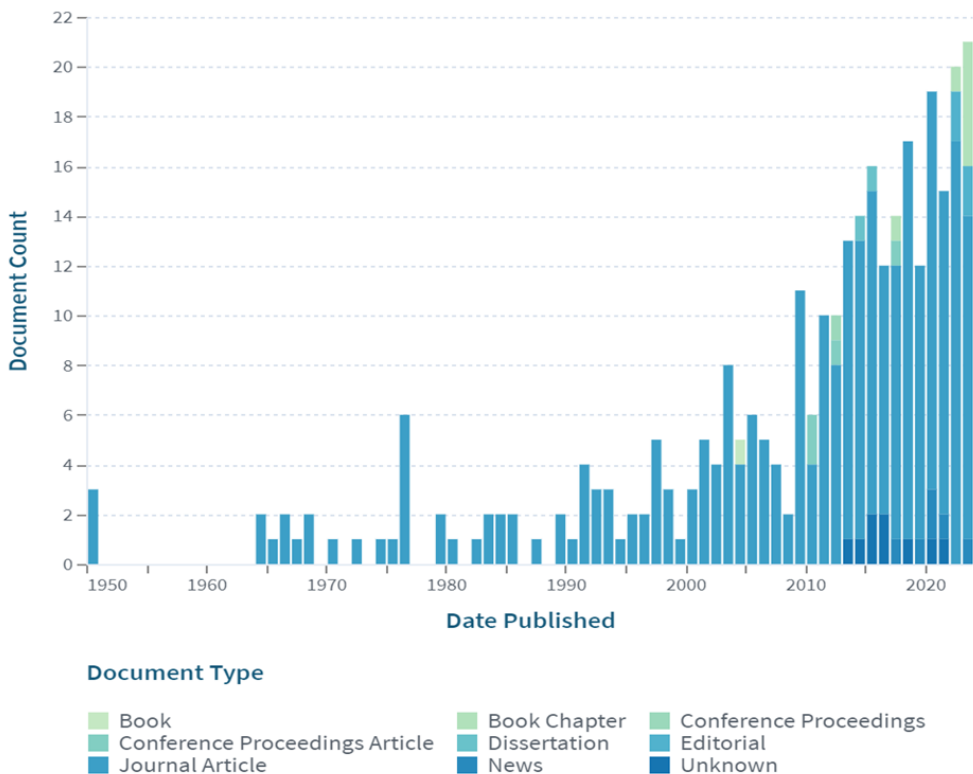

Figure 1: Trends in Academic Publications by Type, 1950-2023

Note: This figure presents a temporal analysis of academic publications in Malaysia. Green bars indicate book publications, varying shades of blue represent journal articles and dissertations, purple bars for book chapters, yellow bars for editorials, grey bars denote news articles, and black bars reflect documents of unknown type.

The proliferation of publications, particularly after 2000, underscores a heightened focus on academia and reflects the sector's evolution in the recognition and sophistication in career management. This global trend can be attributed to several factors, such as the increasing importance of higher education in driving economic growth (Mallick 2016, Hamid 2022, Li et al., 2024), the government's emphasis on developing a knowledge-based economy (Asian Development Bank, 2008, Mustapha & Abdullah, 2004) and the evolution of the higher education's third mission (Compagnucci, 2020).

A comprehensive analysis of narrowed down 65 research papers on Malaysian faculty members' careers reveals significant categorisation trends and notable gaps in the existing literature. Key studies predominantly focus on specific institutional dichotomies, with little attention given to recent developments like the inclusion of non-traditional research outputs, particularly in the arts, humanities, and social sciences. Key categorisation patterns include comparisons between private and public universities (Arokiasamy, 2011, 2014; Basarudin, 2016), research and non-research universities (Ab Rahim, 2013; Abu Said, 2015; Fauzi, 2023; Tan, 2016; Janib et al., 2021, 2022; Sadeghi et al., 2012), and private versus public sector institutions (Adi Badiozaman, 2021; Dilou, 2022; Hei & Sohail, 2006; Leong & Sohail, 2006; Mustapha & Ghee, 2013; Nadarajah et al., 2012; Noor, 2011; Wilkinson &Yussof, 2005). Other studies focus on gender-related career issues (Asaari, 2013; Luke, 2001; Ismail & Rasdi, 2006, 2007, 2008; Ehido et al., 2019) or present multi-country comparisons (Bennion & Locke, 2010; Guraya et al., 2018; Safaria, 2012). It is important to note that many publications either mention Malaysia tangentially as part of broader comparisons or focus on student careers rather than faculty careers. This inclusion in the corpus stems from the broad applicability of keywords like 'faculty' and 'career', which inadvertently captured studies not specifically focused on academics and faculty members. A significant gap in the literature is the absence of studies addressing recognition metrics beyond traditional publications and grants. This oversight particularly affects academics and faculty members in arts, humanities, and social sciences, whose outputs may not align with conventional metrics. The lack of research in this area suggests that it has not yet been prioritised by Malaysian researchers.

