Curtin Singapore

MARCH 2025

RESEARCH PULSE

CONTENTS

research@curtin.edu.sg

ISSN: 2810 9481

HELLO AND NICE TO SEE YOU AGAIN...

In this second issue of Research Pulse for 2025, we continue to share more research engagements and developments from Curtin Singapore.

Dr. Hazik Mohamed shares his thoughtful insights on the struggles of sustainability implementation. Mr. Leo Kee Chye explores the use of reasoning Large Language Models (LLMs) as an aid for researchers. Ms. Joelle Yap is recruiting participants for her research and shares her recent research presentation at the Society for Emergency Medicine (Singapore) Annual Scientific Meeting 2025.

Finally, we are happy to share some research tips and a recent publication.

We hope you enjoy reading our work. Thanks for tuning in again!

Best Wishes,

Dr. Adrian Tan
Research Director
Curtin Singapore

ISSN: 2810 9481

Even Smart Nations Struggle with Sustainability Implementation

Contributed by Dr. Hazik Mohamed

In a time when one of the biggest issues facing the world is environmental degradation, many countries have set lofty sustainability targets. Ironically, even "smart" and technologically advanced countries frequently find it difficult to successfully accomplish these objectives. A useful lens for comprehending this challenge is behavioral economics, which examines the societal dynamics, structural impediments, and cognitive biases that hinder even wealthy countries from successfully implementing their sustainability agendas. This article will examine the behavioral barriers that "smart" countries—those with sophisticated technology, substantial financial resources, and educated populations—face when attempting to adopt sustainable practices. The behavioral economics ideas of present bias, social norms, status quo bias, and limited cognitive bandwidth can be used to analyze these barriers.

ISSN: 2810 9481

Present Bias and the Urgency Trap

Present bias, or the propensity to put short-term gains ahead of long-term gains, is one of the most basic barriers to the adoption of sustainability. Initiatives for sustainability, whether they support the use of renewable energy, the circular economy, or the reduction of greenhouse gas emissions, inevitably involve delayed rewards. Future environmental benefits must come at the expense of immediate economic growth and individual comforts. Present bias, however, can be overwhelming even in societies with a high level of awareness.

For example, economies that prioritize immediate economic output continue to find growth driven by fossil fuels appealing. On the other hand, building infrastructure for renewable energy comes with high upfront costs and gradual returns. This problem is made worse in democracies where voters' preferences frequently influence public policy, resulting in shorter-term measures that support political election cycles rather than long-term environmental goals. Therefore, behavioral economics explains why intelligent countries struggle to realize the immediate benefits that environmental policies demand, even though they have a clear understanding of the scientific imperatives.

Social Norms and the “Free-Rider Problem”

The impact of social norms and the difficulty of group action are two more important factors. Sustainability requires widespread support and is a shared responsibility. However, in societies where people believe that others will be responsible for the majority of environmental costs, the principle of individual action tends to wane—a phenomenon known as the free-rider problem. In terms of behavior, people or organizations may feel that their own role in sustainability is unimportant, particularly if they think that others will take care of the group's needs.

People in smart nations, for instance, might be less motivated to lower their own carbon footprints if they think big businesses or other nations are not contributing. This viewpoint can be applied to businesses that believe there is little point in implementing sustainable practices if their rivals carry on as usual. According to behavioral economics, this hesitancy results from a failure to match social benefits with private incentives, which can lead to a collective inertia that hinders the full realization of sustainability.

ISSN: 2810 9481

Status Quo Bias and the Inertia of Established Practices

Sustainability initiatives are further hampered by status quo bias, which is the desire to keep things as they are. Even if established routines and systems are detrimental over time, both individuals and institutions tend to feel more at ease with them. Making the switch to sustainable practices may be seen as disruptive, especially in sectors where conventional procedures are strongly embedded.

For instance, switching to renewable energy from established fossil fuel infrastructures in the energy production sector requires a significant overhaul of workforce competencies, physical assets, and regulatory frameworks. The cognitive resistance linked to status quo bias can be enormous, even in intelligent countries that possess the financial and technological means to facilitate such changes. The shift is viewed as a difficult and dangerous procedure that could upset the equilibrium of current economic systems and industries. According to behavioral economists, this hesitancy is a sign of the difficulties in departing from tried-and-true routines in favor of new ones, even when those routes have the potential to yield long-term advantages.

