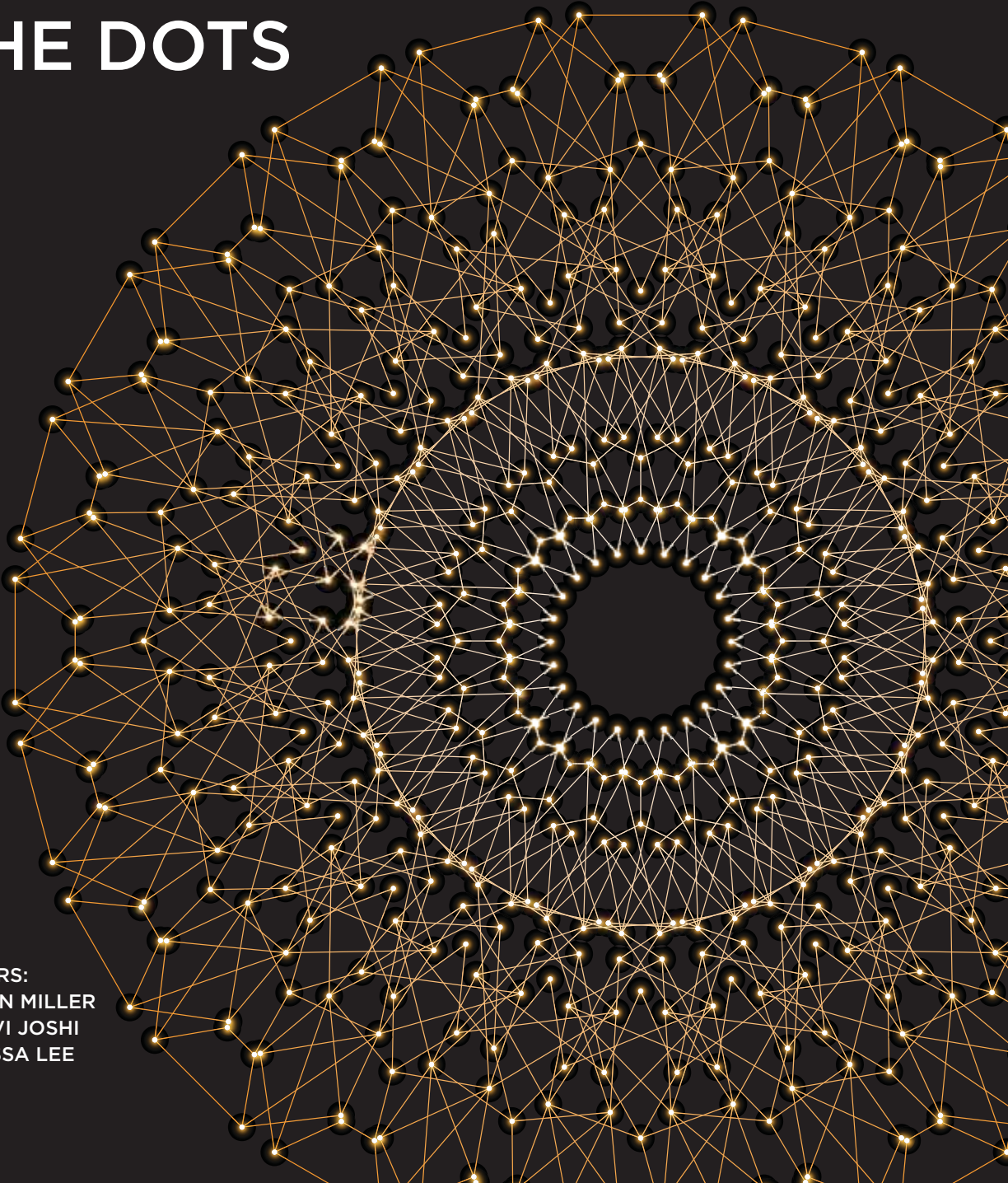


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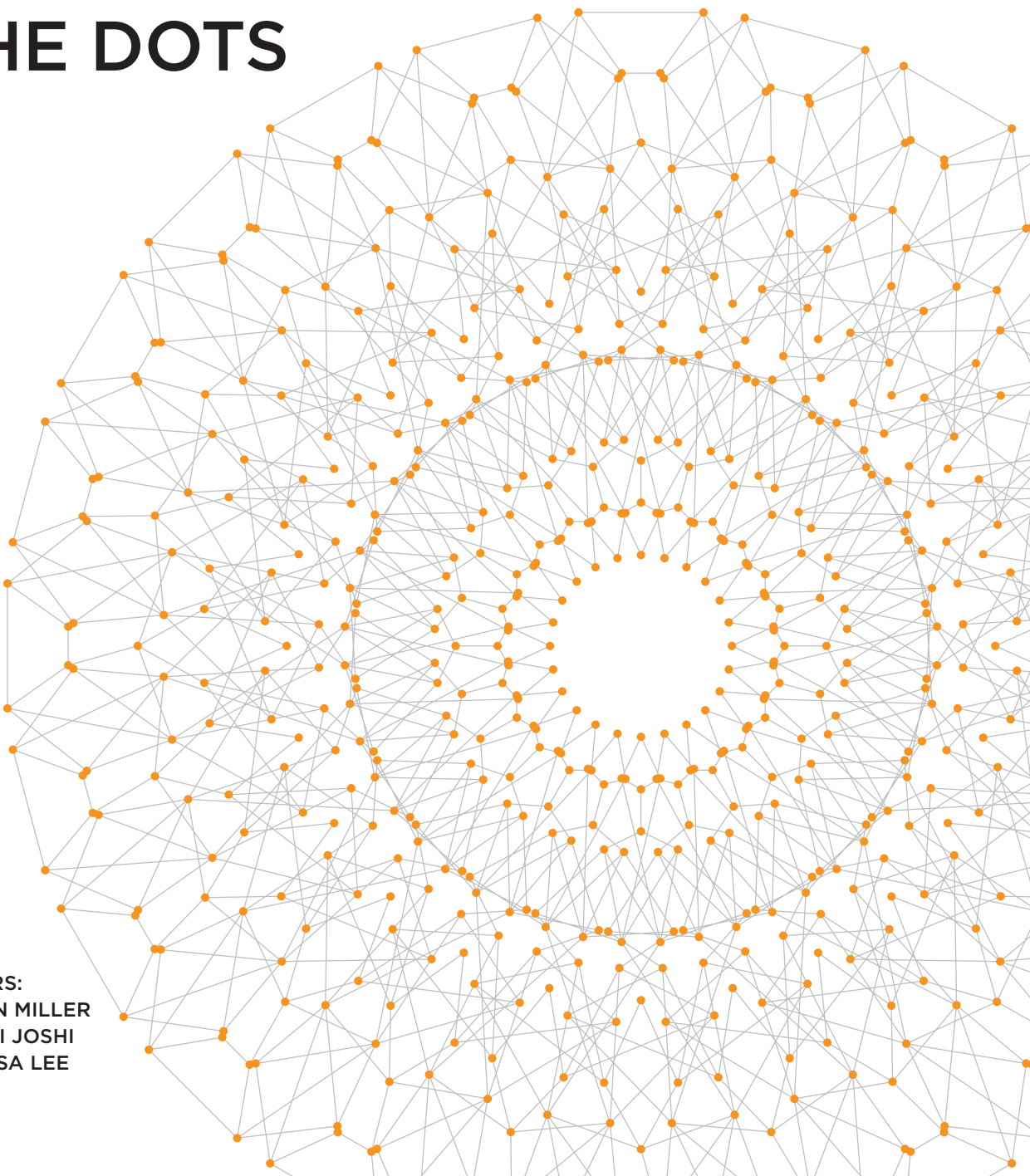






**RESEARCH @ SMU:**

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**EDITORS:  
STEVEN MILLER  
HAVOVI JOSHI  
VANESSA LEE**



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# FOREWORD



**Lily Kong**

Provost

Lee Kong Chian Chair Professor of Social Sciences  
Singapore Management University



SMU was established in the year 2000, and what started off as a business school has since grown to become a university with six schools spanning the disciplines of business, accountancy, economics, social sciences, law, and information systems. Additionally, SMU has established numerous institutes, centres and labs that support research, education and outreach in these disciplinary areas, as well as the integration across them. Adopting an integrated research-teaching-learning-practice approach, we seek to foster innovative learning experiences, generate relevant and impactful research, and create influential change agents. We aim to positively impact business, government and society in Singapore and beyond.

When I joined SMU two years ago, the university was celebrating its 15th anniversary, and the SMU Vision 2025 was created to mark the milestone as well as to serve as a roadmap for the university over the next ten years. As part of the vision, a clear ambition for the university was articulated. We strive to build SMU as a leading university in Asia for high-quality research, with a particular emphasis on providing

evidence-based solutions derived from insights from across disciplines, addressing contemporary Asian issues of global relevance, and bridging theory and practice.

In this book, you'll read about the insights drawn from research by SMU colleagues, and indeed, solutions that have been developed to address some of the world's challenges today. It is my hope that, through this book, more will learn about research conducted at SMU, and witness how we make meaningful impact on business, government and society, in Singapore and beyond.

# INTRODUCTION



**Steven Miller**

Vice Provost (Research)  
Professor of Information Systems (Practice)  
Singapore Management University

The word “Management” in the name of our university was carefully and deliberately chosen to address the needs of institutions and decision-makers across all segments of society: business enterprises and the private sector, government and the public sector, and civil society and the people sector.

Unless you are already familiar with the breadth and depth of research output from Singapore Management University (SMU), you would naturally assume that we were a “management” university that was focusing exclusively on business – in essence, a large business school. The reality is quite different.

Through this book, you will gain a more complete understanding of the research dimension of SMU. You will see how we have grown, since our founding in the year 2000, into a university focused on Management, Social Sciences, and Technology, and their intersections.

This book is organised into four sections. The first section, “Management and the Social Sciences”, features the work of researchers from our Lee Kong Chian School of Business, our School of Social Sciences and our School of Information Systems.

The second section, “Accounting, Finance and Economics”, features the work of researchers from our School of Accountancy, the Lee Kong Chian School of Business, and the School of Economics.

The third section, “Law, Management & Society”, features the work of researchers from our School of Law.

The last section, “Information Systems & Smart Cities Transformation”, features the work of researchers from our School of Information Systems and our Lee Kong Chian School of Business.

Each section starts with a foreword that introduces the theme and provides a capsule summary of each article. The articles have been deliberately/expressly crafted to be accessible, easy to understand and fun to read.

These summaries of our research work will help you understand what “Management” means in the SMU context. It is the management of business enterprises as well as the management of public sector and people issues. It is understanding the behaviour of individuals and groups, the behaviour of organisations, as well as the behaviour of industries, legal systems, markets, economies and global networks. It is about creating computing capability and deploying information technology to help understand how people behave, as well as to improve organisational and societal performance. It is about facilitating the entrepreneurial spirit and efforts in putting people, institutions, technology and capital together in new ways to drive change across the private, public or civil sectors.

We hope you’ll enjoy reading this book as much as we enjoyed creating it.





SECTION 1

# MANAGEMENT & THE SOCIAL SCIENCES

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# FOREWORD

## Management & the Social Sciences

There are major shifts now taking place in the global economy, accompanied by transformations that are impacting individuals, groups and organisations. These changes in industries and their markets are interlinked with changes taking place in the social fabric and societal culture. The essays that follow reveal ways in which SMU researchers from the areas of management and social sciences are analysing these shifts in the Asian, American, European and African context, and providing insights to what is happening, as well as strategies and recommendations to adapt to them.

This section contains articles from management researchers from the areas of human resource management, marketing, information systems management, strategy & leadership, and innovation & entrepreneurship. Additionally, this section contains articles from social science researchers from the areas of social psychology, sociology, political science, geography and public policy. Most of the articles are based on work done in Asia, and some feature cross-border comparisons.

A summary of each article in this section is given below.