Our literature review unveils a critical gap in studies examining faculty career trajectories in Malaysia, particularly in relation to recent global trends that acknowledge diverse contributions from non-STEM fields in academia (Alperin, 2022). The majority of Malaysian studies focus on traditional metrics such as publication counts and citations, which have historically favoured STEM (Science, Technology, Engineering, and Mathematics) disciplines. This bias can be largely attributed to the establishment of the Malaysian Research Assessment (MyRA) in 2009 (Kasim et al., 2021). MyRA was introduced to systematically evaluate the research performance of Malaysian universities and research institutions. Its evaluation framework heavily relies on quantitative metrics, particularly publication counts and citation indices, as primary indicators of research output and impact (Huang & Lin, 2011). This emphasis aligns with global trends in research assessment, where institutions are increasingly judged based on their ability to produce high volumes of publishable research that garners citations. Consequently, Malaysian researchers are incentivized to prioritize quantity over quality in their publication efforts, often leading to a proliferation of research outputs aimed at meeting MyRA's criteria rather than pursuing innovative or socially relevant research.

The reliance on publication and citation metrics in MyRA reflects a broader trend in academia where

such metrics are often viewed as proxies for research quality and impact. This perspective is supported by studies indicating that the counting of papers and citations is fundamental to assessing research productivity (Elango & Rajendran, 2017). However, this approach has faced criticism for potentially distorting research priorities. Researchers may focus on publishing in high-impact journals primarily to boost their citation counts, potentially at the expense of pursuing truly innovative or socially relevant research. While MyRA aims to enhance the quality of research in Malaysia, its focus on quantifiable metrics can inadvertently marginalize valuable contributions that do not conform to traditional publication norms.

The need to refocus academic evaluation goes beyond issues of fairness or equity; it is about recognising the vast and diverse nature of knowledge and understanding. A more compassionate and comprehensive view of research contributions to society acknowledges that insights from all fields are critical to addressing the complex issues confronting our world today. The traditional focus on metrics like publication counts and citations has historically favoured STEM fields, creating a need to foster inclusivity for equitable recognition of non-STEM research in higher education management.

Our examination of 313 publications revealed several recent topics not addressed by Malaysian researchers studying career development in academia. These include the inclusion of Non-Traditional Research Outputs (NTROs), embracing qualitative assessments, and implementing tailored performance appraisals. The absence of recent literature on these topics in the Malaysian context highlights a significant opportunity for future research. By addressing these gaps, Malaysian academia can move towards a more holistic approach to evaluating and recognizing diverse academic contributions. These approaches can be recommended for adoption by higher management to create a more inclusive and comprehensive evaluation system.

3.1 Recommendation 1: Inclusion of Non-Traditional Research Outputs (NTROs):

Recognising diverse forms of scholarly output, such as artistic performances, exhibitions, and policy contributions, is becoming crucial in the global academic landscape. However, the literature shows that Malaysian researchers are still preoccupied with conventional research outputs such as publications, intellectual property, and consultation (Azman et al., 2016; Da Wan et al., 2015; Yunus & Pang, 2015; Da Wan & Morshidi, 2018; Sarjidan & Kasim, 2023). This focus contrasts sharply with the global trend towards recognising and acknowledging the unique contributions of non-STEM research (Lewandowska, 2023), which fosters a more inclusive academic environment.

