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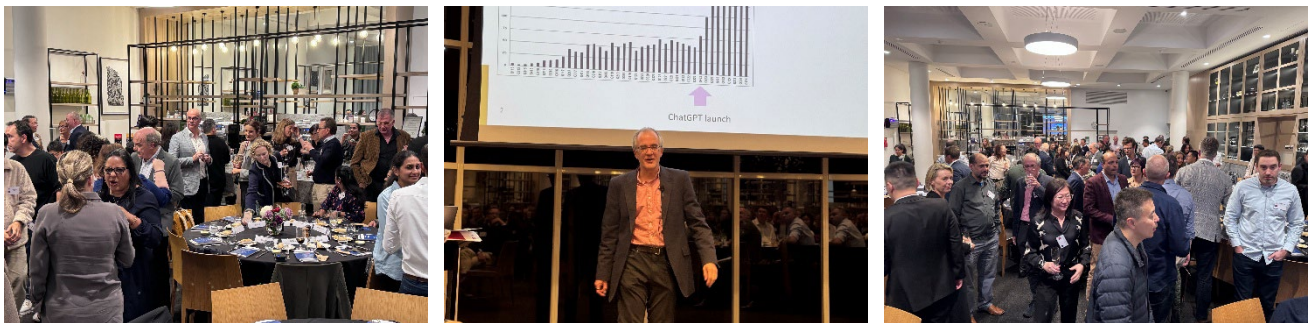
New Data Governance Guide for Australian Boards



The Centre for Business Analytics at Melbourne Business School is proud to have partnered with the **Australian Institute of Company Directors (AICD)** and leading law firm Allens to develop a practical resource on **data governance**, designed specifically for Australian directors. This collaboration combines our academic expertise in business analytics with Allens' legal insights and AICD's governance leadership, providing boards with clear guidance on managing data as a strategic asset. By addressing key governance challenges and offering actionable recommendations, this resource aims to support directors in strengthening oversight, managing data-related risks, and enabling more informed, data-driven decision making.

At the Centre for Business Analytics, we see this as a natural extension of our mission to help leaders transform decision making through data, analytics and AI. This initiative is particularly close to our heart, as Wendy Stops, Chair of our Industry Advisory Board, has long been an advocate for enhancing Board education in this space. This milestone further elevates the Centre's position as a **trusted thought leader** at the intersection of data, analytics and governance—empowering Boards and senior executives with the knowledge, tools and confidence they need to lead in an increasingly data-driven and digitally disrupted economy.

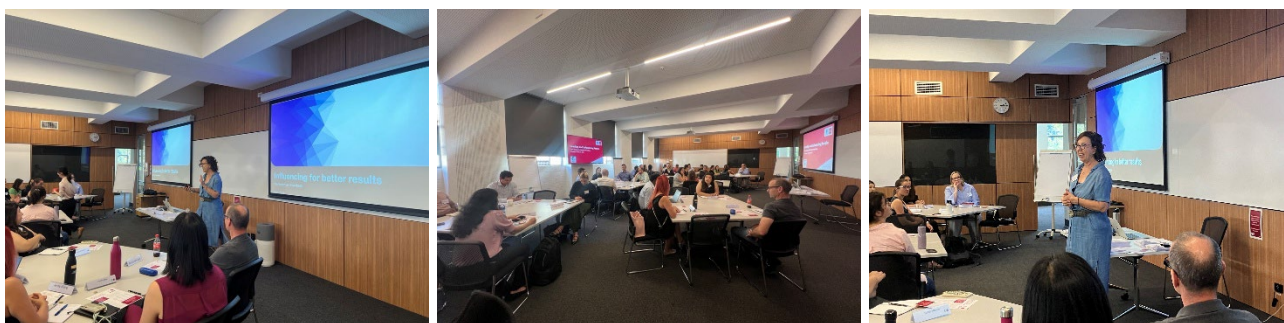
AI & Analytics Summit: Insights from Stanford's Professor Christopher Manning



On **8 May 2025**, the Centre for Business Analytics had the privilege of hosting **Professor Christopher Manning** from Stanford University for two days of invaluable discussions on the future of **Generative AI, Natural Language Processing (NLP), and Agentic AI**. As the Founder of Stanford's NLP Group and Associate Director of the Stanford Institute for Human-Centered Artificial Intelligence (HAI), Professor Manning shared global perspectives with our Corporate Partners—REA Group, Suncorp Group, NAB, Australian Super, and Coles Group—through boardroom sessions and as a keynote at our inaugural AI & Analytics Summit. Supported by our Event Partner, **City of Melbourne**, and Centre Patrons, **Suncorp Group** and **REA Group**, this event offered practical insights into AI adoption beyond the hype. Key messages included the importance of strong data foundations, the current limitations of Agentic AI, and the need for a measured, use-case driven approach to AI transformation. The visit also provided an opportunity to reconnect Professor Manning with the Australian NLP community, making for a highly engaging and informative program.