Records as far back as the Wei Dynasty in China show that businesses have been assessing their employees for nearly 2,000 years. Then as now, the biases of the rater were questioned. In **Performance Appraisals: Pitfalls and Promises**, Gary Greguras and Jochen Reb call for an in-depth understanding of the judgment and decision-making processes involved in performance appraisals. They go beyond the traditional focus on the cognitive processes involved in decision-making related to performance appraisals to investigate the roles of emotions and culture on decisions, and the strong effect of ‘performance trend’ on overall performance evaluations.

Asia’s love affair with all things luxury — bags, watches, perfumes and clothes — is no secret. But the big mystery is why customers will pay US\$5,000 for a bag when you can get a functional one for much less. In **Studying the Logic of Luxury**, Srinivas K Reddy explores the conundrum faced by luxury brands that have no choice but to adapt in order to achieve growth while maintaining exclusivity. It’s nearly impossible to grow sales without using mass-market channels, but greater reach harms perceptions of quality and exclusivity, he says. This article summarises aspects of the research within the LVMH-SMU Asia Luxury Brand Research Initiative.

**Helping Marketing Strategies See the Bigger Picture** reveals the impact of marketing strategy on a company’s share price and financials. Kapil Tuli believes designing a marketing strategy should go beyond unique selling proposition and brand management; his study found that increases in customer satisfaction could lower the volatility of a firm’s stock returns. Meanwhile, outsourcing Customer Relationship Management (CRM)—a key marketing tool—could actually erode a company’s market value. CRM outsourcing is more beneficial to firms that are high on IT capabilities and low on marketing capabilities, and less beneficial when it concerns pre-sales CRM, he adds.

In **Walking Firms through IT Decisions**, Ma Dan queries whether it is better to be an early adopter or wait until the technology matures. Making data-driven decisions, or adapting to technology-driven changes is not simply a case of fastest fingers first. There must be a balance between gaining an



early competitive edge and jumping on the bandwagon only when the technology has stabilised and matured, she cautions.

Guo Zhiling discusses the impact of IT on consumer behaviour and business strategy in **Harvesting Technology to Improve the Consumer Experience**. Consumers are key players in the business ecosystem, which is increasingly digitalised, dynamic and comes with networked social interactions between businesses and consumers. Guo seeks to understand the impact of IT on consumer behaviour and business strategy using an interdisciplinary approach. Building elegant yet powerful research models is both an art and a science to her.

Should firms become early adopters of innovations such as high-frequency trading, or wait and see, and only follow when the technology becomes more mature? **Helping Businesses Embrace Transformational Technology** showcases research from the SMU School of Information Systems (SIS) team that is helping institutions understand both the benefits and risks of real-time business transactions. Led by Ma Dan, together with SIS colleagues Robert Kauffman, Guo Zhiling and Mei Lin, the team concludes there is going to be a shift in the way business value accrues to different stakeholders in the market. It's not about profit: instead, it's about the 'hook up or lose out' relevance as the current revolution in financial technology progresses.

These days, an increasing number of companies in the region are starting to embrace an American style of corporate governance, especially after the 1997 financial crisis, notes Toru Yoshikawa in **The Board Will Now Vote**. The convergence of corporate governance styles has since given rise to a unique hiring problem for Japanese companies. As board members are meant to advise on business strategies and also monitor managerial practices, their relationship with the company CEO is just as important as their qualifications. Not many studies mention the human side of the CEO-board relationship, he says.

Howard Thomas is the former dean of SMU's Lee Kong Chian School of Business. His international perspective on management and education is truly exceptional, and he has been a business school dean of top-tier business schools in the US, the UK and Asia. He has also previously served as chair of the board of the Graduate Management Admissions Council (GMAC), Association to Advance Collegiate Schools of Business (AACSB), the Association of Business Schools (ABS), and the Global Foundation of Management Education (GFME). In **The Serial Dean**, Howard Thomas calls for a greater appreciation of the context and culture of the country a business school operates in: the quality of management education can vary widely among countries. His fine-grained research paints a picture of what business schools could be like in places like Latin America, Asia and Africa. Thomas suggests educators should leave their comfort zones and venture into Africa.

Is there a better way of doing business than the conventional wisdom that dictates that trade secrets have to be protected at all costs? In **When Sharing Is Not Just Caring**, Gerard George, the current dean of SMU's Lee Kong Chian School of Business and an acclaimed scholar in innovation and management, explores various theories as to why people collaborate with one another and how firms innovate and thrive. His recent study upends the conventional wisdom that firms can only survive and grow by zealously guarding their work. Collaboration has become indispensable for innovation, he says.

What it means to be poor or vulnerable in today's society is not as obvious as it was a decade ago. **Taking Action for Social Change** documents the research carried out by John Donaldson together with the team at the SMU Lien Centre for Social Innovation to better understand and respond to the needs of six vulnerable groups in Singapore: the disabled, the mentally ill, single-person-headed poor households, silent workers, foreign workers and new communities. Universities must play a part in building a resilient society, he says, by generating research that is not only rigorous but also something that people can act on in a productive way that will bring Singapore closer as a caring community.

As the global workforce diversifies rapidly, research on multicultural experience and creativity

becomes especially relevant, notes Angela Leung in **Enhancing Creativity through Multiculturalism**. The multicultural experience is a useful lens through which to analyse creative performance, she says. Her research challenges the conventional wisdom that multicultural experiences alone are sufficient to raise creative potential in students.

**Dissecting a Giant: The Commodification of Rural China** examines the unprecedented changes now taking place on all fronts in China. Forrest Zhang and John Donaldson and their colleagues investigate China's rapid and thorough commodification, one of the most profound social changes in today's world. New rungs have appeared in the social ladder. A major challenge is also occurring when rural families rent their farmland to large-scale agricultural producers, such as agribusiness companies.

SMU Provost, Lily Kong, one of the world's leading social and cultural geographers, explores the tensions between religious groups, and between religious groups and secular society, that inevitably arise over religious spaces. **Balancing the Sacred and the Secular** reveals the complexities that surround a society's religious spaces and practices, where the sense of the sacred often runs up against modern urban planning principles.

There are times when governments alone may not have the capacity, resources and foresight to act swiftly upon key issues within a society, says Ann Florini, a noted international expert on collaborations across the public, private and people sectors. **Saving Global Issues Takes Teamwork** calls for a new collaborative approach between governments, businesses and civil societies as well as non-government organisations (NGOs). It is also an area where academics can make an enormous contribution. ■





# Performance appraisals: Pitfalls and promises

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By having a better understanding the performance appraisal process, organisations can develop more effective performance appraisal systems, say Professors Gary Greguras and Jochen Reb.

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Records from the Wei Dynasty in China showed that businesses had been assessing their employees for nearly 2,000 years as writings from that period even questioned the biases of the rater. A surge in performance appraisal research occurred around the middle of the 20th century and performance appraisals remain a topic of interest to scholars and practitioners.

Professors Gary Greguras and Jochen Reb from SMU's Lee Kong Chian School of Business, who specialise in organisational behaviour and human resources, have individually and collaboratively, contributed for many years to a growing body of research on modern day performance appraisal systems. They became interested in this topic because of its relevance and pervasiveness in all types of situations – for example, students are evaluated and also evaluate their instructors; managers evaluate employees' performance; and customers evaluate organisations.

"Past research showed that various rater errors and biases affected performance appraisals," says Professor Reb. "By better understanding the performance appraisal process, organisations can use this knowledge to develop better, more valid and effective performance appraisal systems."

Among their interesting findings was that 'performance trend' had a very strong effect on overall performance evaluations. Performance trend describes how an employee's performance changes dynamically over time: improving,

deteriorating or remaining steady. They found that when employees with a similar overall performance level were appraised, managers evaluated those with an improving trend more positively than those with a declining or flat trend. Professor Reb explains that managers generally interpret an improving trend as indicative of an employee undergoing a process of learning in order to perform at a higher level. Performance trend also has a stronger effect when employees are evaluated for being sent to a skills development programme.

On the other hand, the overall mean-level of performance across the evaluation period was more important when employees were evaluated for promotion and administrative purposes. Both Professors Greguras and Reb argue that this makes sense given that performance trend is likely to be more relevant for developmental purposes, whereas performance level is important for rewarding employees based on performance.

## THE UNCERTAINTY OF THE APPRAISAL PROCESS

In 2014, Professors Greguras and Reb, together with a colleague from the Max Planck Institute of Human Development in Germany and a colleague who is at the University of British Columbia in Canada, contributed a chapter to *Judgment and Decision Making at Work*, a book published by Routledge. Their chapter, 'Performance Appraisals as Heuristic Judgments Under Uncertainty', reviewed existing studies on areas of judgment

and decision-making related to performance appraisals with the aim of identifying where future research would be promising.

“Two of the co-authors came from a judgment and decision-making background and two came from an industrial-organisational psychology background,” says Professor Greguras. “We met to write a chapter at the intersection of these fields, examining judgment and decision processes within the context of performance appraisals. We complemented each other by identifying relevant research theories and models from our respective areas such that the whole was more than the sum of its parts,” he says.

A major concern for researchers and practitioners, the chapter’s co-authors found, was that performance ratings and actual performance did not always match. This suggested that evaluators were less than perfect in their appraisals and/or that rating accuracy might not always be the primary goal of a rater. Existing research clearly indicated that factors other than performance affected overall evaluations (for example, similarity between the rater and ratee, and organisational politics). The chapter’s co-authors emphasised the importance of further research on the various individual, organisational and cultural factors that affect performance ratings and the effectiveness of performance appraisal systems.

### UNDERSTANDING DECISION-MAKING

A variety of factors, including how information is framed, can affect managers’ decision-making processes and evaluations. Raters evaluated performance information presented in a positive frame (for example, 97% attendance) more favourably than identical information presented in a negative frame (for example, 3% absence).

Even completely irrelevant information can affect a manager’s decision. For example, in one study, athletes with larger numbers printed on their jerseys were evaluated as more likely to perform better in a future game than athletes with smaller numbers on their jerseys.

Despite the inherent difficulty of accurately evaluating employees’ performances, evaluators tend to show a remarkable amount

of overconfidence in their judgments. This overconfidence may influence them to overlook the use of decision aids that might help them make a more accurate judgment.

“Given the important consequences of performance appraisals for employees and organisations, organisations inherently have an interest in improving performance appraisal systems and judgments. Ultimately, researchers and human resource practitioners also need to present their findings in a way that demonstrates practical relevance for managers,” says Professor Greguras.

### THE INTERPLAY OF EMOTION AND CULTURE

It is only recently that research has begun to investigate the roles of emotions and culture in performance evaluations. Past research focused more on the cognitive processes involved in decision-making related to performance appraisals.

Managers’ decision-making, for example, was recently found to be affected by their anticipated feelings of guilt or regret over the outcomes of their decisions. Their own emotional state during the appraisal process can also affect their judgment. This was less the case when evaluators were aware that their emotions were influenced by something unrelated to the appraisal. However, if they find themselves unable to pinpoint the source of their emotion, they might attribute it to information about the employee’s performance, leading to a more negative rating if they were experiencing negative emotions.

An interesting yet uncommonly addressed area of research in this field is the influence of culture on the appraisal process. Both Professors Greguras and Reb have made this one of their more recent research areas of focus.

“We are currently looking at the evaluation of dynamic performance across East and West,” says Professor Reb. Judgment-making in Western cultures, he explains, is more dominantly analytic, while in Eastern cultures it is more holistic. Also, employers from Eastern cultures tend to highly value employees who defer to superiors, which is often not the case in the more individualistic

Western cultures. Not only can culture affect the evaluator, it also affects how employees construe and respond to negative feedback. More research is needed to better understand this in order to maximise the benefits of feedback interventions.

There is much need for an in-depth understanding of judgment and decision-making processes involved in performance appraisals, says Professor Greguras. On the practical side, raters could benefit from explicit instructions or training to focus on dynamic performance characteristics such as performance mean, trend and variation, says Professor Reb. Raters and ratees should also receive clear definitions of performance.