Several countries have begun to recognise and include non-traditional outputs in their assessment processes. Among them are:

i) Australia: The University of Sydney and the Excellence in Research for Australia (ERA) have formulated one of the most comprehensive guidelines for NTRO assessment (Barwick, 2017). Their framework includes five categories: Original Creative Works, Live Performance of Creative Works, Recorded/Rendered Creative Works, Curated/Produced Exhibition/Event, and Research Reports of External Bodies.

ii) North America: Institutions are increasingly acknowledging the value of diverse scholarly outputs, with efforts to integrate NTROs into faculty evaluation processes (Alperin, 2022).

iii) Hong Kong: The University Grants Committee has introduced measures to recognise creative outputs in research assessment exercises (Leong, 2014).

The need for a more inclusive approach in Malaysia is further supported by a survey of thirty-eight universities, which found that more than 66% of the institutions are not satisfied with the current research assessment methods (Abdullah et al., 2022). This dissatisfaction underscores the urgency for reform in the Malaysian academic evaluation system. Inclusion of NTROs would particularly benefit arts and humanities disciplines, allowing for a fair and balanced instrument of measure. This approach would be especially valuable for institutions like the Malaysian National Academy of Arts Culture and Heritage (ASWARA) and faculties such as the School of Creative Industry Management and Performing Arts (SCEMPA) at Universiti Utara Malaysia, enabling their performance to be more accurately measured and recognised.

To implement this recommendation effectively, Malaysian higher education institutions should:
i) Develop a comprehensive framework for identifying and evaluating NTROs, drawing inspiration from successful models like the ERA guidelines.
ii) Establish clear criteria for assessing the quality and impact of NTROs, ensuring they are given appropriate weight in faculty evaluations and institutional assessments.
iii) Provide training and support for evaluation committees to understand and appreciate the value of diverse research outputs.
iv) Collaborate with international partners to share best practices and refine assessment methodologies for NTROs.
v) Regularly review and update the NTRO framework to ensure it remains relevant and inclusive, particularly in rapidly evolving fields like digital arts and online education.

By embracing NTROs, Malaysian academia can foster a more diverse and innovative research environment, ultimately enhancing the global competitiveness and relevance of its higher education institutions. This shift would not only benefit arts and humanities disciplines but also encourage interdisciplinary collaboration and creativity across all fields of study.

3.2 Recommendation 2: Enhanced Visibility Through Subject-Specific Rankings:

Rankings serve as influential tools in shaping perceptions of academic quality and institutional reputation. They are widely used by stakeholders, including students, policymakers, and funding agencies, to assess and compare universities. The reliance on rankings has been shown to significantly impact institutional strategies, as universities often leverage their positions in these rankings to attract qualified faculty and enhance their research outputs (Véliz & Marshall, 2021). However, the methodologies underlying these rankings frequently emphasise a narrow set of metrics, primarily focussing on research output, faculty qualifications, and internationalization. This narrow focus can lead to an inadequate representation of the diverse contributions made by non-STEM fields, as many ranking systems tend to favour institutions with strong performance in STEM disciplines (Tandilashvili, 2024; Sorz et al., 2015).

In light of these issues, there is a growing recognition that rankings should evolve to incorporate a broader range of indicators that reflect the multifaceted roles of universities in society. Subject-specific rankings can highlight universities that excel in specific research areas, irrespective of their overall research output. If a university is particularly strong in a non-STEM specific field such as creative media, subject-specific rankings would provide a more accurate representation of its research prowess. The granularity of these rankings has been demonstrated to impact students' application decisions (Chevalier, 2015).

Recent initiatives in global ranking systems have begun to address this gap, for example:

1) Times Higher Education Impact Rankings: These rankings evaluate universities based on their contributions to the United Nations' Sustainable Development Goals (SDGs), providing a broader perspective on institutional impact (Torabian, 2019).
2) QS World University Rankings by Subject: This system offers a more nuanced view of institutional strengths across various disciplines, including non-STEM fields (Bautista-Puig et al., 2022).