Leadership, Influence and Decision-Making in a Data-Driven World

As part of our executive education series for our Corporate Members, the Centre for Business Analytics hosted a **workshop** titled “**Influencing People and Leadership**” with **Jennifer Overbeck**, Professor of Management at Melbourne Business School on **13 March 2025**. Drawing on her expertise in **power dynamics, influence, and organisational behaviour**, Professor Overbeck explored how leaders can navigate complex decision-making environments shaped by data and analytics. The session focused on practical strategies for influencing stakeholders, managing organisational politics, and fostering a data-driven culture while maintaining effective human leadership. Attendees gained valuable insights into balancing analytical rigor with interpersonal influence, a critical capability for leaders driving transformation in today’s data-rich business landscape.



Generative AI for Business: Inaugural Programs Delivered with Industry Partners



The Centre for Business Analytics has successfully delivered two flagship **Generative AI for Business** programs at Melbourne Business School, designed to equip leaders with practical insights into the opportunities and challenges of generative AI adoption. Our first-ever **open enrolment short course**, held on **20–21 March 2025**, brought together a diverse group of participants for two days of hands-on learning, led by Professors Yalçın Akçay, Ujwal Kayande, Jeannie Marie Paterson, Professor Eduard Hovy. The program explored how generative AI can drive business value, manage risks, and enable responsible innovation.

Building on this success, we delivered a customised version for **Bupa** on **29–30 April 2025**, tailored to the organisation’s strategic priorities in partnerships in healthcare insurance. Both programs were met with strong engagement, energetic discussion, and overwhelming positive feedback—reflecting a growing appetite among Australian businesses to embrace the potential of generative AI. We look forward to continuing this important work with our partners and the broader business community.

To learn more about the Generative AI for Business course and how it can be tailored for your organisation, please **reach out to us** at the Centre for Business Analytics.



Reflections as I Step Down as Director of the Centre for Business Analytics

Yalçın Akçay

Professor of Operations, Melbourne Business School



About the Author: Professor Yalçın Akçay joined Melbourne Business School in 2017 and has served as the Director of the Centre for Business Analytics until 15 May 2025.

His research focuses on revenue management, dynamic pricing, inventory management, and retail operations, with a particular emphasis on applying stochastic modelling to service and manufacturing systems. His work has been published in leading academic journals, including *Management Science*, *Operations Research*, and *Production and Operations Management*, and has received multiple awards such as the Wickham Skinner Best Paper Award (POMS) and the IIE Transactions Best Paper Award (IIE). Prior to joining MBS, Yalçın was an Associate Professor at Koç University. He holds a dual-title PhD from Penn State Smeal College of Business, and teaches Operations Management across the MBA, Executive MBA, and Senior Executive MBA programs.

After more than three immensely rewarding years, I will be stepping down from my role as Director of the Centre for Business Analytics at Melbourne Business School. I will continue my journey at the School as Professor of Operations, focusing on teaching in our degree programs and executive education courses, while also reigniting my research agenda.

Reflecting on my time as Director, I am incredibly proud of how the Centre has remained at the forefront of the evolving worlds of data, analytics, and AI—always seeking to engage with the most pressing issues facing businesses and society. Fittingly, my first event as Director was a talk I gave during the pandemic on how advanced analytics can build supply chain resilience—a topic that became critically important as global supply chains faced unprecedented disruptions. More recently, we closed this chapter by hosting the Analytics and AI Summit, where we welcomed Professor Christopher Manning, one of the world’s most distinguished leaders in natural language processing and AI, to deliver a keynote on how Generative AI is transforming business. These events exemplify the Centre’s mission: to equip organisations with the insights, tools, and knowledge they need to make data-driven, future-ready decisions.