Finally, both the professors recommend more research that takes basic findings – such as those coming from their research – and translate them into valid and practical applications for performance appraisal systems. ■







# Studying the logic of luxury

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The SMU Centre for Marketing Excellence is partnering with Asia's luxury sector to navigate trends that are changing the face of retail.

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Asia's love affair with all things luxury - bags, watches, perfumes and clothes - is no secret. According to some estimates, 37% of the global luxury market lies in the shopping malls and streets of Asia-Pacific, and grows about 7% to 8% a year.

But the Internet, mobile and millennials are turning the retail sector upside down and, just like any retailer, luxury brands have no choice but to adapt. This requires some hard thinking and mind-set changes, not least to solve the conundrum of achieving growth while maintaining exclusivity.

The need for new thinking based on high quality academic research about the luxury brand sector and the Asian market led to the establishment of the LVMH-SMU Asia Luxury Brand Research Initiative, a partnership between SMU and LVMH Moët Hennessy Louis Vuitton SA (LVMH), the stable of many of the world's most popular luxury brands.

"The luxury market has not been studied rigorously for a long time. We still have a lot to learn about why customers will pay US\$5,000 for a bag when you can get a functional one for much less," says Professor Srinivas K Reddy, director of SMU's Centre for Marketing Excellence. His vision is to make Singapore the research hub for the global luxury market.

When asked to explain Asia's penchant for luxury brands and its rise as the market driver, Professor Reddy notes, "The western economies went through a similar phenomenon; success was determined by the accumulation of material wealth and all the things associated with it - what you wear, what you drive, where you live.

Japan went through it." Now, he says, it is the turn of the new kids on the block: India, China and Indonesia.

## TODAY IT'S VOGUE, TOMORROW IT'S NOT

While it is important to understand what drives success for the luxury market, the more urgent focus of the LVMH-SMU Initiative is to examine the future, and the forces that would affect the market and change its landscape. "The luxury sector faces a host of challenges - the changing generation of customers, digital retail, and what it means for the brick-and-mortar retail space," says Professor Reddy.

The Initiative's first step is to start off with Singapore, a study on the Asian luxury brand customers and their perceptions of luxury - what luxury means to them and what brands they would consider to be luxury brands. Having completed the study in 2015, with interviews, focus groups and a survey, the Initiative plans on collecting data at least once a year to track developments about the customers' luxury brand perceptions, their luxury purchase intentions and preferred retail environments. With this data, the Initiative hopes to track the challenges that the industry faces.

First, there is changing demographics, says Professor Reddy. "We need to understand the millennials. They will not behave like their parents do. They may not be buying luxury products now but they are an aspirational group whom we need to understand better in terms of their perceptions, what influences them and how they buy. We need to prepare for the future."

Second, the future is all about going digital

and mobile, a game-changing meteorite putting brick-and-mortar retail stores under pressure, but which, says Professor Reddy, many retailers may still be underestimating. He points to China, describing it as a nation of online shoppers and surprisingly advanced. “China skipped a generation and went straight to mobile,” he says.

### INTEGRATING ONLINE AND OFFLINE SHOPPING

To cope with and thrive in this new marketplace, Professor Reddy believes the question is how to integrate the online and offline worlds. In his view, the key is for stores to create an experience that people love and make them want to come back.

“When the Apple stores opened, analysts were sceptical and said they would not survive. They were of the view that it is expensive to maintain the stores full of expensive goods. And Apple staff, as they are not rewarded by in-store sales, have no pressure to sell.” Professor Reddy explains. “However, what the analysts were missing is that the purpose of the Apple stores is for people go to the physical shops, learn about the product, have a good experience – it doesn’t matter whether people buy there or online.”

Interestingly, retail success poses another conundrum for the luxury market. Some luxury brands have gone public and face constant pressure to grow their sales and value for their shareholders. But growth endangers a luxury brand’s most prized possession – exclusivity.

### GROWTH VERSUS EXCLUSIVITY

Finding growth strategies around this issue is the aim of a second study, as part of the Initiative, led by doctoral student Tan Yong Chin, along with Professor Kapil Tuli at SMU and Professor Mark Ritson at the Melbourne Business School, Australia and former in-house professor for LVMH.

This project will explore strategies to succeed at a most difficult task, says Professor Tuli. “It’s nearly impossible to grow sales without using mass-market channels, but greater reach harms perceptions of quality and exclusivity.” His project will use in-depth interviews with brand managers across the world

to tap into their mental models and learn from the theories they are putting into use.

Close engagement with industry is key to the Centre’s research on these issues, as is cooperation throughout the value chain. At the 2015 APAC Retail Summit, Professor Reddy was very interested to seek out manufacturers and retailers whom the Centre could work together to find ways to adapt to the future landscape.

But even as malls continue to bloom across Singapore’s landscape, what is the future for brick-and-mortar retailers? Professor Reddy says we have yet to see how online retail will change the footprint of retailers. “It may be more about the experience that they can create offline, and whether the purchase is made online or offline does not matter.”

What will not change, he says, is the importance of retaining the best talent, and this is another important area of collaboration under the Initiative. Professor Reddy says the Initiative will help gear up skill sets so that the sector can do a better job of addressing these issues. “Traditional business school students might not have the training for working in the luxury market. The products are different. The customers are different. Why are they willing to pay \$5,000 for a bag? How do you make the purchase and subsequent enjoyment and experience attractive? How do you build the right retail environment and service to accomplish this? Preparing the next generation of talent to manage and grow this exciting industry is important to us,” he says.

Professor Reddy is very optimistic about the future of the Initiative itself, believing that his team is on the cusp of something big. “We can create a global network of researchers and we will be at the centre of this knowledge on luxury.” ■

# Helping marketing strategists see the bigger picture

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Professor Kapil Tuli studies the impact of marketing strategy on a company's share price and financial risk.

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A successful marketing strategy highlights a product's unique selling proposition (USP), encouraging consumers to choose a specific brand over thousands of others that line the shelves of retail stores. This translates into stronger sales and brand loyalty in its target market. Much of marketing research thus revolves around understanding and catering to consumers' needs and wants.

For Professor Kapil Tuli at SMU's Lee Kong Chian School of Business, however, designing a marketing strategy should go beyond USP and brand management.

Professor Tuli's research focuses on the impact of a company's marketing activities (advertising, product placement and search engine optimisation, for example) and marketing assets (customer satisfaction and brand quality) on its share value. He began work in this field in 2004, as a PhD student at Emory University studying how the concepts and tools used in marketing interact with the American equities market.

## CONSIDERING RISK IN ADDITION TO RETURNS

Professor Tuli studies several aspects of marketing, including brand quality, customer relationships and strategy. His research has revealed that how a marketing plan is executed has a direct impact on a listed company's share price and financial risk.

"In evaluating the financial impact of marketing actions and assets, it is important to not only look at how they impact returns but also consider their risk implications," Professor Tuli says.

Together with his collaborator, Professor Sundar G. Bharadwaj of the University of Georgia,

Professor Tuli used financial data from American companies to study the effect of customer satisfaction on the risk of the stock returns of these companies. They found that increases in customer satisfaction can lower the volatility of a firm's stock returns and also reduce its systematic risk (also known as the 'beta' of a firm's stock price).

A key implication of the study is that marketing managers need to be aware of their contribution to reducing the risk of a firm's stock returns. "Most marketing managers under-sell the benefits of risk reduction afforded by marketing assets such as high customer satisfaction rate," he says.

That said, Professor Tuli also notes that the prospect of higher returns and the pressure to maintain quarterly targets are some of the factors that might force marketers to unwittingly design strategies that will increase the company's financial risks.

With Professor Bharadwaj and Professor Andre Bonfrer of the Australian National University, Professor Tuli used financial data from publicly-listed American companies to study the effect of brand quality on shareholder wealth.

The researchers found that perceived brand quality has a significant impact on a company's financial risk. In a highly competitive industry, brand quality has a stronger impact on the company's stock returns and consequently, on shareholders' wealth.

These findings suggest that any investment meant to improve brand quality must also boost the company's reported earnings and competitiveness, says Professor Tuli. Hence, listed companies may also need to disclose brand quality improvements, he says.

## OUTSOURCING WITH CARE

Professor Tuli also applies his research to current industry trends. For example, recent moves by American companies to outsource their customer relationship management (CRM) operations to developing countries may appear to be good for a company's bottom line. But, as Professor Tuli's study has revealed, outsourcing CRM – a key marketing tool – can actually erode a company's market value.

The study was done in collaboration with marketing professors Kartik Kalaigam of the University of South Carolina, and Tarun Kushwaha and Jan-Benedict E.M. Steenkamp of the University of North Carolina. Professor Tuli and his colleagues collated CRM outsourcing announcements made by 111 publicly-traded American firms between January 1996 and December 2006. To analyse the impact of these announcements, they employed the event study method – a common statistical method used to assess the impact of events such as mergers and acquisitions, earnings disclosure, regulatory changes and even natural disasters on a company's shareholder value.

Their analysis revealed that outsourcing is beneficial if the company only outsources its back-office information system operations. A company making such an announcement usually enjoys a positive effect on stock price. But a company announcing that it is outsourcing its front-office CRM systems will not get the same optimistic response from investors.

"CRM outsourcing is more beneficial to firms that are high on information technology capabilities and low on marketing capabilities, and less beneficial when it concerns pre-sales CRM," Professor Tuli says.

Professor Tuli attributes this to cultural differences between the companies' American customers and customer service personnel, who are citizens of other countries and unfamiliar with American culture.

"While outsourcing of customer relationship management function might lower costs initially, it can lower customer satisfaction and therefore harm long term profitability. This is likely to happen if one tries to outsource the customer

facing pre-sales function to a firm that operates in a culturally different environment," he says.

The study found that, on average, the market value of firms outsourcing to culturally distant countries declined by US\$82 million. "Our findings reveal that CRM processes significantly moderate the relationship between shareholder value and outsourcing firm capabilities and resources. The adverse effects of CRM outsourcing by strong marketers are four times stronger when outsourcing concerns pre-sales CRM than post-sales CRM," says Professor Tuli.

Professor Tuli and his colleagues advise listed firms with strong marketing expertise to think twice before outsourcing pre-sales activities. These companies, however, might consider outsourcing post-sales CRM processes to culturally distant countries, since this does not appear to have any adverse effect on shareholder value.

He currently collaborates with colleagues in the US (Georgia Institute of Technology and University of Tennessee) and Europe (Tilburg University in Netherlands and Goethe University in Germany) to study the reaction of investors and financial analysts to marketing actions such as brand licensing agreements, spending on marketing and R&D, and the disclosure of customer metrics by publicly-listed firms.

## ADVICE FOR FUTURE MARKETERS

Professor Tuli says that his findings make a strong case for marketing managers considering the impact of marketing plans on a firm's stock price. This insight continues to inform not only Professor Tuli's research work but also the advice he gives as a mentor to future marketers. He encourages his students to consider how their future marketing campaigns may affect a company's stock price.

"If marketers do not know how their actions affect shareholder value, they are unlikely to have a say on the major strategic decisions taken by the top management of the firm. Importantly, if they cannot articulate their impact on shareholder value, they are likely to be more vulnerable to cost cuts initiated by top management under pressure from stock markets or when faced with a recession," he says. ■

# Walking firms through IT decisions

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Is it better to be an early adopter or wait till the technology matures? Professor Ma Dan helps companies make data-driven decisions.

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While IT has opened up new modes of business such as e-commerce, it has also driven other industries into decline. Take the music industry for example, which, at its peak in 2000 sold over 2.45 billion CDs. By 2014, CD sales had declined to just 140.8 million, as MP3s became widely popular and music streaming services grew in sophistication.

However, adapting to technology-driven changes is not simply a case of fastest fingers first. There must be a balance between gaining an early competitive edge and jumping on the bandwagon only when the technology has stabilised and matured, cautions Professor Ma Dan from SMU's School of Information Systems.

"In the early 2000s, software companies in the US were keen to implement a new business model called Application Service Provider (ASP), whereby users access software hosted by the ASP rather than buy products to run on their own systems. However, it failed because the technology had not yet matured," she explains.