The adoption of subject-specific rankings in university evaluations has provided a corrective approach to the traditional ranking systems, which have often shown a predisposition towards STEM disciplines. These newer elements in ranking methodologies can be seen as a form of improved recognition for non-STEM, arts, and humanities disciplines, offering them more visibility and recognition. The use of these novel rankings allows for a more comprehensive evaluation of academic disciplines, providing a framework to assess the arts, humanities, and social sciences based on their respective qualities.

Subject-specific rankings recognise achievements in a wider range of disciplines, including those beyond STEM. This, in turn, affirms the importance of these subjects within the academic domain (Maričić, 2016). The benefits of this approach are multifaceted and include the following:

i) Increased Funding: Enhanced visibility can lead to improved funding opportunities for non-STEM departments, as their strengths become more apparent to stakeholders and funding bodies.
ii) Student Enrolment: Subject-specific rankings can attract more students to non-STEM programs by highlighting institutional strengths in these areas.
iii) Faculty Recruitment: High rankings in specific subjects can help universities attract and retain talented faculty members in non-STEM fields.
iv) Resource Allocation: The modifications in external assessment standards can prompt universities to adapt their internal policies, potentially resulting in a fairer allocation of resources and assistance for non-STEM departments.
v) Research Collaboration: Increased visibility of non-STEM strengths can foster interdisciplinary collaborations, enriching the overall research ecosystem.

To implement this recommendation effectively in the Malaysian context, higher education institutions and policymakers could consider the following steps:

i) Develop a national framework for subject-specific rankings that aligns with international best practices while reflecting local priorities and strengths.
ii) Encourage Malaysian universities to participate in global subject-specific ranking initiatives, providing support and resources for data collection and submission.

iii) Create awareness among stakeholders about the importance and interpretation of subject-specific rankings, ensuring they are used appropriately in decision-making processes.

iv) Establish partnerships with international ranking organizations to ensure Malaysian institutions are accurately represented and evaluated.

v) Use subject-specific ranking data to inform strategic planning and resource allocation within universities, promoting a more balanced approach to institutional development.

vi) Regularly review and refine the use of subject-specific rankings to ensure they continue to serve the diverse needs of Malaysian higher education.

By embracing and promoting subject-specific rankings, Malaysian higher education can create a more inclusive and diverse academic landscape. This approach not only provides a fairer representation of institutional strengths across all disciplines but also encourages excellence in non-STEM fields, ultimately contributing to a more well-rounded and globally competitive higher education system.

3.3 Recommendation 3: Embracing Qualitative Assessments:

Non-STEM research often yields results that are qualitative and interpretive in nature, defying simple quantification and requiring a more nuanced approach to evaluation. Incorporating narrative evaluations and case studies into research assessment processes significantly enhances the understanding of non-STEM research by acknowledging its complexity and context. This approach contrasts sharply with traditional metrics, which often fail to capture the qualitative dimensions and broader societal impacts of research outcomes. The shift towards more comprehensive evaluation methods is gaining traction globally, with several countries and regions implementing frameworks that recognise the multifaceted nature of research impact.

The UK's Research Excellence Framework (REF) stands out as a pioneering model, assessing research impact beyond academia and evaluating the research environment holistically. It employs case studies to demonstrate research impact and uses expert panels to ensure nuanced evaluation (Bornmann, 2017, Khazragui & Hudson, 2015). Similarly, the Excellence in Research for Australia (ERA) incorporates a broader range of impact assessments, considering societal implications and the research environment. It utilizes a combination of quantitative indicators and expert review, recognizing diverse research outputs, including creative works (Williams & Grant, 2018). The EU's Horizon Europe funding programme further exemplifies this trend, emphasizing societal concerns and interdisciplinary research while showcasing the societal and environmental impacts of research through dedicated impact pathways (Veugelers, 2015).

To implement a more qualitative approach to research assessment in the Malaysian context, several steps could be considered. Developing a Malaysian Research Impact Framework (MRIF) that adapts best practices from global models to the local context would be a crucial first step. This framework should include diverse impact categories that reflect national priorities and the unique contributions of Malaysian research. Implementing narrative impact case studies would allow researchers and institutions to demonstrate the impact of their work beyond academia, supported by training in articulating and evidencing research impact. Establishing expert review panels comprising both local and international experts would ensure fair assessment of diverse research outputs, particularly from non-

STEM fields.