The Centre’s progress over these years has only been possible through collaboration and teamwork. In particular, I would like to extend my sincere thanks to **Anita Arbogast**, Executive Director of the Centre, and **Arita Economou**, Centre Manager. Their professionalism, energy, and dedication have been instrumental to everything we have accomplished together. Together, we have achieved several milestones that I am particularly proud of, which reflect both the Centre’s commitment to thought leadership and its responsiveness to the rapidly evolving needs of business leaders in the era of data and AI.

Among these, the launch of two brand new executive education programs—**Generative AI for Business** and **Leading Data Teams in the Age of AI**—stands out as a strategic response to the transformative shifts reshaping industries. These programs are designed to equip senior leaders and managers not only with an understanding of emerging technologies like Generative AI but also with the leadership capabilities needed to build, guide, and empower high-performing data and AI teams within their organisations. In addition, the launch of our new online short course, *Data Analytics for Business Professionals*, has made critical data literacy skills more accessible to a broader audience of professionals, helping them make informed, data-driven decisions regardless of their technical background. These offerings are more than just courses—they represent essential learning pathways that help bridge the gap between technical innovation and business strategy. In a world where data and AI are becoming central to competitiveness, these programs play a vital role in helping leaders future-proof their organisations, foster a data-driven culture, and navigate the complex ethical, governance, and societal implications of AI. Through these programs, the Centre continues to empower Australian and global business leaders to thrive in an increasingly digital, data-driven economy.

We have delivered three high-impact **Melbourne Business Analytics Conferences**, bringing together and hosting some of the most influential industry executives and global academics to explore how data, analytics, and AI are transforming business and society. These conferences have become a flagship event for the Centre, consistently receiving outstanding feedback for their relevance, thought leadership, and ability to spark important conversations between academia and industry. We also introduced the **Practice Prize**, now proudly sponsored by SAS, to celebrate and showcase innovative, real-world applications of analytics that deliver tangible impact—further reinforcing our commitment to bridging theory and practice.

We also built important bridges across the **University of Melbourne**, collaborating with the Centre for AI and Digital Ethics at the Melbourne Law School, Melbourne Connect, and the Faculty of Engineering and Information Technologies—helping embed a truly holistic approach to business analytics and AI.

In addition, the Centre published three timely whitepapers on critical industry topics—**Why do Analytics and AI Projects Fail?**, **Enterprise AI Governance for Senior Executives**, and **Building Resilient Australian Supply Chains**. Most recently, we collaborated with the Australian Institute of Company Directors (AICD) and Allens to release **Data Governance Foundations for Boards**. This publication marks a significant step in supporting Boards and senior executives to lead confidently in an increasingly data-driven, digitally disrupted economy.

We launched our quarterly **newsletter**, expanding our channels for sharing insights from faculty, students, and our advisory board, as well as research from our Academic Fellows. Our **workshop offerings** for corporate members grew to include both technical and leadership-focused sessions, ensuring organisations can develop not only their data capabilities but also the leadership needed to harness them effectively.

Finally, I would like to express my gratitude to our **industry partners**, whose engagement has been essential to our success, and to the members of our **Industry Advisory Board**. I would like to particularly thank **Wendy Stops**, our Chair, for her leadership, guidance, and unwavering support. I would also like to sincerely thank our faculty experts who have contributed their time, insights, and thought leadership as **Academic Fellows** of the Centre—your expertise has been invaluable in advancing our mission. I am grateful to our dedicated **Student Fellows** from the Master of Business Analytics program, whose enthusiasm and fresh perspectives have added great energy to our activities and helped strengthen the bridge between learning and practice.

It has been a privilege to serve as Director of the Centre. I look forward to continuing to contribute to our mission of transforming decision making through business analytics in my ongoing roles at Melbourne Business School.



Future Proof Your AI Strategy

Stephen Brobst

Chief Technology Officer at Ab Initio Software

Member of Industry Advisory Board, Centre for Business Analytics



About the Author: Stephen Brobst is Chief Technology Officer at Ab Initio Software, a spin-off from the MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) where he did his Masters and PhD research. He also holds an MBA with joint course and thesis work at the Harvard Business School and the MIT Sloan School of Management. Stephen is on the advisory board for the Centre for Business Analytics at the Melbourne Business School as well as a number of start-ups in the area of AI/ML and data management.