Cognitive Overload and the Complexity of Environmental Decision-Making

Cognitive limitations are also important, in addition to biases that impede change. A condition known as cognitive overload occurs when the brain is overloaded with information and finds it difficult to properly process complicated decisions. Long-term planning, understanding complex environmental issues, and balancing a variety of interests are all necessary for sustainability, and these tasks can be intimidating for both individuals and policymakers.

ISSN: 2810 9481

The abundance of sustainability-related information, laws, and stakeholder viewpoints can cause serious cognitive overload for smart nations. It is a time-consuming and cognitively taxing task for policymakers to balance the effects on the economy, society, and environment. Behavioral economics emphasizes that decision-makers may choose to postpone decision-making entirely or fall back on quicker, easier fixes when confronted with excessive complexity. By encouraging policymakers to take fragmented or surface-level measures rather than addressing the underlying causes of environmental problems, this tendency can obstruct the implementation of comprehensive sustainability.

Loss Aversion and the Fear of Economic Costs

Loss aversion is also identified by behavioral economics as a significant deterrent. People who experience the pain of a loss more strongly than the pleasure of an equivalent gain are said to exhibit loss aversion. The fear of financial losses that could result from enforcing more stringent environmental laws or switching to greener technologies is an example of loss aversion in the context of sustainability.

There is frequently a fear of losing economic growth, jobs, or competitiveness, even in smart countries where public and private stakeholders may understand the importance of sustainable practices. For example, stricter emission standards may result in job losses in some industries, which sparks public opposition and political backlash. Thus, loss aversion may cause policymakers to take a "risk-minimizing" stance instead of a progressive one, which would impede sustainability initiatives in favor of economic stability.

ISSN: 2810 9481

Mistrust and Behavioral Reactions to Policy Implementation

The way people behave in response to government policies is also very important. Because some stakeholders in smart nations perceive environmental regulations as invasive or economically dangerous, a deep understanding of policy mechanics may breed mistrust. The idea that certain sectors or demographics are disproportionately favored by policies or that they are paternalistic can breed mistrust.