By the time Professor Ma graduated from University of Rochester with a PhD degree in Information Systems in 2006, advancements in technology had revived the ASP business model, but only to fail again. This motivated her to question its failure despite the availability of technology readiness.

## FROM PRODUCTS TO SERVICES

Back then, ASP seemed like a good idea in theory. By providing Software as a Service (SaaS) rather than a product, companies gave consumers cheaper access via monthly subscriptions or pay-per-use schemes rather than one-off

purchases. More importantly, services such as maintenance, data backup and upgrades were all provided with the software as a package. What was lacking, says Professor Ma, was flexibility.

"Companies did not realise that the software they sold as a product should be different from the version they sold as a service. When sold as a product, the software is typically customised to meet each customer's needs. In contrast, when a software is put in a server and delivered as a service in the marketplace, it has to be a version that can serve everyone's needs."

Once companies decide on what type of software can be provided as a service, they then have to deal with the question of pricing. Her work with Amazon Web Services has helped Professor Ma to generate different kinds of pricing and competitive strategies for software providers.

"In moving from products to services, Amazon now uses what is called on-demand cloud computing service which charges customers based on their usage of its IT resources. It also offers another more innovative pricing strategy by allowing users to bid for usage on a per minute basis. Amazon wants to know whether this new strategy is optimal, and if so, under what specific circumstances," Professor Ma shares.

The trouble with bid pricing is that the number of people competing to use the service makes it risky for users who might have their existing projects interrupted if higher bids come in. To mitigate this risk, Amazon posts a 90-day record of previous bids, in an attempt to allow customers to predict prices and decide whether they want to pay the full price for guaranteed services or bid for available slots.



“One of my research studies modelled this whole process using real cases to investigate whether Amazon should use this pricing scheme or not. Proposing a damaged services perspective, it showed that Amazon should use service interruptions to differentiate between its two services to make its pricing strategy work,” Professor Ma says.

### **SUPPORT FOR CLOUD COMPUTING**

Professor Ma notes that many small and medium-sized enterprises in Singapore are facing similar technology-driven transitions as the multinational companies she has studied (such as Amazon), and looks forward to applying her expertise to the local context.

“Even Singtel is moving into the SaaS market, having established a cloud service platform in 2009. In fact, I produced a paper in 2010 that addressed what customers really need and what kind of services a provider should deliver,” she says.

“My study was driven by several impetuses. In Singapore, the development of cloud computing was supported at all levels, from policy to the merchants. This, coupled with the industry collaborations that SIS had, gave me a unique environment to explore this fascinating field.”

### **TECHNOLOGY-DRIVEN TRANSITIONS IN FINANCIAL MARKETS**

Beyond the software market, Professor Ma also applies her research to financial markets, particularly in studying how IT has penetrated mobile payments and technology investment decision-making.

“When it comes to mobile payments, it does not solely depend on banks’ decisions to allow such payments to replace existing credit card payments. It also involves decisions from IT infrastructure providers like Google, as well as cooperation from mobile manufacturers and individual merchants to install special machines to facilitate these transactions,” she notes.

“The entire ecosystem needs to come to a consensus on whether to adopt the new technology, and understand what are the costs and benefits of doing so,” she adds.

In the realm of high frequency trading, where tiny differences on the scale of microseconds could bring traders either huge profits or losses, Professor Ma studies how innovation can be used and what guides whether firms should create new technology or take a wait-and-see approach.

“My work ultimately helps firms forecast what the market structure will be and what are the trends caused by IT innovation. I hope that the evidence I provide can help them decide on the role they can play in these technology-driven transitions,” she says. ■

# Harnessing technology to improve the consumer experience

Professor Guo Zhiling is studying the impact of information technology on consumer behaviour and business strategy.

Technology has transformed the consumer experience by creating novel ways in which businesses can interact with their customers. For example, in place of visiting a brick-and-mortar store, you might recently have learned about a two-for-one deal from a company's Facebook page, placed a winning bid at an online auction, or contributed ideas for the next generation of a product on a crowdsourcing website.

"Consumers are key players in the business ecosystem, which can be characterised by increasingly digitalised, dynamic and networked social interactions between businesses and consumers," says Professor Guo Zhiling of SMU's School of Information Systems, whose research seeks to understand the impact of information technology (IT) on consumer behaviour and business strategy.

For example, a company may want to design an electronic referral programme for existing customers to recommend products to their contacts via social media channels. Paid referral programmes are not a new concept for effective customer acquisition, but what is new is the high degree of tracking and accountability enabled by modern technology. These technologies not only provide consumers with tools to conveniently spread their word-of-mouth (WOM) messages via social networks (e.g., Facebook likes, quick links in email messages or online profile pages), but also enable firms to automatically track sign-ups and

reward consumers accordingly by following their digital trails.

## HELPING BUSINESSES USE SOCIAL MEDIA TECHNOLOGIES

As the rules of the game evolve, how can businesses leverage the social influence of existing customers and more effectively engage them in new product promotion and marketing campaigns? How can companies create unique social profiles of their consumers, help their WOM go viral, shape consumer behaviour and drive referral sales?

"A better understanding of consumers' behaviour will facilitate the design of new business solutions and IT-enabled new business models," Professor Guo explains. Because consumer behaviour may be affected by many economic and social factors, she uses an interdisciplinary approach to gain insights into complex problems.

By bringing together modelling techniques from the fields of economics and marketing, Professor Guo studies how social recommendation technology and economic incentives can alter consumer referral behaviour in the context of social media marketing. More specifically, her research answers questions such as when to offer the referral reward and how much of the reward to offer to existing consumers, to what degree existing customers can be motivated to respond to financial incentives, and what is the likelihood of converting potential consumers into purchasers by combining economic incentives with social

media technologies. On a more practical note, Professor Guo also guides companies on how to craft incentive-based digital marketing strategies that maximise the social media reach of loyal customers and monetise the existing customer base.

“As an Information Systems (IS) researcher, I would not restrict myself to one field of study or narrowly focused method. I view myself as a quantitative modeller who is interested in interdisciplinary IS research spanning across economics, operations management and marketing,” says Professor Guo.

### WHAT FIRMS CAN LEARN FROM STRATEGIC CONSUMERS' 'BUY NOW OR LATER' DECISIONS

For technology aficionados, the joy of owning a shiny new gadget may be tempered by the knowledge of one sobering certainty: obsolescence, upon the release of an updated product version. The savvy consumer is thus faced with several choices: Should he buy that smartphone now? Or be patient and count on its price being slashed once a newer model is released? Or perhaps wait to fork out more for the newer version? Businesses, on the other hand, want to understand how their strategies for pricing and marketing new products will affect the decisions consumers eventually arrive at.

When studying this ‘buy now or later’ problem, Professor Guo found that when consumers anticipate a substantial discount on the first generation product, they tend to, unsurprisingly, delay their purchases of an existing model until a newer model is released. This can undermine initial sales of the earlier product version, and adversely affect profits.

Provided the discount remains within a certain range, however, she also discovered that consumers who wait to buy the newer model can actually benefit the company in the long run. These consumers ‘seed’ the market by becoming early adopters of the newer model when it becomes available, translating into greater influential power over their peers to quickly adopt the new product. Although the consumers’

preference to wait for the newer model would hurt the sales of the old generation product, it will help boost sales of the newer generation product. Therefore, through careful pricing of the two generation models, the gains may outweigh the losses and the firm may still benefit from the seemingly undesirable delayed purchase.

“Strong peer influence will dramatically speed up market penetration of the newer generation product in the early stage of the product diffusion process. Thus the firm benefits from the accumulated positive word-of-mouth from customers who wait for the newer generation product, resulting in more sales and higher profitability across both generations than it would be in the absence of strategic consumers’ waiting behaviour,” Professor Guo explains.

Her results provide fresh insight into how companies can communicate new product releases to their customers. Instead of giving out free trial products to seed the market (now a common practice), it would instead be more effective to educate consumers about the new product, and let them pass the information on to their friends.

“By leveraging crowd intelligence in the social network, better information dissemination and aggregation can be achieved, which helps minimise consumers’ strategic errors and enables them to make more informed decisions,” Professor Guo explains.

### BUILDING RESEARCH MODELS IS BOTH AN ART AND A SCIENCE

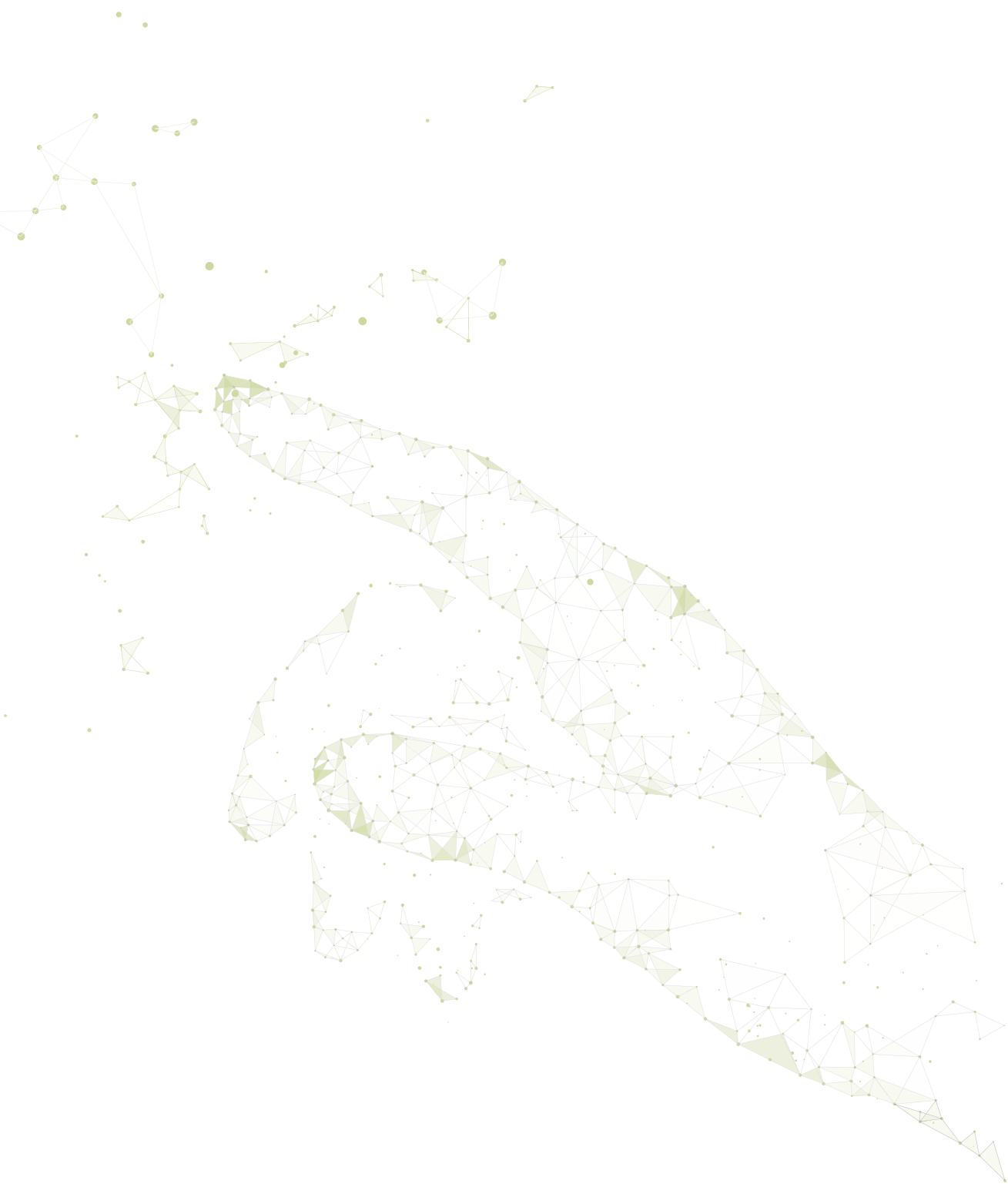
Advances in IT have enabled the collection of vast amounts of consumer data in real-time and on an unprecedented scale. Professor Guo is a participating faculty member at the Living Analytics Research Centre (LARC), a partnership between SMU and Carnegie Mellon University that focuses on the emerging research areas of big data analytics and computational social science. At LARC, she works on developing flexible models to better predict consumer behaviour and more reliably perform social network analytics.