The hype surrounding Artificial Intelligence these days is overwhelming. All of the noise makes it very hard for business leaders to formulate a coherent strategy for leveraging this emergent technology. Moreover, the field is moving so fast, it is hard to determine what are the right choices to make at any given time. Given all of these factors, I have three pieces of advice to help guide effective deployment of an enterprise AI strategy: (1) do not be led down the garden path by vendors trying to sell whatever is the latest shiny AI object, (2) invest in your data foundation to have a successful AI deployment, and (3) invest more in your people and change management than in the AI technology. Adhering to these three principles will go a long way toward achieving success in your AI journey.

The current rate of innovation in the field of AI is unprecedented and will impact all industries and all organizations. However, deployment of AI should not be the “goal” of a business strategy. Creating business value is the number one priority for successful organizations. There are many ways to create business value: “increase revenue”, “decrease cost”, and “increase customer delight” are three that come to mind. In this context, the question should not be “where can I use AI in my business”, but rather what are my most important business value priorities and what are the best ways to achieve my business goals. AI is one of many approaches that may be appropriate, but rarely is AI successful in isolation (more on that later). These days, many people think that AI means generative and agentic AI. The reality is that there are many methods for use of deep learning and more traditional machine learning in the AI toolbox. And more are being added every day. New AI technologies do not typically “replace” existing AI technologies, but rather add to the toolbox. Don’t get heavily invested into a specific Large Language Model (LLM) because in six months there will be a better one just around the corner. Support for multiple Large (and Small) Language Models is quickly becoming the industry norm.

The primary factor driving your success in AI deployment will *not* be the underlying mathematical and statistical models. This aspect of AI deployment, while very interesting from an academic perspective, will not create differentiated value from one competitor to the next. Most enterprises have access to the same AI algorithms by virtue of open-source and commercially available software. This area will quickly commoditize. The true competitive advantage will come to those who have invested in robust data products that provide detailed insight with high trust. AI-ready data is where the winners are focusing their efforts. This means investment in data quality controls, service level contracts, transparency, and self-service access for business subject matter experts and data scientists. Minimum viable governance with a focus on agility while protecting against data anarchy is a key guiding principle.

The last (but not least) critical success factor is a focus on the human element of change management. The most impactful uses of AI are not simply automation of existing processes. Saving money is good, but is usually not



transformational without business process change. Almost all business process changes require human engagement in the transformation of how work gets done. Daron Acemoglu, Nobel Laureate in Economics, speaks about “Good AI” and “Bad AI” with a strong recommendation to lean into the use of AI to empower employees to do things not previously possible within their existing skill sets – this approach is much more transformational than simplistic task automation. Humans have lots of inertia when it comes to changing the way that they work, even to the point of sabotage to avoid change that may invoke insecurity about their future livelihood. Educating and setting proper expectations on how AI will transform job roles into more enriching employment experiences is essential. Having said that, AI will also eliminate the need for some skill sets – and that is also a change management challenge.

Focusing on business outcomes rather than technology, investing in data products, and proactively engaging in change management are common themes among all successful AI initiatives that I have encountered in my many decades working in this space.



The Big Data Bias and the Reality of Scarce

Conor Game

Alumnus, Master of Business Analytics Program, Melbourne Business School

Past Student Fellow, Centre for Business Analytics



About the Author: Conor is an Alumnus of the Master of Business Analytics student at Melbourne Business School and currently an Associate Consultant at Ember Advisors. Conor is committed to continuous learning and seeks to employ advanced analytics to solve complex business challenges, aiming to drive sustainable growth and innovation across sectors.

Artificial Intelligence and Big Data—a match made in heaven. Driven by the promise of unprecedented insights and automation, AI and Big Data have generated immense excitement across industries, with companies racing to leverage vast datasets to unlock competitive advantage. Companies use troughs of data to build machine learning models and predictive algorithms that forecast sales, optimise supply chains, set optimal prices, segment customers, detect fraud—the use cases for AI go on. In turn, and more recently, non-technical users can unlock the value of their Big Data by using Generative AI tools, like ChatGPT, that analyse their data and build models that yield actionable insights. The two are inseparable and often, co-dependent.