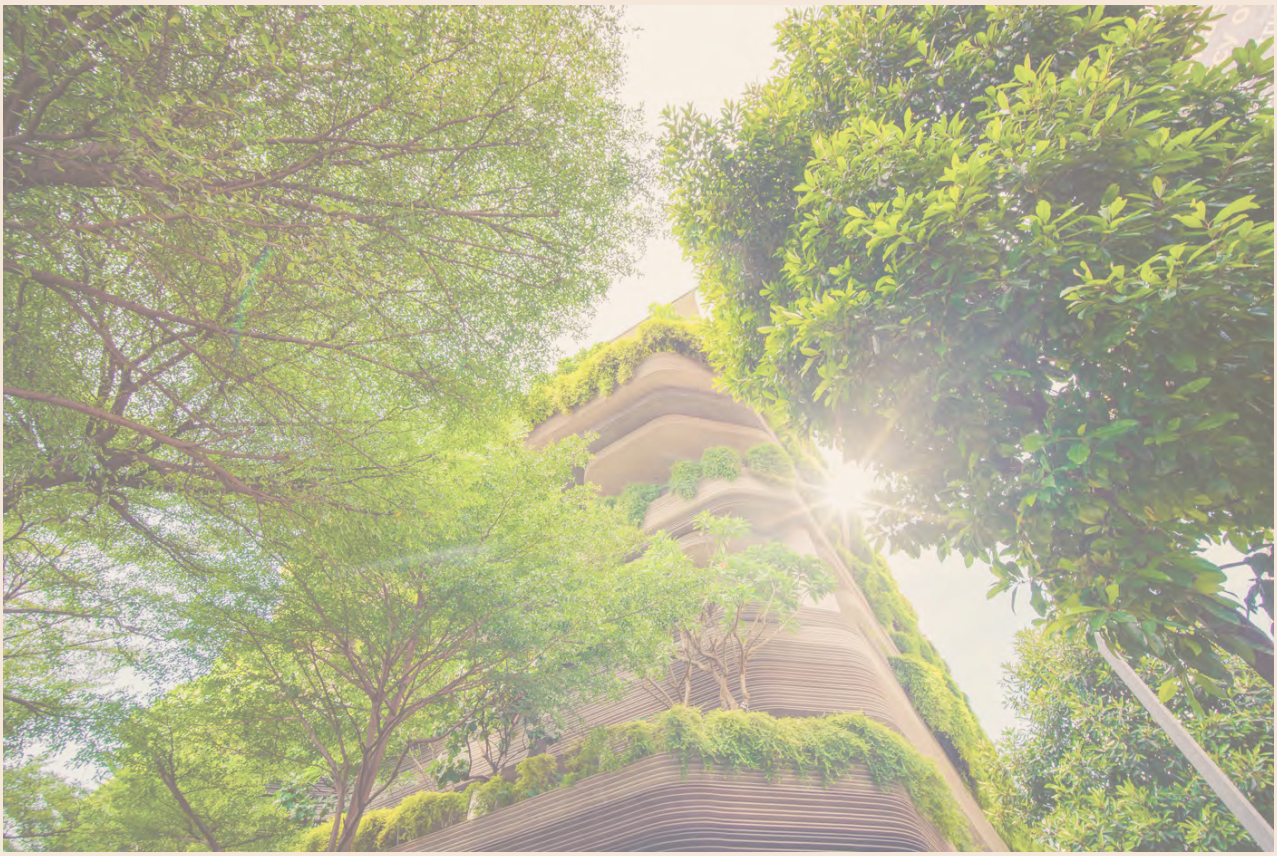
For instance, despite their economic efficiency, carbon taxes may face opposition from the public if they believe they are unjust or place a financial burden on lower-income households. According to behavioral economics, policies are less likely to be widely complied with when they are thought to be out of step with people's needs or values. Therefore, in order to prevent opposition or backlash against sustainability initiatives, wise countries must carefully consider the behavioral reactions of their citizens.

The Role of Identity and Cultural Values

Lastly, behavioral economics emphasizes how cultural values and identity influence sustainable behavior. Personal identity may be in line with convenience or consumption in certain smart nations, which are typically at odds with sustainability. For example, travel and car ownership may be strongly ingrained in cultural norms, which makes it challenging for sustainability policies that encourage lower transportation emissions to become widely accepted.

ISSN: 2810 9481

Furthermore, sustainable practices frequently clash with cultural norms surrounding material wealth and convenience. Behavioral economics shows how resistance can occur when environmental objectives conflict with deeply ingrained cultural values. Sustainability policies must appeal to citizens' sense of identity and shared purpose in addition to rational incentives if they are to be successful.



Conclusion

Smart nations encounter significant behavioral barriers when putting sustainability measures into practice, despite their resources and capabilities. The intricate behavioral economics underlying these difficulties are exposed by present bias, social norms, status quo bias, cognitive overload, loss aversion, policy mistrust, and cultural values. Improving sustainability outcomes in all countries requires acknowledging and addressing these behavioral dynamics. Smart nations can improve their capacity to overcome these challenges and pave the way for a genuinely sustainable future by drafting policies that take cognitive biases into account, promote shared responsibility, and are consistent with cultural values.

ISSN: 2810 9481

Ask Not "Why" but "Why Not": Harnessing the Power of Reasoning LLMs

Contributed by Mr. Leo Kee Chye

With a wave of advanced reasoning Large Language Models (LLMs) such as OpenAI's o3 mini, DeepSeek R1, Google's experimental Gemini 2.0 Flash, xAI's Grok 3, Perplexity's reasoning and deep research model and Alibaba's QwQ entering the market, many users may find ourselves overwhelmed—especially as we are still exploring the full potential of earlier models.