To Professor Guo, building elegant yet powerful research models is both an art and a science. “No research model captures all reality. Each model is an abstraction that only includes some of the possible interactions in the real world,” she says. “It is always a challenging task to balance the design and decide the most important factors and key components to be included in the research model.”

To bring her work a step closer to her goal of discovering new business strategies that can be applied in real life, Professor Guo also has plans to run consumer behavioural trials on SMU’s LiveLabs Urban Lifestyle Innovation Platform, a city-scale test-bed that uses mobile sensing technology to gather information about consumer activity and preferences.

“It is not enough to research a problem, produce solutions to it and publish the results. Theory must be tested in the real world, and truly impactful research should influence industry practice,” she says. ■





# Helping businesses embrace transformational technology

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Research from the SMU School of Information Systems is helping institutions understand both the benefits and risks of real-time business transactions.

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In today's corporate environment dominated by companies such as Google, Apple and IBM, it is clear that IT has transformed the way the world does business. IT has given companies unprecedented insights into their customers, hastened the internationalisation of business operations and opened up new modes of business such as e-commerce. But the most dramatic change that IT has brought is perhaps the increase in the speed of making transactions.

Just a couple of decades ago, stockbrokers jostling on the trading floor bought and sold by the second. Although securities and derivatives trading in the stock exchanges today still involves many people, their faces lit by the glow of at least five or six monitors, in some countries, computers make near to or greater than 50% of all transactions on their behalf. Able to make transactions at one million times the speed of human decisions, high-frequency trading software algorithms exploit small stock price fluctuations to make profits of a fraction of a cent, accumulating them over thousands of trades per second.

The dramatic increase in speed, however, is accompanied by its attendant risks. "High-frequency trading has been blamed for the 2010 Flash Crash, where a mistake in an automated computer order caused the Dow Jones Industrial Average to crash in just 10 seconds," explains Ma Dan, Professor at SMU's School of Information Systems (SIS).

"Should firms become early adopters of

innovations such as high-frequency trading, or wait and see, and only follow when the technology becomes more mature? These are some of the research questions my collaborators and I address in our research," she adds.

## BRINGING PAYMENTS UP TO SPEED

Professor Ma, together with SIS colleagues Professors Robert Kauffman, Guo Zhiling and Mei Lin, are investigators on a project studying the feasibility of implementing another technology that is rapidly changing business operations: real-time payment and settlement systems.

The team of four, led by Professor Guo, has been funded by a grant from the Belgian-based SWIFT Institute, the research arm of a network of over 10,800 financial institutions around the world.

Unlike investment banks that have readily embraced the high-octane world of high-frequency trading, retail banks have rightfully been more cautious to adopt faster clearing and settlement practices for their customers' payments. Dealing with smaller amounts of money that flow between customers and merchants, retail banks have traditionally settled their transactions at the end of the day, holding on to funds in what is known as a 'float'.

"These days, SWIFT and other financial services organisations that are involved in settling international payments are trying to figure out ways to make it such that small merchants who receive low dollar payments get their money almost as soon as the transaction



is made,” Professor Kauffman says. “This helps small businesses with their cash flow.”

### BEST OF BOTH WORLDS

Currently, two types of settlement procedures are used, each with their own strengths and weaknesses. Interbank netting systems support ‘Delayed Net Settlement’ (DNS) through batch processing systems. The process involves accumulating payments and settling them in batches at the end of a predefined netting cycle, such as the end of the day. At the other end of the spectrum are what the industry calls ‘faster payment’ and near ‘Real-Time Gross Settlement’ (RTGS), where interbank obligations are cleared one by one in close to real-time so banking customers can receive them.

“DNS is an efficient way to reduce the liquidity needs of a payment system, but it accumulates financial risks and incurs settlement delays. On the other hand, RTGS may avoid short-term debts among participants, but it creates intraday liquidity needs to smooth payment flows that are not synchronised,” Professor Guo notes.

“Instead, we propose a hybrid payment management system that combines various functions of DNS, RTGS, payment priority queuing and liquidity provision functionalities. This gives banks the flexibility to settle some high priority payments immediately using their central bank reserves. At the same time, queued payments are cleared either when the sending banks have sufficient liquidity or through credit extension from the central queue to prevent further delays.”

Extensive simulations showed that the hybrid system can significantly reduce payment delays compared to DNS, while effectively lowering liquidity needs to a greater extent than RTGS. Professor Guo and colleagues also showed that the central queue provides faster access to funds without imposing unacceptable interbank settlement risk, effectively speeding up payment settlement between banks.

“Our research offers a deep understanding of the economic incentives and business value that arise from real-time payment systems, helping the payments industry and payments policymakers decide whether and how to

implement such advanced technology-based business processes,” Professor Guo says.

### WHEN PAYMENTS GO MOBILE

The SIS researchers’ hybrid mechanism study has implications for the rapidly growing arena of mobile payments, where financial transactions are made using mobile phones rather than cash, cheques or credit cards. Driven by the ubiquity and convenience of mobile phones, mobile payments have steadily increased in volume, growing from 73 million accounts in 2013 to 103 million in 2014.

“The momentum for real-time payment systems is growing around the world. Countries such as the UK and Singapore have already implemented schemes like the Faster Payments Service (FPS) and G3, respectively. Australia plans to roll out its New Payments Platform to bring efficiency gains for businesses through immediate clearing and settlement of retail payments. Over the next few years, at least a dozen new real-time payment clearing and settlement systems are expected to emerge, as countries around the world do their best to embrace the future of fast money,” Professor Guo says.

However, embracing new technology is not without its costs, she adds. “Incentives are needed to facilitate adoption. To make the migration to real-time payments, banks require a huge upfront investment in new infrastructure but face uncertain payoffs in the long term. When market forces alone are insufficient to produce innovations in the payment industry, bankers need to dig a little deeper to promote technological change in support of higher quality financial services,” Professor Guo says.

“The result is that there is going to be a shift in the way business value accrues to different stakeholders in the market,” says Professor Kauffman, adding that “much more value will go to consumers, and small and medium enterprises.”

Professor Kauffman elaborates, “Bankers also need to recognise that their investments will contribute to public infrastructure for faster payments, which may be harder for them to monetise. They can create new capabilities

that reflect the diminishing demand for cash, and the future 'on-demand' nature of digital payment services. So it's not about profit: instead it's about the 'hook up or lose out' relevance as the current revolution in financial technology progresses.

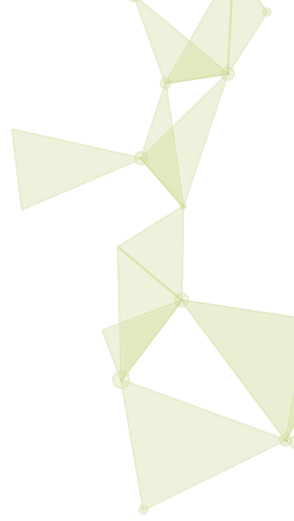
### **HARNESSING ANALYTICS FOR BUSINESS**

The effect of real-time payment technology on business value is but one example of how IT is changing the face of business, the SIS researchers say.

"Just as automated payrolls that have enabled companies to do analytics and forecasting of their cash flow are now commonplace, I envision that technology-transformed business processes such as faster payments will lead to an integration of data analytics services and make business processes more efficient," says Professor Kauffman.

Professor Kauffman and his SIS colleagues have been at the forefront of helping businesses to make sense of the wide range of information now available to them through IT, and use it to their advantage. SIS researchers have provided businesses with economic and strategic insights, by their collaborative efforts in research areas that span data analytics to information security and software systems.

"I believe that our research is solidly grounded on financial services industry practices, and I have benefited from interacting with payment and risk management professionals at the Monetary Authority of Singapore, the global head of research at the SWIFT Institute, and industry experts from Australia, Singapore, and the UK," Professor Ma says. "The strength of our school's research team is its ability to develop state-of-the-art technology solutions to address real-world business challenges." ■





# The board will now vote

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Well-structured corporate governance frameworks are necessary to ensure that companies adhere to ethics and best practices, says Professor Toru Yoshikawa.

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In September 2015, a scandal of Enron-esque proportions hit international headlines. The US Environmental Protection Agency had found that German car manufacturing giant Volkswagen AG was intentionally installing sophisticated software in their diesel vehicles to evade emissions tests.

More concerning, Volkswagen CEO Martin Winterkorn initially opted to blame a handful of “rogue engineers” when he testified before a US congressional committee. The ensuing fallout of this ‘diesel dupe’ was that Winterkorn resigned; shares fell by about a third since the scandal broke; and now, the carmaker is being sued for €3.3 billion (US\$4.07 billion; 2017) in Germany by institutional investors.

It is when such enormous failures in corporate social responsibility are unceremoniously thrown into the spotlight that we are reminded of the importance of a solid corporate governance framework, says Professor Toru Yoshikawa of SMU’s Lee Kong Chian School of Business, who studies corporate governance of listed companies in Asia.

## **CORPORATE GOVERNANCE REFORM IN JAPAN**

An interesting observation Professor Yoshikawa has made is that some companies in the region are starting to embrace an American style of corporate governance, especially after the 1997 financial crisis.

“In the US, the CEO looks out for shareholders’ interests; he/she cares about shareholders, share prices and market value of the company,” he explains. “Also, companies in the US are exposed to heavy market pressure to assure financial returns.”

The professor of strategic management studies this phenomenon, called convergence, where corporate governance styles start looking similar across nations. His findings have been published in a 2009 paper titled ‘Convergence of Corporate Governance: Critical Review and Future Directions’ by the journal *Corporate Governance: An International Review*.

Japan is a good example of convergence in practice, says Professor Yoshikawa. Since Prime Minister Shinzō Abe’s party came to power in Japan four years ago, he pushed for reform in corporate governance, an area he thought the country was weak in. Finally, in June 2015, the Tokyo Stock Exchange (TSE) implemented a new corporate governance code that requires at least two independent external directors to sit on a listed company’s board. “This is the first time that Japan is embracing independent boards,” he says.

However, codes like these give rise to a unique hiring problem for Japanese companies, he says. Typically, they appoint professional managers, retired executives, lawyers, accountants and maybe even the odd university professor to the board. But, as Professor Yoshikawa points out, board functions go beyond legal or accounting issues, to providing strategic advice and monitoring of the management.

As such, his ongoing large-scale study looks at family-controlled, public listed companies on the TSE and how receptive they are to best practices, and if these might threaten their controlling power.

“The family owners [want to] retain the control of their own company; therefore, they tend not to embrace best practices that can challenge

their position as the controlling owner. That's happening everywhere, not only in Japan. However, under some circumstances, they do accept best practices if they can get information from trusted individuals, such as board members from other family-owned companies," Professor Yoshikawa says.

### COMPLIANCE VARIES BETWEEN BIG AND SMALL COMPANIES

His findings in Japan are in contrast to Singapore, which he describes as being "far more advanced" in corporate governance strength. In terms of structure and competition, Singapore has the best corporate governance regime in Asia, he believes. For instance, the majority of board members are independent in most of Singapore's listed companies.

But still, Professor Yoshikawa says there exists a huge gap in corporate governance strength between government-linked corporations, such as Singapore Telecommunications Limited, and smaller family-owned companies, which make up 70% to 80% of the companies listed on the Singapore Exchange.

He says this discrepancy in compliance is due to a lack of resources. "[Small family-owned company boards] cannot delegate tasks of the committee to other people because they simply don't have the resources," he says, adding that large companies have well-established systems in place to carry out compliance responsibilities.

The presence of a controlling owner complicates things further. "In small family-owned companies, family owners are the majority shareholder and also serve as CEO," he says. "There [should be] different expectations for large companies and small and medium enterprises owned by families. You cannot expect small family-owned companies to be like Singtel or Singapore Airlines."