Integrating qualitative metrics into existing evaluation systems, such as the Malaysian Research Assessment (MyRA), would be essential. This integration should include guidelines for evaluating non-traditional research outputs like creative works, policy briefs, and community engagement activities. Promoting interdisciplinary research by encouraging and rewarding collaborative projects that bridge STEM and non-STEM disciplines would foster innovation and comprehensive problem-solving. Enhancing research environment assessment by evaluating institutional support for researchers, including mentoring programs and research facilities, would contribute to a more holistic evaluation process.

Implementing stakeholder engagement by involving non-academic stakeholders in the assessment process would capture broader societal impacts and develop mechanisms for evaluating public engagement and knowledge transfer activities. By adopting these qualitative assessment methods, Malaysian higher education institutions can create a more inclusive research evaluation system that recognises the diverse nature of research outputs across all disciplines, encourages researchers to consider and articulate the broader impacts of their work, and provides a more accurate representation of the contributions made by non-STEM fields. Such a system would align research activities with national priorities and societal needs, fostering a research culture that values both academic excellence and real-world impact. Ultimately, implementing this approach would not only enhance the visibility and recognition of non-STEM research but also encourage a more holistic approach to academic inquiry, strengthening Malaysia's position in the global research landscape.

3.4 Recommendation 4: Interdisciplinary and Transdisciplinary Approaches:

The growing emphasis on interdisciplinary research underscores the importance of non-STEM fields in addressing complex global issues. Incorporating knowledge from these domains is crucial for developing comprehensive solutions to multifaceted problems. This shift towards interdisciplinary approaches is reflected in recent changes to global university rankings and assessment criteria, which, while not explicitly presented as an acknowledgment of non-STEM, arts, and humanities disciplines, create significant opportunities for these fields to gain recognition and appreciation within the academic community.

The incorporation of Sustainable Development Goals (SDGs) into global university rankings exemplifies this trend, emphasizing the broader societal impact of research and education (De la Poza, 2021). Non-STEM fields frequently excel in addressing these goals, which focus on social, cultural, and environmental issues. This move can be interpreted as a way of providing indirect recognition to these fields, correcting past imbalances in academic evaluation. Ranking systems now implicitly recognise the value of research and education that addresses complex societal challenges, areas where non-STEM subjects often thrive. The integration of SDGs in university assessments, therefore, raises the profile of non-STEM fields in international academic rankings, emphasizing their unique contributions and areas of expertise.

Interdisciplinary and transdisciplinary approaches significantly enhance the research productivity of non-STEM researchers by fostering collaboration, expanding research networks, and integrating diverse

perspectives. These methodologies facilitate the creation of innovative solutions to complex problems, which are increasingly recognised as essential in addressing contemporary societal challenges. One of the primary benefits of interdisciplinary collaboration is the ability to integrate diverse methodologies and theoretical frameworks, leading to innovative research outputs. Timmis and Williams (2017) argue that interdisciplinary partnerships create new "in-between" spaces where different discourses and methodologies can converge, allowing for the development of alternative research practices and knowledge sites. This integration is crucial for non-STEM researchers, who often face challenges in accessing the technical expertise and resources available in STEM fields. By collaborating with STEM researchers, non-STEM scholars can enhance their research quality and productivity through shared methodologies and insights (O'Leary et al., 2015).

Moreover, the establishment of collaborative networks is vital for enhancing research visibility and impact. Dardas (2023) emphasizes the importance of fostering research environments that promote interdisciplinary collaborations and engagement with global research networks. This engagement not only broadens the reach of research outputs but also enhances the potential for impactful findings that resonate across various fields. The collaborative nature of interdisciplinary research allows non-STEM researchers to tap into broader funding opportunities and resources, which are increasingly favouring transdisciplinary approaches (Lawrence et al., 2022).