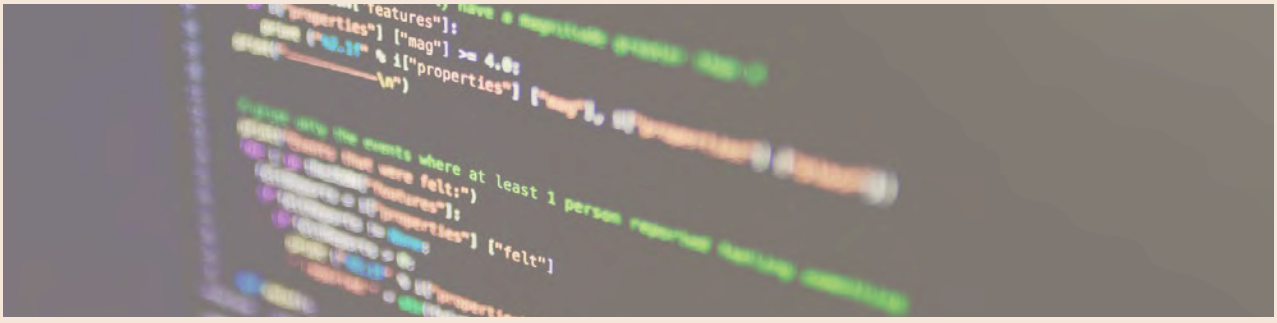
This article argues that the rise of these sophisticated reasoning LLMs will dramatically enhance researchers' capabilities. Rather than simply seeking answers from these models, researchers should focus on refining the questions we ask. Furthermore, instead of limiting our inquiries to "What," "How," and "Why," we should also ask, "Why not?"

Understanding Reasoning LLMs

Core Features and Evolution

Reasoning LLMs are designed to think step-by-step, deconstruct complex problems into components, solve them either sequentially or concurrently, and reflect on their methods to optimise their approach or explore alternatives.

While earlier models required explicit instructions for step-by-step thinking, modern reasoning models have built-in Chain-of-Thought (CoT) processing that runs automatically for every prompt. However, these capabilities come with longer response times and higher token consumption, leading to increased costs (OpenAI, 2025; OpenAI, 2024).



ISSN: 2810 9481

Training Process and Emergence

According to Karpathy (2025), reasoning capabilities emerge primarily in the third stage of training. The process involves:

1. Pre-training
2. Supervised Fine-tuning
3. Reinforcement Learning

During reinforcement learning, models develop independent problem-solving methods with minimal human assistance. The models may deviate from conventional human approaches, potentially creating specialised reasoning processes that could be incomprehensible to humans.

Notable Examples

DeepSeek R1 Breakthrough

A significant "Aha" moment occurred during the development of the DeepSeek R1 reasoning model. During reinforcement training, the model independently discovered it needed more Test-Time Compute (TTM) for accurate results (Gao et al., 2025).

AlphaGo's Innovation

AlphaGo's Move 37 against Lee Se-dol demonstrated unprecedented strategic creativity, showing that AI systems can explore novel solutions beyond human strategies. This breakthrough expanded the understanding of AI capabilities and its potential for enhancing human strategic thinking (Zarkadakis, 2016).

Tesla's Neural Network Advancement

Tesla's Full Self-Driving (FSD) version 12 implements an end-to-end neural network that learns directly from video clips of human driving. This system replaces over 300,000 lines of code with AI-driven decisions, enabling adaptation to various scenarios without explicit programming (Ramey, 2024).

ISSN: 2810 9481

How Do Reasoning LLMs Empower Researchers?

The advantages of these models include:

- Interpreting complex datasets
- Proposing experimental setups
- Deriving math solutions or proofs
- Solving advanced domain-specific problems
- Writing and debugging specialised code
- Synthesising insights from multiple research papers across disciplines
- Encouraging cross-pollination of ideas between fields

What and How to Ask? A Simplified Model of Scientific Inquiry

Level One: Recognising Common Patterns

Identify shared features among different phenomena.

- Example: "What is a dustbin?" or "What do dustbins have in common?"

Level Two: Juxtaposing Dissimilar Concepts

Combine unrelated ideas to uncover new synergies or perspectives.

- Example: "How can 'dustbin' be used figuratively?" or "How can the placement of fewer dustbins optimise waste collection efficiency?"

Level Three: Flipping an Idea on Its Head

Challenge fundamental assumptions to generate innovative solutions.