### THE IMPORTANCE OF TRUST

As board members are meant to advise on business strategies and also monitor managerial practices, their relationship with the company CEO is just as important as their qualifications, Professor Yoshikawa argues.

In a 2013 paper 'The Effects of CEO Trustworthiness on Directors' Monitoring and Resource Provision' published in the *Journal of Business Ethics*, Professor Yoshikawa and colleagues examined how board members' resource provision and monitoring are affected by their perceptions of the CEO's trustworthiness.

Their findings revealed that there needs to be a certain level of trust between the CEO and outside directors for the board to function effectively. "Without trust, board members do not get all the information they need, as the CEO may be uncomfortable sharing his innermost thoughts."

This level of trust only comes with time – one that takes at least a year to develop, according to Professor Yoshikawa. But, as it takes two hands to clap, board members must also be perceived as being committed to the board, or otherwise the CEO will not listen to their opinions.

"I don't think many studies mention the human side of the CEO-board relationship," he muses. "Without trust, you won't tell anything that is important to you to other people, right? Here, it's the same. After all, [the board is] still a group of humans, and so emotions will play a role." ■

# The serial dean

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Leave your comfort zone and venture into Africa, says Professor Howard Thomas.

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For the individual, going to a business school to get an advanced degree in management can mean better pay and job prospects. At the same time, the quality of management education can vary widely among countries, with business schools in the mature economies of the US and Europe having the most well-developed programmes.

Recognising the need for a greater appreciation of the context and culture of the country each business school operates in, Professor Howard Thomas, the Lee Kong Chian School of Business (LKCSB) Distinguished Term Professor of Strategic Management and Management Education at SMU, is conducting fine-grained research into adapting management education for non-Western audiences.

Drawing on nearly 50 years of experience in management education and hundreds of hours of extensive face-to-face interviews, Professor Thomas paints a picture of what business schools could be like in places like Latin America, Asia and Africa.

“What I have found is that the great mistake is for Europeans or those from the Western schools to believe that you can simply transplant a Western model into another culture,” he shares. “There is no meaning to education unless you understand the context and the culture that you’re working in,” he stresses.

## A DEAN ON THE MOVE

For Professor Thomas, who served as the dean of LKCSB from 2010 to 2014, the insights he has gained from months of fieldwork in Africa came as a refreshing surprise. “It’s a different story than what I thought I was going to tell at the beginning, but that’s what research is about.”

Similarly, his own career has taken many interesting turns. Professor Thomas’ PhD degree is in statistical decision theory, and he spent the first decade of his career teaching and researching mathematical statistics before turning his attention to management education. “When I was in the London Business School in the early 1970s, my work was widened into strategy modelling and then subsequently, strategic management,” he explains.

Since then, Professor Thomas has not looked back, going on to teach strategic management from an analytical perspective in schools around the world. In 1990, he became dean at the University of Illinois Urbana-Champaign, before moving to Warwick Business School in 2000 to serve in the same capacity and finally to SMU in 2010.

“I’m a serial dean who has been dean of business schools in Europe, the US and in the Asia-Pacific region,” he shares. “When I was given a sabbatical after having done three deanships in a row, I took the opportunity to catch up on things that I really wanted to do, which for me was to go to Africa.”

## BIG EARS, NOT A BIG MOUTH

“My passion is to tell a story about Africa that can provide a stimulus for a tremendous improvement in the quality of management education. This would help create economic growth and trade patterns that don’t currently exist, namely more inter-regional trade in Africa and more global trade between Africa and the rest of the world,” Professor Thomas enthuses.

But before management education can hope to make an impact on the continent of Africa, business schools first need to understand that

Africa is not uniform but a series of countries that are all different, he adds. “Even the physical distances among countries in Africa are enormous, quite apart from the social and cultural differences. We need to listen and learn from Africans, having big ears but not a big mouth.”

Visiting almost 20 African countries over 18 months of travelling, Professor Thomas and his co-author and wife, Lynne, conducted around 100 interviews to get to know the management education needs of Africa. The result is *Africa: The Management Education Challenge*, a book presenting a framework for examining the African style of management education launched in June 2016. The book, which was supported by grants from the European Foundation for Management Development and the Graduate Management Admissions Council, is joined by a second volume *Africa: The Future of Management Education* in June 2017 and both books will be distributed for free in Africa.

In addition to his work on Africa, Professor Thomas is also writing a book on the evolution of management education in Latin America. “They are two different studies about two different stages of evolution, the African one being more fundamental and the Latin American one being at least halfway towards a high-quality Western model. My work catalogues the two different waves of evolution of business schools that have to be seen in their context and culture and not simply as extensions of Western culture,” he says.

### GET OUT OF YOUR COMFORT ZONE

Professor Thomas’ work on Africa also has implications for how business schools are run in Asia, he says. “There are parallels between Asian and African cultures, such as the strong dominance of family, the web of obligations and the communitarian spirit.”

Noting that 80% of the undergraduates at SMU currently have some kind of international experience – be it studying abroad for a semester, graded study trips or community projects around the region – he urges both students and faculty to get out of their comfort zone and look

beyond developed countries to build a truly global mind-set.

“The stories often told of Africa are of corruption and poverty. The truth of the matter is that some of that exists, but Africa is rising and its people are hungry for growth,” Professor Thomas states. “Understanding Africa will be a tremendously important aspect of being a global citizen, and I would like to persuade more and more people to work with African business schools as I do.” ■

# When sharing is not just caring

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Conventional wisdom dictates that trade secrets have to be protected at all costs, but Professor Gerard George's research shows there may be a better way of doing business.

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If tech firms of the world such as Amazon, Facebook and Google shared their technology secrets, the resulting innovation would undoubtedly be better for the world. But could such openness help the firms themselves as well?

Professor Gerard George, Dean of SMU's Lee Kong Chian School of Business, has developed numerous theories on why people collaborate with each other and how firms innovate and thrive, as part of a long career devoted to studying innovation and entrepreneurship.

His research paper, 'Appropriability and the Retrieval of Knowledge After Spillovers', co-authored with Imperial College London's Professor Tufool Alnuaimi and published in *Strategic Management Journal*, upends the conventional wisdom that firms can only survive and grow by zealously guarding their work.

"Most research and development is built on the premise that technological secrecy is good and knowledge leakage is bad," Professor George says. "But, sometimes, results get exposed through the patenting process or the innovation ecosystem. Firms that continue to invest in R&D could, in the long run, benefit from other firms' innovations that use their original effort as a building block."

## SHARING AND THE FREEDOM TO INNOVATE

In general, firms that produce more complicated technologies are more likely to benefit from part of their work becoming common knowledge, Professor George found. To understand why,

consider the analogy of a jigsaw puzzle or Lego blocks.

"In low tech firms, there are only a few jigsaw pieces - each piece matters, and if you lose one to your rivals, that's value loss. But in complex technologies, there are many interdependent pieces. If a rival builds on your work, you already have some of the pieces and can understand how to slot them to come up with the new puzzle, and even better ones. Your other rivals won't have this advantage," Professor George explains.

The technology's complexity, however, is not the only factor. To reap the most benefit, the firms should give their employees some - but not too much - autonomy and freedom to experiment and innovate.

In a company that is too decentralised, the division that came up with the original product will find it difficult to obtain relevant knowledge from other divisions to build on its rivals' discoveries. If a firm's departments are too interdependent, on the other hand, employees will find it difficult to understand exactly why projects succeeded or, more importantly, failed, hurting their ability to reverse-engineer and improve on competitors' work.

"In Singapore, we tend to centralise a lot of functions, because we believe in efficient structures to cut costs and reduce duplicated efforts. However, we have found that it is important not to be fully centralised but instead have some decoupling, especially in high-tech sectors. Having some autonomous units helps you to explore and absorb external knowledge for use," he says.



### THE LEAKY INNOVATION PIPE

Each year, Cornell University, the United Nations' World Intellectual Property Organisation and business school INSEAD publish a Global Innovation Index that ranks countries' innovation investments and results, such as the numbers of patent applications, published scientific and technical articles, high-tech exports and science and engineering graduates.

While Singapore was ranked the most innovative country in Southeast Asia and Oceania in 2015, it was a shocking 100th in innovation efficiency, not only behind India, South Korea, Myanmar, Thailand and the Philippines, but also Zimbabwe and Nigeria. Simply put, Singapore, for all its investments into innovation, is not getting its bang for the buck.

"It's very important for Singapore to improve its innovation productivity, so that companies feel that their investments in innovation will have a better pay-off in the country compared to other competing hubs in the region. If we don't accomplish this, the consequences will erode the other advantages of being located in Singapore," warns Professor George.

One way to improve innovation productivity is to develop a better understanding on why people collaborate. In a study of relational capability and collaboration preferences, Professor George and his research team explore the attitudes toward collaboration in the UK's plastics electronics industry.

According to the study, the researchers are more likely to want to work with others when they believe they are ahead or behind of peers in their fields. Even when this professional gap exists, those with good networking and social skills are more likely to collaborate than their less sociable peers. And researchers in academia are, in general, more willing to collaborate than those in industry, especially on government-funded projects.

### RELOOKING INNOVATION FROM TOP TO BOTTOM

Collaboration has become indispensable for innovation, says Professor George, from different departments in a university working together

to countries pooling their resources and expertise to solve problems such as climate change and advance scientific discovery. The Large Hadron Collider, the world's single largest scientific machine, was built with the help of more than 10,000 scientists and engineers from more than 100 countries.

But to improve people's lives, innovation needs to be successful at both the top and bottom of the social pyramid, Professor George reckons. As he puts it, "At the top, we need to improve organisations' innovation and investments in technologies, so they can create more value for society. At the bottom, we need to look at improving business and distribution models so that the innovations can actually transform lives on the ground." ■

# Taking action for social change

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Research at the SMU Lien Centre for Social Innovation is helping to better understand and respond to the needs of vulnerable communities in Singapore.

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What it means to be poor or vulnerable in today's society is not as obvious as it was a decade ago. The vocabulary of poverty in low-income countries, traditionally expressed in 'one dollar a day' terms, no longer conveys an insightful picture of what causes people to struggle in Singapore's bustling metropolis. These changes are forcing researchers to completely rethink their approach to understanding Singapore's social needs.

"Our society is facing issues that it hasn't had to deal with before. More and more conversations are taking place about how some segments of the middle class struggle to make ends meet, and what it means to 'succeed in life' here," says Professor John Donaldson, senior research fellow at the Lien Centre for Social Innovation (LCSI) – a partnership between the Lien Foundation and SMU that aims to advance the thinking and capability of the social sector.

## **PUTTING ACTION INTO RESEARCH**

The SMU Change Lab, one of LCSI's main platforms, aims to use what it calls 'action research' to better understand and respond to the needs of vulnerable communities in Singapore. Researchers at the SMU Change Lab work with community members, Voluntary Welfare Organisations (VWOs) and students to collect, share and query qualitative primary research in actionable ways – by designing new or improved needs-based social services based on the research, for example.

"Action research is useful because we can better understand the issues people face, and at the same time, make a difference in their lives. Many research projects end up gathering dust

on shelves, so it's been exciting to participate in work that's designed to have an impact on study participants," says Dr. Cate Smith, research associate at LCSI.

The SMU Change Lab builds on the LCSI's seminal 2011 report on unmet social needs in Singapore. The first-ever study identified gaps in the social protection system and community groups most affected by these gaps. It focused on six groups: the disabled, the mentally ill, single-person-headed poor households, silent workers, foreign workers and new communities.

But the 2011 report had certain limitations, Professor Donaldson notes, as it was based on secondary research from newspapers, existing policies and online sources. "There was no interviewing at all. SMU Change Lab picks up from there and goes deeper into these needs by talking to communities, the government and VWOs," he explains.

At the core of SMU Change Lab is collaboration, says Ranjana Raghunathan, programme manager at LCSI. Researchers work with VWOs, SMU students and community members to carry out qualitative primary research. They then apply their findings to specific issues that affect vulnerable communities. "The voices of people from these communities play a prominent role in policy suggestions and programme design. This is the most exciting thing for me," she says.