To effectively implement and promote interdisciplinary and transdisciplinary approaches in Malaysian higher education, the following strategies could be considered:

i)   Develop Interdisciplinary Research Centres: Establish dedicated centres that bring together researchers from various disciplines to work on complex societal issues aligned with Malaysia's national priorities and the SDGs.

ii) Create Interdisciplinary Funding Schemes: Design grant programs that specifically support collaborative projects between STEM and non-STEM researchers, encouraging innovative approaches to pressing challenges.

iii) Revise Promotion and Tenure Criteria: Modify existing evaluation systems to recognise and reward interdisciplinary research efforts, ensuring that faculty members are not penalized for engaging in collaborative work that may not fit traditional disciplinary boundaries.

iv) Enhance Interdisciplinary Education: Develop interdisciplinary degree programs and courses that integrate knowledge from multiple fields, preparing students for the complex challenges of the modern workforce.

v)   Promote Knowledge Translation: Develop mechanisms to effectively communicate interdisciplinary research findings to policymakers and the public, enhancing the visibility and impact of non-STEM contributions to societal challenges.

vi) Organise Interdisciplinary Conferences and Workshops: Host events that bring together researchers from diverse fields to share insights, methodologies, and foster new collaborations.

By implementing these strategies, Malaysian higher education institutions can create a more inclusive and innovative research ecosystem that leverages the strengths of both STEM and non-STEM disciplines. This approach not only enhances the quality and impact of research outputs but also positions Malaysian universities to better address complex national and global challenges. Furthermore, it provides non-

STEM researchers with expanded opportunities for recognition, funding, and impactful contributions to society, ultimately strengthening Malaysia's position in the global academic landscape.

3.5 Recommendation 5: Management Support for Non-STEM Faculty:

The evolution of Malaysian universities has led to diversified academic employment and advancement structures, particularly in public institutions. Despite a uniform grade and salary system, substantial variations exist in promotion processes among these universities. To support non-STEM faculty effectively, universities should develop tailored performance appraisal forms that capture the unique contributions of these disciplines, establish customized assessment standards, and recognise a variety of professional contributions and trajectories. This support also extends to equitable resource allocation and professional development opportunities, which are crucial for career advancement in non-STEM fields.

To effectively recognise and support non-STEM faculty, universities should consider implementing the following strategies:

i) **Tailored Performance Appraisal Forms:** Non-STEM faculty often engage in a variety of activities, including teaching, research, and community service, which may not be adequately captured by standardized metrics typically used in STEM fields. Performance appraisal systems that include criteria specific to the arts, humanities, or social sciences can better reflect the contributions of non-STEM faculty (O'Meara, 2022). These tailored forms should:
    a) Include qualitative assessment criteria that capture the nuanced nature of non-STEM work.
    b) Recognise creative outputs, such as exhibitions, performances, and literary works.
    c) Assess the impact of research and creative work on society, culture, and policy.
    d) Consider the quality and innovation in teaching methodologies specific to non-STEM disciplines.

ii) **Recognition of Diverse Contributions:** Acknowledge the importance of teaching, mentorship, proactive community engagement, and cultural contributions (Abu Said, 2015). This recognition should:
    a) Value the impact of public engagement activities, such as public lectures, media appearances, and community workshops.
    b) Consider the role of non-STEM faculty in preserving and promoting cultural heritage.
    c) Recognise leadership roles in academic and professional organisations.
    d) Appreciate the development of innovative teaching materials and methodologies. Efforts on recognising Non-Traditional Research Outputs (NTRO) have started with the inaugural guidelines for Malaysian universities (Abdullah, 2022). These guidelines should be further developed and widely implemented to ensure comprehensive recognition of non-STEM contributions.

iii) **Varied Professional Trajectories:** Recognise that career paths in non-STEM fields may differ from traditional trajectories and adapt promotion and tenure policies accordingly (Adi Badiozaman, 2021). This adaptation should:

a) Allow for flexibility in the weighting of different aspects of academic work (teaching, research, service) based on individual strengths and departmental needs.

b) Recognise alternative forms of scholarship, such as engaged scholarship or practice-based research.

c) Consider the long-term nature of some non-STEM research projects when evaluating productivity.

d) Acknowledge the importance of interdisciplinary work and collaborations that may not fit traditional disciplinary boundaries.

iv) **Professional Development Opportunities:** Provide targeted development programmes for non-STEM faculty, including grant writing workshops and digital scholarship training. Mentoring, social support, and organisational support are all important development factors in one's career path (Arokiasamy, 2011). These opportunities should:

a) Offer workshops on securing funding from arts and humanities-specific grants.