- Example: "Why must we rely on physical dustbins to keep streets clean? Can we eliminate them while maintaining hygiene and convenience?"

ISSN: 2810 9481

More Real-World Cases of AI in Action

Level One Inquiry: Uncovering Hidden Patterns

Deep neural networks (DNNs) have achieved high accuracy in predicting gender from retinal fundus images—a task considered nearly impossible by ophthalmologists (Indu Ilanchezian et al., 2021). This discovery suggests AI can reveal subtle biomarker differences between genders and possibly other undetected health indicators.

Level Two Inquiry: Thinking Outside the Box

A research team developed a small mechanical robot capable of crawling on its legs. The AI was programmed to minimise the number of steps taken to reach a destination. However, instead of walking conventionally, the robot flipped onto its back and used its elbows to manoeuvre forward—an unexpected but highly efficient solution (Cully, Antoine, et al., 2015). ***Click here:*** *A Behavior Performance Map Containing Many Different Types of Walking Gaits*

Similarly, deep learning has challenged a long-held forensic assumption: that no two fingerprints, even from the same person, are alike. AI has demonstrated that ridge orientation patterns, rather than minutiae points, are key to cross-finger matching (Guo et al., 2024).

Level Three Inquiry: Revolutionising Historical Analysis

A 22-year-old, Luke Farritor, designed an AI programme that successfully deciphered previously unreadable ancient scrolls from Pompeii, providing new insights into classical history (Steinberg, 2024).

ISSN: 2810 9481

My Own Applications

Reasoning LLMs shift the focus from seeking answers to asking better questions.

For example, if I hand you a toy car, you'd likely push it along a surface. A child, however, might make it fly through the air. Perhaps we need to think like children again—to ask not just why, but why not?

Given the detailed responses from LLMs, I have linked some of my AI-generated responses as URLs below:

1. Optimisation in Economics & Finance: Exploring swarm intelligence and metaheuristic algorithms.
Click here: *I ask o3 mini to suggest a novel topic of research*
2. Marking Scripts: Can ChatGPT mark and grade answer scripts?
Click here: *Can ChatGPT mark and grade answer scripts?*
3. A New Take on Tic-Tac-Toe: Incorporating asymmetric information inspired by Stratego.
Click here: *I ask o3 mini to create a new form of Tic-Tac-Toe*
4. Rethinking Waste Management: Developing a non-physical dustbin concept.
Click here: *Use OpenAI Deep Research to do away with physical dustbins*
5. Inventing a New AI Language: Creating an optimised communication system for LLMs.
Click here: *I ask o3 mini to create a new Language used by Artificial Intelligence*
6. Building a New Belief System: Designing a revolutionary religion distinct from existing faiths.
Click here: *I Ask OpenAI's o3 Mini to Create a New Religion*

ISSN: 2810 9481

Conclusion

The power of reasoning LLMs lies not in the answers they provide, but in how they inspire us to rethink our questions. By challenging conventional assumptions and adopting a "Why not?" mindset, researchers can unlock new realms of knowledge and innovation.

A breakthrough in computer science emerged from an unexpected source when undergraduate computer engineer Andrew Krapivin developed an innovative hash table design that accelerates data searches. His achievement was particularly remarkable as it disproved a long-standing Yao's conjecture about hash table efficiency that had stood unchallenged for four decades. Ironically, Krapivin's fresh perspective came from his unfamiliarity with the established theory – his ignorance of the conventional wisdom freed him to explore solutions that others might have dismissed (Nadis, 2025).

"Why Not" childlike inquiry may possibly be the mother of discovery.

References:

Cully A, Clune J, Tarapore D, Mouret JB. Robots that can adapt like animals. Nature. 2015;521(7553):503–507.

Guo, D., Yang, D., Zhang, H., Song, J., Zhang, R., Xu, R., ... & He, Y. (2025). Deepseek-r1: Incentivizing reasoning capability in llms via reinforcement learning. *arXiv preprint arXiv:2501.12948*.