However, not every business has access to such extensive, clean, and labelled data. When data are scarce, machine learning algorithms overfit to unrepresentative data, misclassify noise as real signals, and often simply break down. Scarce data issues affect not only start-ups and emerging industries but also large companies with outdated data systems and collection methods. Furthermore, the COVID-19 pandemic introduced two years of biased data, while data from before 2020 may no longer capture recent shifts in consumer and market behaviour. While Generative AI tools have democratised programming skills, enabling cheaper and easier data analysis, sourcing high-quality data—and knowing what to do when you don't have it—remains a challenge.

Quality vs. Quantity: Why Both Matter More Than Ever

Quality over quantity? Or a balance of both? In reality, data scarcity often means lacking quality, quantity, or both. Businesses need high-quality data in sufficient volume to support reliable insights.

The quality of data depends on several factors, with accuracy, completeness, representativeness, and accessibility being among the most crucial. A business may have data free from errors and inconsistencies, but if it's missing key values or unrepresentative of the broader population, it will fail to provide reliable insights. For example, if a national retailer wants to analyse customer preferences, using unrepresentative data that overlooks certain demographic groups or geographic regions will likely lead to flawed analysis. Similarly, even if data are accurate and representative, if they are siloed across divisions and systems—making data inaccessible or incomplete—it's equally problematic.

Quality of data can be improved by implementing standardised data collection processes, regular data cleaning to remove inaccuracies, implementing protocols for data sharing to break down siloes, and using diverse data sources to achieve representative data. Data governance is a business principle that specifically works to improve data quality. Thankfully, machine learning algorithms can generally eke out insights and patterns in poorly kept data as long as there is enough data. However, poor data collection systems and guidelines mean that many businesses don't track and store enough data for any insight to be gained. Expanding data storage

infrastructure, implementing a data collection strategy, and increasing data sources will enhance both the quantity and quality of data. However, while collecting more primary-source data is time-consuming and expensive, there are strategies to make the most of scarce data.

Smart Strategies for Scarce Data: Generating More, Using Less

There are various approaches to addressing data scarcity, ranging from advanced techniques like Generative Adversarial Networks (GANs) to more straightforward solutions, such as leveraging pre-trained models from related domains. These approaches can be grouped into two key themes: generating new data and adapting existing machine learning models. Generating new data is a fast and effective way to augment datasets for improved modelling. However, working with synthetic or 'fake' data carries the risk of introducing biases if not executed carefully. Adapting existing models, on the other hand, involves modifying techniques to work effectively with limited datasets.

Generating New Data

Starting with the least technical methods of generating new data. Information fusion is a technique that combines data from multiple sources to fill in gaps and add context. For example, a business can merge limited internal sales data with publicly available market data to gain insights into customer behaviour and improve targeted marketing strategies. A healthcare provider looking to predict its case mix might bolster its historical admissions data by incorporating local population demographics such as age distribution, income levels, weather data, economic indicators, and health insurance penetration statistics. The challenge lies in finding complementary datasets that provide new insight.

Alternatively, data resampling is a technique used to address data imbalances by duplicating or removing data points. Data imbalance is a specific form of data scarcity that arises when certain outcomes, such as fraud and accidents, are rare compared to others. Oversampling methods, which duplicate data from underrepresented classes, and undersampling methods, which reduce the size of overrepresented classes, can help create a more balanced dataset. A more technically intensive version of resampling is Synthetic Minority Oversampling Technique (SMOTE), which generates new data points similar to some minority class, such as rare disease cases in a medical dataset. These approaches address the Accuracy Paradox that arises in skewed class distributions by preventing an algorithm from favouring a majority class.

Finally, Generative Adversarial Networks (GANs) are a feasible solution to generating new data. They consist of two neural network models that engage in a perpetual but productive competition. A generator learns to create synthetic data that progressively becomes more indistinguishable from the real data, and a discriminator classifies whether input data are real or generated. The two parts are trained concurrently such that the generator aims to deceive the discriminator while the discriminator refines its ability to distinguish between the real and fake data. In this way, through some healthy competition, the generator becomes adept at creating robust and accurate data to augment a scarce dataset.



Adapting Models to Scarcity

If keeping the data unchanged is preferred, the model can be adjusted instead. Transfer learning and controlling model complexity are practical adjustments to machine learning algorithms when data are lacking.