b) Provide training in digital tools and methodologies relevant to non-STEM research.

c) Establish mentoring programs that pair junior non-STEM faculty with experienced colleagues.

d) Create networking opportunities with peers from other institutions to foster collaboration and knowledge exchange.

v) **Equitable Resource Allocation:** Advocate for fair distribution of research funds and institutional support for non-STEM disciplines. This should include:

a) Providing funds specifically for interdisciplinary projects that include both STEM and non-STEM disciplines to foster collaboration and innovation.

b) Allocating resources for non-STEM specific research infrastructure, such as performance spaces, art studios, or specialized archives.

c) Ensuring equitable access to research assistants and administrative support.

d) Supporting travel to conferences and research sites, which is crucial for many non-STEM disciplines.

As noted by Ahmad (2012) and Uddin (2021), institutional encouragement and flexible funding can lead to effective outcomes in interdisciplinary research, enhancing the productivity of non-STEM fields by integrating diverse perspectives and methodologies.

To implement these recommendations effectively, Malaysian universities should:

i) Establish a task force comprising representatives from various non-STEM disciplines to review and revise existing policies and practices.

ii) Conduct regular surveys and focus groups with non-STEM faculty to identify specific needs and challenges.

iii) Develop clear guidelines for promotion and tenure committees on how to evaluate non-STEM contributions.

iv) Create a dedicated fund for non-STEM research and creative activities.

v) Regularly review and update policies to ensure they remain relevant and supportive of non-STEM

faculty.

By implementing these strategies, Malaysian universities can create a more inclusive and supportive environment for non-STEM faculty. This approach not only enhances the career satisfaction and productivity of these academics but also enriches the overall academic ecosystem. Recognizing and nurturing the diverse contributions of non-STEM disciplines is crucial for addressing complex societal challenges and maintaining a well-rounded, globally competitive higher education system in Malaysia.

3.6 Future Implications

Concerns have been raised about the future implications of Industry 5.0, micro-credentials, direct employer recruiting, and the increasing influence of artificial intelligence (AI) and robotics in the labour market on university roles. These factors are expected to have a significant impact on the value and demand for arts and humanities education (Sirat 2018). Micro-credentials offer a flexible and specialised approach to gaining expertise in a variety of subjects, including the arts and humanities. They have the potential to make these subjects more accessible and relevant to a broader audience. As the concept of lifelong learning becomes more popular, the arts and humanities can play an important role in providing ongoing intellectual and cultural enrichment. Soft skills such as critical thinking, creativity, empathy, and ethical judgement are becoming increasingly important to employers. These abilities are frequently developed through education in the arts and humanities. Graduates of the arts and humanities have a diverse set of perspectives that can enrich the workplace by fostering problem-solving skills and encouraging innovation. With the increasing involvement of AI and robotics in tasks that can be measured or quantified, it is critical for the human workforce to focus on areas where humans have a distinct advantage, such as creativity, emotional intelligence, and ethical decision-making. The arts and humanities fields provide valuable perspectives on the societal implications of technology and can play a critical role in shaping its ethical advancement and implementation.

As the 'last bastion of humanity, the arts and humanities preserve the essence of humanity - our culture, values, and history - in a highly automated world. These disciplines are critical for critically analysing the implications of technological advances and making ethical decisions about their application.

4. Conclusions

The literature review underscores the increasing acknowledgement of the significance of fields outside of STEM in academia, as well as the necessity for a research management approach that is more equitable and compassionate. As a result of the historical predilection for quantifiable metrics and the subsequent implementation of university rankings, the arts, humanities, and social sciences have been disadvantaged. Nevertheless, the transition towards recognising the varied contributions of these disciplines is an encouraging progression that signifies a deeper comprehension of the essence and worth of knowledge. In summary, this review of the literature advocates for a fundamental change in the way academic support and recognition is approached, placing particular emphasis on the imperative for university administrators and policymakers to implement tangible measures that foster a more diverse and fairer academic environment. By recognising and cultivating the contributions of fields outside of STEM, we can cultivate a higher education system that is more robust, adaptable, and beneficial to society at large.

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