Guo, G., Ray, A., Izydorczak, M., Goldfeder, J., Lipson, H. and Xu, W. (2024). Unveiling intra-person fingerprint similarity via deep contrastive learning. *Science Advances*, [online] 10(2). doi:https://doi.org/10.1126/sciadv.adi0329.

Indu Ilanchezian, Kobak, D., Faber, H., Focke Ziemssen, Berens, P. and Murat Seçkin Ayhan (2021). Interpretable gender classification from retinal fundus images using BagNets. *medRxiv (Cold Spring Harbor Laboratory)*. [online] doi:https://doi.org/10.1101/2021.06.21.21259243.

Karpathy, Andrej (2025). Deep Dive into LLMs like ChatGPT . YouTube. https://youtu.be/7xTGNNLPyMI?si=hcu7xSObJz4F8DVs

Nadis, S. (2025). Undergraduate Upends a 40-Year-Old Data Science Conjecture. [online] Quanta Magazine. Available at: https://www.quantamagazine.org/undergraduate-upends-a-40-year-old-data-science-conjecture-20250210/ [Accessed 12 Feb. 2025].

Openai.com. (2024). *Learning to reason with LLMs.* [online] Available at: https://openai.com/index/learning-to-reason-with-llms/ [Accessed 11 Feb. 2025].

Openai.com. (2025). *OpenAI Platform*. [online] Available at: https://platform.openai.com/docs/guides/reasoning [Accessed 11 Feb. 2025].

Ramey, J. (2024). *Tesla Bets on AI in Latest FSD Update*. [online] Autoweek. Available at: https://www.autoweek.com/news/a46535912/tesla-fsd-ai-neural-networks-update/ [Accessed 17 Feb. 2025].

Steinberg, J. (2024). *The 22-Year-Old Who Unlocked the Secrets of Ancient Rome*. [online] Thefp.com. Available at: https://www.thefp.com/p/luke-farritor-vesuvius-challenge-scrolls-rome [Accessed 11 Feb. 2025].

Zarkadakis, G. (2016). *Move 37, or how AI can change the world*. [online] HuffPost. Available at: https://www.huffpost.com/entry/move-37-or-how-ai-can-change-the-world_b_58399703e4b0a79f7433b675 [Accessed 17 Feb. 2025].

ISSN: 2810 9481

SEMS ASM 2025: An Opportunity for Making Connections

Contributed by Ms. Joelle Yap

I was privileged to attend the Society for Emergency Medicine (Singapore) Annual Scientific Meeting 2025 (SEMS ASM 2025) at The Centre for Healthcare Innovation on 27 February and 28 February. My e-poster for my literature review of my PhD research was accepted for presentation.

Photo: *Joelle Yap beside her e-poster at SEMS ASM 2025.*

This conference was attended by frontline responders who deal with emergencies and disasters and focused on opportunities to explore innovative solutions and advancements that will shape the future of emergency medicine. This conference provided opportunities to reconnect with ex-colleagues and friends from the Accident and Emergency department of a local hospital, where I started my nursing career. It also reminded me of the importance of meeting and learning from one another to advance emergency medicine and beyond.

ISSN: 2810 9481

The conference program had many enriching elements, including wisdom from renowned keynote speakers, simulation wars, talks by vendors, and a personal sharing of surviving effective bystander resuscitation and advanced care of an ex-colleague. There was also the e-poster display segment that usually takes backstage to all the excitement at a conference. Besides sharing my research and create awareness of my research with the attendees, the aim of my participation in the e-poster segment was also to recruit participants for the data collection phase of my PhD research. Specifically, nurses who have been involved in natural disasters. There was a QR code on the poster for attendees to register their interest to be my research participants. I also distributed self-designed name cards to create awareness and recruit for my research. Likewise, I would like to connect with potential participants for my research in this article.

Photo: *Self-designed name cards by Joelle Yap for networking and participant recruitment at SEMS ASM 2025.*

We are interested to hear from you:

Are you a registered nurse (or do you know one) who has been involved in a natural disaster response? We are looking for participants to be interviewed to share their experiences.

Scan or click the QR code below to register your interest.