Transfer learning is a practice that allows methods to apply previously acquired knowledge to new, related problems. Instead of starting from scratch, a model reuses what it had already learnt and is fine-tuned with the specific company data to adapt to solving new problems. This is particularly useful in fields where large datasets are scarce. For example, a manufacturing company that wants to engage in predictive maintenance for specialised equipment but lacks sufficient historical failure data can apply transfer learning. They can use models trained on similar equipment and fine-tune the model with the limited available data specific to the company's equipment and then predict potential failures and optimise the maintenance schedule.

Finally, whilst it's somewhat counterintuitive, reducing the complexity of models by applying specific regularisation methods such as Lasso and Ridge regression or Dropout regularisation is an effective approach. These techniques prioritise simplicity by penalising overly complex structures, reducing reliance on specific features or occurrences, and mitigating overfitting to unrepresentative data. In fact, regularisation to reduce model complexity is a consideration for all machine learning applications regardless of data quality. But it is especially important in cases of scarce data because complex models will often memorise the limited training data and therefore won't generalise to new unseen data.

The Long Game: Building Resilient Data Practices in a Scarce World

The methods outlined above demonstrate that even limited datasets can yield valuable insights. However, while these strategies mitigate the challenge of data scarcity, the importance of investing in robust data infrastructure, improving data collection, and fostering a culture of data governance is still imperative.

Many organisations lack access to high-quality 'big data' but still aim to leverage their internal data to drive better decision-making. By combining innovative techniques with thoughtful data strategy, organisations can turn the challenges of data scarcity into opportunities for growth and competitive advantage.



The Double-Edged Sword of Recognition: Rethinking Motivation in Online Innovation Contests

Ping Xiao

Associate Professor of Marketing, Melbourne Business School

Academic Fellow, Centre for Business Analytics



About the Authors: Ping Xiao is an Associate Professor at Melbourne Business School, University of Melbourne. She holds a Ph.D. from Washington University in St. Louis and a bachelor's degree from the University of Science and Technology of China.

Dr. Xiao's research focuses on strategic business expansion, digital information nudges, big data analytics, policy evaluation, pricing, consumer and social network analytics, sustainable and smart product consumption, corporate social responsibility, and empirical industrial organisation. Her work has been published in leading journals such as *Marketing Science*, *Management Science*, *Journal of Marketing Research*, and *Journal of Econometrics*, among others. She was a finalist for the prestigious 2015 John D.C. Little Best Paper Award.

A dedicated educator, Dr. Xiao teaches across data analytics, pricing, marketing insights, research methods, and marketing research. Her teaching excellence has been recognised with multiple awards, including the 2022 MBS Dean's Academic Excellence Award, a Top 20 Teaching Award from UTS, and a Research Excellence Award from Deakin University.

This article provides a non-technical summary of the recent research paper published in *Decision Sciences* titled "Online community's recognition and continued participation in idea competitions", authored by Ping Xiao in collaboration with Kai-Yu Hsieh, Noshir Contractor, and Li Wang.

Citation: Hsieh, Kai-Yu, Ping Xiao, Noshir Contractor, and Li Wang. "Online community's recognition and continued participation in idea competitions." *Decision Sciences* 55, no. 2 (2024): 176-190.

Abstract: This study examines the effect of online community's recognition on continued participation in idea competitions, and how personal winning record moderates such an influence. We reason that the motivating role of community recognition might either be reinforced or substituted by personal winning record, depending upon whether relational motives (psychological and social bonding) or individualistic motives (personal benefits, such as status and career enhancement) are the primary behaviour driver. Through an event history analysis of data obtained from a platform of creative design contests, we find that although community recognition exerts a positive effect on the rate of continued participation for designers who are yet to win any competitions, this effect increasingly turns negative for designers who have won. Such findings indicate that the motivating role of community recognition might be substituted instead of reinforced by personal winning record, lending support to the individualistic view while rejecting the relational view. Although virtual social spaces represent an important means for modern competition platforms to attract and motivate participants, our study informs practitioners about online community's limitation in retaining "star" participants.

In the age of digital innovation, online idea competitions have emerged as a dynamic strategy for sourcing creative solutions from global crowds. Platforms like Threadless, where thousands of designers compete to have their t-shirt designs produced and sold, epitomize this shift. Beyond the prizes, these platforms thrive on fostering vibrant communities that engage, recognize, and motivate participants.

However, new research by Ping Xiao, Academic Fellow at the Centre for Business Analytics, and colleagues challenges some assumptions about what keeps participants coming back. Specifically, their study investigates how recognition from the online community influences designers' willingness to continue competing—and how this relationship changes once participants begin winning.