## **SOCIAL ISOLATION OF ELDERLY RESIDENTS LIVING IN ANG MO KIO**

One vulnerable portion of society that SMU Change Lab is helping through action research is a group of socially isolated elderly residents in an

Ang Mo Kio neighbourhood. It all began with a sobering observation: A VWO partner of LCSi, which was conducting successful programme activities for seniors, had to turn away elderly residents who were living outside its service area due to insufficient funds to cater for a larger clientele.

“We suggested to that VWO partner to let us find out the needs of this group of elderly who were being turned away,” Professor Donaldson recalls. “We made a list of possible needs, one of which was social isolation, which you may not link directly to poverty itself.” From the study, SMU Change Lab researchers found that one-third of the elderly residents they spoke to could be considered socially isolated – one that was linked to poor measures for mental well-being.

The study also revealed subtle yet crucial insights into what was affecting the elderly’s mental well-being. For example, whether elderly residents lived with their children or not did not prove to be a significant factor in their mental health status. Rather, it depended on the quality of their relationships with their children and grandchildren, and whether they had somebody they could count on in times of need.

Central to SMU Change Lab’s reports on vulnerable communities are the participants’ narratives. One of them involves an elderly resident who is now living alone after his wife passed away two decades ago. His eldest son had committed suicide and his married daughter lives far away. The senior said that he had nothing to eat, preferring to sleep as much as possible throughout the day.

“I was most struck by some of the participants who have had so many challenges, and have grown so isolated, that they seemed to have little hope left. Our analysis plays a part, but the voices of the participants drive each of the reports,” Dr. Smith says.

### **BUILDING SOCIAL RESILIENCE**

The work of SMU Change Lab and its partners has already borne fruit in the community. Following their research on social isolation of the elderly, they engaged the community through a creative exhibition put together by SMU

students and the seniors, right in the neighbourhood where the latter lived. “Through the exhibition and social conversations, we were able to gauge if our findings made sense and whether they validated what VWOs already knew on the ground,” Professor Donaldson says.

In July 2015, it released three full-length reports – on the elderly, low-income single-parent families, and people with physical disabilities, respectively – focusing on the unmet social needs of these vulnerable communities in Singapore. There is also a handbook on poverty and inequality for time-strapped VWOs to easily refer to existing research when carrying out social services.

Overlooked needs have also been uncovered through SMU Change Lab’s new study on food insecurity among Singapore’s vulnerable communities. The team became interested in this topic after interviewing the elderly and single mothers for other projects, including the one on social isolation.

“We found that many in this group were not getting enough to eat. They were having one or two meals a day and scrounging for their next meal,” says Professor Donaldson. Together with a VWO with knowledge in this area, the team has applied for a grant to study food security issues among low-income working families, where at least one person in the family works.

Through building resilience and sustainability in communities, SMU Change Lab’s work brings to life the university’s 2025 vision of tackling the world’s complexities and impacting humanity positively. Jonathan Chang, executive director of LCSi, sees the programme as a neutral platform that can bring all sectors together. “Our aim is to promote sustainable change – not just an incremental upgrade – to social issues,” he says.

Adds Professor Donaldson, “Universities must play a part in building a resilient society. We can do this by generating research that is not only rigorous but also actionable; something that people can act on in a productive way that will bring Singapore closer as a caring community.” ■

# Enhancing creativity through multiculturalism

Professor Angela Leung finds that multicultural experience is a useful lens through which to analyse creative performance.

Multiculturalism is a fact of modern life. From overseas exchanges to leisure travel, communities are now more connected than ever before. As cultural connectivity continues to become a greater part of everyday living, psychologists are showing greater interest in understanding how and when individuals thrive in multicultural environments.

“As the global workforce gets more diverse rapidly, research on multicultural experience and creativity becomes especially relevant,” says Professor Angela Leung from SMU’s School of Social Sciences. Her research focuses on two major areas: firstly, whether multicultural experiences lead to more creative outcomes; and secondly, whether there is a link between bodily experiences and creativity.

## ARE MULTICULTURAL INDIVIDUALS MORE CREATIVE?

In one study, Professor Leung exposed European American undergraduates to one of these three conditions using a 45-minute multimedia slideshow: (i) single culture through presenting pictures of items that depicted either the American culture (e.g., the Statue of Liberty, a hamburger) or the Chinese culture (e.g., the Great Wall, hotpot dinner) on each slide; (ii) dual cultures through presenting pictures of items that depicted American culture *and* pictures that depicted Chinese culture on each slide; and (iii) fusion of cultures (e.g., a picture of Starbucks’ mid-Autumn festival mooncakes). She found that participants demonstrated better creative performance when exposed to dual cultures and fusion of cultures,

compared to those who were exposed to one culture. Their creative performance persisted five to seven days after the initial exposure.

“Initially, I thought those who were exposed to the fusion culture would perform the best. But the tendency was that those who were exposed to two different cultures showed more creativity. Perhaps the exposure to separate cultures gave them the space to engage in cognitive juxtaposition of the ideas from the respective cultures. When they seek to actively compare and contrast the presented cultures, they delve deeper into the different cultural representations and receive more creative inspirations,” she says.

Another significant finding from her research was that while multicultural individuals tended to be more creative, other considerations had to be taken into account, such as how open and receptive an individual was to new experiences.

In a different study of European American undergraduates, Professor Leung used the extent of participants’ multicultural experiences and their openness to experience trait to predict how well they would perform in creative tasks. Such ‘openness’ was measured by a self-assessment survey that gauges participants’ receptivity to new experiences.

The creative tasks included coming up with novel uses of a garbage bag and writing down the first 20 occupations that came to mind. Professor Leung’s results showed that individuals with more extensive multicultural experiences were more likely to be creative if they also

possessed the openness to experience trait. Interestingly, among those who were not open to new experiences, having more extensive multicultural experience was associated with lower creative potential.

These findings have implications for how creativity is promoted in schools, says Professor Leung. “Our results challenge the conventional wisdom that multicultural experiences alone are sufficient to raise creative potential in students. For close-minded students, experiences with other cultures could be overwhelming, threatening and even shocking,” she says. Hence, a learning environment that not only exposes one to a variety of cultures, but also encourages an open mind-set, is the most conducive to the development of creative potential, she says.

### THE MIND-BODY LINK

Professor Leung’s research also looked at how creativity could be inspired by physical movement. “Advice to spur creativity typically comes in the form of metaphors. We are encouraged to ‘think outside the box’ and to ‘put two and two together’. I am interested in exploring the connection between concrete bodily experiences and creative cognition,” she explains.

Together with her PhD student, she conducted a set of studies to better understand the link between body and mind, and how enacting metaphors for creativity would enhance creative problem solving.

In one study, she asked three groups of participants to perform two different creative tasks. One was to generate a caption for an ambiguous picture and the other was to brainstorm what different configurations of Lego bricks could represent. For both tasks, unconventional and unexpected solutions would indicate greater creativity. The study had a catch: these creative tasks had to be performed while executing various physical movements. One group was to walk freely, another in a fixed, rectangular path around the lab, while the third was to remain seated. Interestingly, the free walking group generated more creative ideas compared to the groups that had to walk a fixed path or remain seated.

“This experiment confirmed our prediction. If you enact the bodily experience of walking out of the box, it helps to free up your mind and therefore enhances flexibility and creativity. The fixed walking and sitting groups did not differ in their creative performance,” Professor Leung explains.

“One major implication that students and the public should be aware of is that taking a leisurely walk outdoors or freely pacing around the office may benefit creativity. From a management perspective, more open space in offices or schools such as lounge areas, or the lack of cubicle dividers, could stimulate creativity,” she adds.

### HOW COSMOPOLITAN ARE YOU?

In another project, Professor Leung tries to develop a measurement scale for a person’s cosmopolitan orientation. She notes that such measures are not only useful to organisations when designing training programmes for their employees, but have potential implications on a societal level. Her preliminary research already shows a positive link between an individual’s cosmopolitanism and his or her support for environmental conservation.

“Cosmopolitan-oriented individuals tend to endorse global altruism that confers a global conception of moral citizenship. This attitude fosters a stronger sense of collective obligation and responsibility to eradicate environmental problems. When cosmopolitan individuals base their moral rights to go beyond a national context, they are more likely to feel an obligation to preserve the integrity of nature not just for the benefit of the fellow citizens of their nation-state, but also for the collective benefit of the citizens around the world,” she explains.

A proponent of multiculturalism in the society, Professor Leung believes that her research is also best approached from diverse angles. She is keen to explore interdisciplinary projects with SMU colleagues who seek to make sense of societal level big data related to multiculturalism and cosmopolitanism, as well as those who study the organisational implications of cultural diversity. ■

# Dissecting a giant: The commodification of rural China

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Rapid growth is causing unprecedented transformations in the social fabric and market structure of rural China, Professors Forrest Zhang and John Donaldson, researchers at SMU investigate.

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Over the past few decades, China's shift to a market-based economy has led to the fastest sustained expansion in GDP by a major economy in history. This has caused profound changes in the country. Professors Forrest Zhang and John Donaldson from SMU's School of Social Sciences, together with their colleagues, have been investigating how rural China is being transformed by these changes.

"Rural China is now at a critical juncture of social change and development," explains Professor Zhang. "Unprecedented changes are taking place on all fronts. Socially, the population is moving out of the countryside and ageing rapidly. Economically, new ways of agricultural production are replacing the thousand-year-old tradition of family farming. And politically, a series of new policies under the name of 'Building a New Socialist Countryside' have been rolled out. Given the size of China's rural population (which the World Bank stated to be at 44% of China's total population in 2015), this could be one of the most profound social changes in today's world," he says.

## A LANDSCAPE PRIMED FOR CHANGE

Professors Zhang and Donaldson secured a grant from the Ministry of Education in Singapore to embark on a three and a half year research project titled 'Transformation of Rural China: Central Policies and Local Innovations'. The most important aim of the project is to find out how

social, economic and political developments are changing livelihoods in China's countryside.

One of their most important findings has been that rural China is undergoing rapid and thorough commodification. "Everything is turning into a commodity," says Professor Zhang, "and all kinds of social relations are now reshaped as commodity relations."

Historically, access to land and its resources in rural China had been based on collective membership. In 1978, the Chinese government granted limited land rights to individual households, which was a decisive force driving extensive poverty reduction and agricultural growth in the country. This was followed by a further strengthening of property rights around the turn of the century and beyond.

China's egalitarian distribution of land rights provided hundreds of millions of people with a stable economic and social foundation in addition to the flexibility to choose to search for better opportunities across the rural-urban divide, says Professor Zhang.

## NEW RUNGS IN THE SOCIAL LADDER

The commodification of land and labour in rural China is beckoning the rise of a new social structure. In his paper titled 'Class differentiation in rural China: Dynamics of accumulation, commodification and state intervention', Professor Zhang draws on secondary literature and his eight years' worth

of field observations to describe the changes in rural China's social fabric.

Capitalist employers occupy the top of the social ladder, he explains. These include entrepreneurial farmers who hire year-round labour and top managers of corporate farms. In many cases, their accumulation of wealth is related to access to political office, be it directly through occupying an office, or indirectly through social connections with people in office. This gives them privileged access to information on government subsidies and an opportunity to mobilise undervalued collective resources into the circuit of capital. An example is that of two businessmen who used their political clout to rent forestland at a very low price for the production of livestock, fruit and landscape trees.

But this is not the only way for Chinese farmers to reach the top of the social scale. Those with superior agricultural know-how and/or technological prowess are able to produce highly competitive crops that give them a strong foothold in the marketplace.

Commercial farmers occupy the middle rung of rural China's social ladder. They operate family-worked farms and are fully integrated into the market. They can hire seasonal labour, but when competition becomes tough, these farmers may choose to lease out their land and/or work for wage income. Their resilience is contingent on political-economic conditions, giving them limited opportunity to play the role of "backbone of the rural community", as some academics expect them to, explains Professor Zhang.