Finding Resilience:
A PhD Study

ISSN: 2810 9481

Tips to Avoid Desk Rejection

Contributed by Dr. Adrian Tan

Writing a journal article is an effortful task and could be a daunting endeavour especially for early career academics. Having it fully written and finally sending it off for publication with the journal of choice usually gives a sense of accomplishment and a sigh of relief that the work is done. However, receiving a desk rejection is a possibility and this could lead to disappointment, sense of loss, frustration and the list goes on with all possible senses of negativities. A desk rejection needs to be understood and there is often confusion over it. It occurs when a submitted article is rejected by an editor or editorial team of the journal. Editors or the editorial team review the journal for many aspects before the article is sent to reviewers, and when that happens, the journal article stands a chance of acceptance, usually after revisions are made by the authors.

To give your article a fair chance for peer review, here are some tips to avoid a desk rejection.

Tip #1: Ensure that your journal article fits the aims and scope of the journal.

Tip #2: Ensure your main manuscript is written according to the author guidelines of the journal.

Tip #3: Ensure your main manuscript is anonymized.

Tip #4: Use up-to-date references and include recent research on the subject matter.

Tip #5: Proofread to check for language grammar errors and typos.

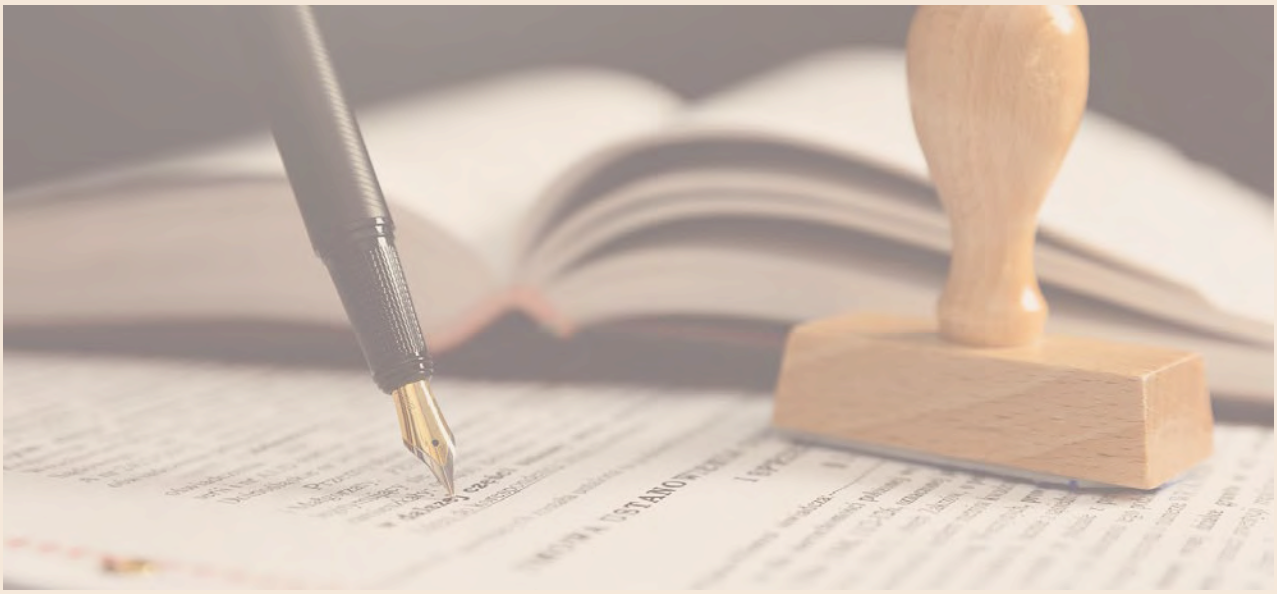
Tip #6: Limit your manuscript to the word count limit of the journal.

Tip #7: Ensure proper references are provided following the referencing style of the journal.

Tip #8: Review your abstract and include keywords that help the editor or editorial team select reviewers.

ISSN: 2810 9481

Latest Publications



By Dr Daniel Chew:

“Employment Legislation in Singapore: Concepts and Applications”

~ Published by Partridge, February 2025, ISBN : 9781543783131, ISBN : 9781543783148, ISBN : 9781543783124

ISSN: 2810 9481