The team analysed a rich dataset from Threadless, capturing over 144,000 design submissions and 129 million feedback evaluations over six years. Their approach utilized event history analysis, a method borrowed from data science, to track when and why participants re-enter competitions over time.

Data Science at Work: Understanding the Recognition Paradox

Using large-scale behavioural data, the researchers modelled the complex relationship between community feedback (both volume and sentiment) and participants' future engagement. Their findings unveil an important paradox.

For new and yet-to-win designers, community recognition—such as positive feedback and high visibility—significantly boosts their likelihood to continue participating. This aligns with intuitive expectations: praise and attention fuel motivation.

But the story changes dramatically for those who achieve winning status. Once a designer wins, the same community recognition that once inspired them becomes less motivating, even detrimental. In fact, the data showed that for these "star" participants, community approval no longer encourages participation—it may actually reduce it.

This counterintuitive finding highlights that personal winning records effectively substitute for community validation. For these individuals, the personal status and career benefits they gain from winning eclipse the social bonds and psychological rewards provided by the community. Essentially, they begin playing a different game—less about community and more about personal brand-building.

Implications for Business: Rethinking Platform Engagement Strategies

For platform managers, these insights have immediate, actionable implications. Many innovation platforms have invested heavily in building social communities to keep participants engaged, under the belief that community recognition is a universally strong motivator.



However, this study shows that this model has limits—especially for your elite contributors. As participants climb the ladder of success, they may become immune to the community's cheers. Worse, the very dynamics that attracted them may start to feel less relevant, prompting them to "graduate" from the platform.

This calls for a strategic rethink of how to engage and retain top talent in competitive online ecosystems. Simply doubling down on community recognition will not suffice. Instead, platforms need to consider bespoke incentives for winners—such as exclusive access, financial rewards, or professional advancement opportunities—that align with their evolving motivations.

A New Lens on Digital Innovation Metrics

This research exemplifies how advanced analytics can unearth non-obvious patterns in user behaviour. By applying data science methods to behavioural data, the research offers a fine-grained understanding of motivational dynamics—something traditional surveys or focus groups would likely miss.

For business leaders, this underscores the importance of leveraging behavioural analytics and longitudinal data to monitor and predict engagement trajectories. It also highlights the dangers of assuming a one-size-fits-all approach to motivation in digital platforms.

In short, the message for businesses is clear: as platforms scale and participant profiles diversify, data-driven segmentation and personalized engagement strategies become essential to sustain innovation ecosystems.



Planning Amid Uncertainty: A Smarter Way to Predict Customer Choices

The Problem with Predicting the Unpredictable

Gerardo Berbeglia

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Academic Fellow, Centre for Business Analytics



About the Author: Gerardo Berbeglia is an Associate Professor at Melbourne Business School, where he has been a faculty member since 2012. He holds a PhD in Operations Research from the Université de Montréal and a Master's in Computer Science from the University of Buenos Aires. Prior to academia, Gerardo worked as a Senior Scientist at ExPretio Technologies and as a Postdoctoral Fellow at McGill University.

His research spans revenue management, optimisation, and the impact of social influence in online markets, with publications in leading journals and conferences. Gerardo teaches Operations, Optimisation, and Supply Chain Analytics across MBS's MBA and Master of Business Analytics programs, and is a three-time recipient of the MBS Teaching Excellence Award.

This article provides a non-technical summary of the recent research paper published in INFORMS Journal on Computing titled "Approximate resolution of stochastic choice-based discrete planning", authored by Gerardo Berbeglia in collaboration with Zhang, Jiajie and Yun Hui Lin.

Citation: Zhang, Jiajie, Yun Hui Lin, and Gerardo Berbeglia. "Approximate resolution of stochastic choice-based discrete planning." Forthcoming in INFORMS Journal on Computing (2025).

Abstract: Stochastic choice-based discrete planning is a broad class of decision-making problems characterized by a sequential decision-making process involving a planner and a group of customers. The firm or planner first decides a subset of options to offer to the customers who, in turn, make selections based on their utilities of those options. This problem has extensive applications in many areas, including assortment planning, product line design, and facility location. A key feature of these problems is that the firm cannot fully observe the customers' utilities or preferences, which results from intrinsic and idiosyncratic uncertainties. Most works in the literature have studied a specific type of uncertainty, resulting in customized decision models that are subsequently tackled using ad hoc algorithms designed to exploit the specific model structure. In this paper, we propose a modelling framework capable of solving this family of sequential problems that works for a large variety of uncertainties. We then leverage an approximation scheme and develop an adaptable mixed-integer linear programming method. To speed up the solution process, we further develop an efficient decomposition approach. We show that our solution framework can yield solutions proven to be (near-)optimal for a broad class of problems. We illustrate this by applying our approach to three classical application problems: constrained assortment optimization and two facility location problems. Through extensive computational experiments, we demonstrate the performance of our approach in terms of both solution quality and computational speed, and we provide computational insights. In particular, when we use our method to solve the constrained assortment optimization problem under the exponential choice model, it improves the state of the art.

When businesses offer customers a menu of products, services, or locations, predicting what they'll choose is both a science and an art. But what if your predictions are based on incomplete or noisy data about customer preferences? This is the reality for firms engaged in assortment planning, facility location, or product design, where customer choice is influenced by a combination of observable and hidden factors—some rational, others deeply personal.

Traditional decision models often assume fixed behaviours or rely on one-size-fits-all assumptions. But those models quickly break down when confronted with the real-world messiness of human behaviour.

Gerardo Berbeglia, Academic Fellow at the Centre for Business Analytics, and his co-authors present a novel approach that combines stochastic modelling, optimisation, and advanced computational methods to enable better business decisions—even in the absence of perfect data.

A Versatile Analytics Engine for Customer-Driven Decisions

The core innovation lies in the development of a unified modelling framework for stochastic choice-based discrete planning—a mouthful that essentially means helping businesses make the best decisions even when they can't fully predict what customers will do.

Their framework is designed to solve a family of planning problems where:

- The firm (the “planner”) chooses a set of options to offer.
- Customers select from that set based on uncertain preferences.
- The firm’s goal is to maximize expected outcomes, like revenue or market share.



What sets this work apart is its flexibility and scalability. Previous models required firms to assume a specific type of customer behaviour (e.g., all customers make rational choices based on price). This new model handles multiple types of uncertainty—from intrinsic product qualities to quirky, individual customer tastes—without being tied to any one choice model.

Technically, the researchers combine sample-based approximations (drawing multiple likely customer behaviour scenarios) with mixed-integer linear programming (MILP) and a highly efficient Benders decomposition algorithm. The result: firms can make near-optimal decisions with quantifiable confidence—even with messy or limited data.

From Algorithms to Action: Real-World Use Cases

To demonstrate its practical power, the research team applied their framework to three common business problems:

- **Assortment Optimization:** Choosing which subset of products to sell, where customer preferences are partly random. Their method outperformed state-of-the-art algorithms—especially when uncertainty was high.
- **Facility Location with Pricing:** Determining where to open service locations and what price to charge, accounting for geographical demand and customer travel preferences. Their model handles both cost and pricing decisions together, a notoriously hard problem.
- **Market Share Maximization:** Opening locations to capture the largest possible customer base, even when a competitor is present. Their method handles this with highly realistic choice behaviour, outperforming existing methods in scalability and accuracy.

Across all applications, the framework demonstrated superior solution quality and speed, successfully solving large-scale problems that were previously intractable. Notably, the team included a rigorous way to statistically validate how close their solutions were to the true optimum, a feature often missing in analytics approaches.

A Playbook for Smarter, Data-Resilient Decision Making

For business leaders, the message is clear: you don't need perfect customer data to make high-quality strategic decisions. What you need is a robust analytics engine that can adapt to different kinds of uncertainty and still deliver actionable insights. This research doesn't just advance academic theory—it provides a playbook for smarter, more resilient decision-making in a world where data is often incomplete or unpredictable. As the analytics arms race heats up, having models that can flex with reality—not just theory—will be a major competitive advantage.



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About The Centre for Business Analytics

The Centre for Business Analytics was founded by Melbourne Business School to address the worldwide demand for analytics research and knowledge.

The vision of our multi-disciplinary centre is to 'transform decision making through business analytics'. The Centre investigates how data of any size can drive organisational success through fact-based, data-driven, proactive decision making.

The Centre also manages educational programs and provides opportunities for students, faculty and industry leaders to come together to deliver both academic and business impact.

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