At the bottom of the ladder are dual-income households and wage workers. A gender and generational based division of labour exists in dual-income households, usually involving a husband who has migrated to work in the city and a wife who has remained behind to take care of the children, tend to the family farm and, more likely than not, engage in wage work. Unmarried adult children also take on wage work while older parents may find their only resort is petty commodity farming. Wage workers, on the other hand, have leased out or completely lost their land and can only sell their labour to make a

living. Both classes find it more difficult than others to climb the social ladder.

### LAND AS AN ABSTRACT CONCEPT

The commodification of land in rural China is also leading to rapid urbanisation, which has prompted the Chinese government to become increasingly aware of the need for farmland preservation to maintain food self-sufficiency. Central policies have been tailored to control the amount of agricultural land that can be converted for urban use.

One particularly successful albeit localised scheme, called zeng jian gua gou (translated to linking up increase [in urban construction land] with decrease [in rural construction land]), has been taking place in the municipality of Chengdu in central China since the mid-2000s. Discussed in the paper written by Professor Zhang and his co-author, 'Political dynamics in land commodification: Commodifying rural land development rights in Chengdu, China', the scheme states that when non-agricultural developments occupy farmland, rural construction land elsewhere must be reclaimed into farmland. The scheme is unique in that it has abstracted the concept of land, allowing different localities in Chengdu to trade "quotas" of land rather than actual land.

For example, if one locality turns a piece of rural construction land into farmland, they can give that quota to another locality that can then 'develop' its agricultural land. This process has facilitated the re-organisation of China's rural landscape - from one which is spatially fragmented and dominated by vast farmland dotted with small, scattered houses - to one that concentrates industries in centralised developmental zones and residents in new rural communities, while farmland is encouraged to become incorporated into scaled-up agricultural operations.

### MAJOR CHALLENGES

A huge challenge that has developed from the commodification of land in China is when rural families rent their farmland to large-scale agricultural producers, such as agribusiness companies.



Professor Donaldson explains that conventional wisdom holds that agribusiness requires large-scale producers to achieve the kind of stable and secure output they need. Accordingly, Chinese policymakers in recent years have been looking at ways to increase the scale of landholdings, to the detriment of millions of small-scale landholders.

Professors Zhang and Donaldson's research was published in 2008, titled, 'The Rise of Agrarian Capitalism with Chinese Characteristics: Agricultural Modernization, Agribusiness and Collective Land Rights' in the *China Journal*; and in 2013, 'China's Agrarian Reform and the Privatization of Land – a Contrarian View' in the *Journal of Contemporary China*. The research underscores that the commodification, consolidation and increasing scale of land are not necessary to serve the needs of agribusiness.

"In contrast to the conventional wisdom, China has shown that the large-scale production that agribusiness often needs can be managed by small-scale producers through the adoption of a variety of innovative relationships. However, this win-win situation is being undermined," Professor Donaldson says. "The drive to consolidate land has pushed many producers out of the equation. If this continues, the ability of small producers to engage with agribusiness could be undermined. This is both unnecessary and unfortunate."

"The implications of our research overall are clear: broad-based prosperity and long-term development of China depend on putting the interests of China's small-scale farmers first," Professor Donaldson says. "The Chengdu case shows that the Chinese government is experimenting. The jury is still out, but it seems what the Chinese government is doing, the Chengdu case notwithstanding, has been largely antithetical to some of the most marginal members of Chinese society."

Arising from their research project, Professors Zhang and Donaldson, together with colleagues, have published five research papers, four book chapters, and held four conference presentations in China and Japan. ■





# Balancing the sacred and the secular

Professor Lily Kong, widely regarded as one of the world's leading social and cultural geographers, studies the complexities that surround a society's religious spaces and practices.

In culturally diverse, relentlessly developing cities such as Singapore, tensions naturally arise over the use of space. Buildings with deep historical significance stand in the way of new developments; churches, mosques and temples sit cheek-by-jowl alongside secular public areas; green spaces and wildlife habitats are affected by pollution and environmental fragmentation. How can societies understand and negotiate such tensions, and perhaps find urban planning solutions that make cities more liveable for all?

Lily Kong, Provost and Lee Kong Chian Chair Professor of Social Sciences at SMU, has built her career around exploring complex socio-spatial issues such as these. After 24 years as a researcher and top administrator at the National University of Singapore, Professor Kong joined SMU in September 2015, in a landmark appointment that saw her become Singapore's first female provost.

## RELIGION, SPACE, CONFLICT

Professor Kong has a long-standing interest in religious spaces such as churches, mosques and temples. Tensions among religious groups, or between religious groups and the secular society, inevitably arise over such spaces: in the US, for example, a proposal to build an Islamic community centre near the site of the 9/11 attacks in New York City caused an uproar; in parts of India, disputes between Hindus and

Muslims regularly escalate into violence and loss of lives.

"When people firmly believe that a site is sacred, it's not about rationality - it's about belief systems, value systems, and emotional investment in the meaning of a space or place," says Professor Kong. Yet, this sense of the sacred often runs up against modern urban planning principles. In cities such as Singapore, constant reinvention means that religious buildings may be demolished or relocated to make way for new developments.

Identifying the root causes of such tensions, and understanding how different societies have negotiated them, is critical for policymaking and urban planning, says Professor Kong, who explores these issues in her 2016 book *Religion and Space - Competition, Conflict and Violence in the Contemporary World*. "Policymakers will begin to learn about how, in different societies, certain actions can in fact exacerbate opposition and violence, and how other ways of dealing with it might be 'wearable' for their own society," she explains.

In Singapore, for example, the government has taken an even-handed approach to urban planning, with numbers of religious buildings in housing estates tied to the population size of each religious group. "That sort of even-handedness is a way of addressing any potential complaints about privileging a religion or discriminating against a religion," says Professor Kong.

### WHERE THE SACRED MEETS THE SECULAR

Outside of religious buildings, tensions may also occur over secular spaces – religious processions, for example, are highly visible events that often take place on public roads. While such occasions are deeply meaningful for the faithful, the rest of the community may in fact regard them – and their attendant noise levels and traffic disruptions – as a nuisance.

To study these issues, Professor Kong did some fieldwork of her own – she followed Thaipusam processions in Singapore, and interviewed kavadi carriers and their families about the ritual. Despite having to contend with temple officers shooing her off overhead bridges, this rewarded her with deeper insights into how devotees related to the procession and the regulations imposed on it.

For example, while the use of recorded religious music is permitted during the procession, participants felt that this was not the same as live musicians who can respond to the needs of the kavadi carriers – by playing more loudly or softly, for instance. In addition, they explained that it is difficult to carry the kavadi and then have to go to work – one of the reasons why the Hindu community has been pushing for Thaipusam to be made a public holiday.

In several cities, the authorities have banned religious processions altogether because of fears of violence. This may be warranted under certain circumstances, says Professor Kong. But before resorting to such drastic policies, a better understanding of both religious and secular concerns can help regulators ensure that the faithful are able to practice and derive meaning from their rituals, in ways that are tolerable, if not acceptable, to others in a diverse society.

### FINDING FRESH INSPIRATION AT SMU

The move to SMU has put Professor Kong – physically – right in the middle of the city, and given her fresh inspiration for her work. With Singapore’s colonial heart abutting its finance and technology-oriented central business district, issues such as conservation of national heritage,

public consultation in urban planning, and the integration of migrant populations constantly capture her trained geographer’s eye.

“Looking at the city every day reminds me that the study of the urban and urban phenomena is central to making cities much more liveable for humanity,” she says, gesturing at the view from her office window. “Being in the city has just completely rejuvenated my interest in the urban.”

As SMU Provost, Professor Kong oversees academic matters, which include research, teaching, and continuing education. Her goal, she says, is to create an environment that encourages SMU researchers to do both theoretically sophisticated work, as well as work that has profound real-world impact. “The two are not mutually exclusive, but to combine them can be very difficult,” she says. “The challenge that I would like all of us together as a community of scholars to rise up to is to be able to achieve both those peaks of excellence.”

Having the right incentives in place, she says, will be essential for achieving this. Too strong an emphasis on publishing in top academic journals may turn researchers away from work that has impact on the community, while too much of a focus on real-world applications will provide a disincentive for pushing theoretical boundaries. At the same time, recognising that people have different interests and strengths is also important. “It doesn’t have to be the same person who achieves both – it could be a portfolio approach.”

Setting the goalposts such that it is clear that both fundamental and applied research are laudable and will be supported by the university, says Professor Kong, will go a long way towards helping SMU become truly world-class. ■

# Solving global issues takes teamwork

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Professor Ann Florini believes that to solve the world's problems, a new approach based on collaboration among governments, businesses and civil societies is needed.

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Pandemics, poverty, financial volatility and climate change. Against a growing swirl of threats, opportunities for new ways of addressing them abound. But governments alone may not have the capacity, resources and foresight to act upon them swiftly.

Ann Florini, Professor of Public Policy at SMU's School of Social Sciences, believes that a new problem solving approach to safeguarding the future is emerging, one that includes the participation of businesses and Non-Government Organisations (NGOs).

## **INTERPLAY BETWEEN GOVERNMENT, BUSINESS AND CIVIL SOCIETY**

Previously a senior fellow at The Brookings Institution in Washington, DC, Professor Florini was drawn to Asia because of the region's dynamic experiments with new approaches to address major issues. There are plenty of studies that document the gravity of economic, environmental and social challenges, but much more rigorous research is needed to identify what works and what does not.

"Academics can make an enormous contribution in this space. The many problem-solving experiments already underway need to be studied, and perhaps replicated. The most promising new types of governance are partnerships that bring together unlikely bedfellows from the government, business and people sectors," she says.

But these are difficult studies to do. For example, to find out if a collaboration has a good chance of succeeding, researchers must also

consider a myriad of social and legal factors, such as corporate law and support systems that enable NGOs to operate in each country. And even then, there is no guarantee of success.

"Research has shown that one of the biggest obstacles to tri-sector collaboration is that each sector doesn't know how to speak to the other," says Professor Florini. "They don't know how to institutionalise those partnerships, and the success of partnerships often depends on the individual staff involved. As soon as these staff leave, the partnership dissolves. I thought it was crazy that no one is training people to work together across the sectors," she notes.

Citing industry leader Unilever as an example, Professor Florini explained how several years ago, the company realised that major global challenges – ranging from environmental degradation to social exclusion – could threaten their future markets. To address this, they developed a Sustainable Living Plan, which aspires to double the size of their business while halving their environmental impact. "This is the sort of transformation that needs to happen," she says.

To extend such thought leadership to other organisations, Professor Florini developed a new curriculum at SMU called the Master of Tri-Sector Collaboration to train much-needed "social intrapreneurs".

She explains SMU's motivation for starting this program: "The last few decades have seen the rise of social entrepreneurs. However, there is a huge inertia built in companies, governments and large NGOs. Unless we bring about transformational change within

these organisations, we won't see a change in society. We need people inside these organisations – social 'intrapreneurs' – to be able to lead this transformation."

And with the pioneer cohort currently undergoing training at SMU, Professor Florini sees Singapore as a useful research test bed. "The Singapore government is realising that tri-sector collaboration, or as they term it, 3P (public, private and people sectors) partnership, is needed," which accounts for the proliferation of 3P divisions in government bodies.

While the scope of Professor Florini's research is not for the faint-hearted, she has found some room for optimism. "The tri-sector collaboration space provides an extraordinary scope for innovation in collective problem solving," she says. "It is open to anyone who cares. You just have to pay attention to how your organisation can connect to problems that affect you."

Take the haze affecting the region for example. Although little breakthrough has been achieved through inter-government processes, significant progress has been made through a collaboration among NGOs Greenpeace and The Forest Trust, and several companies including Golden Agri-Resources, on establishing a common understanding of the steps that need to be taken to minimise palm oil deforestation.

"This collaboration has the potential to solve the haze issue and take into account smallholders' livelihoods. To my surprise, it has been more successful than government partnerships," she says.

### GLOBAL ENERGY GOVERNANCE

Professor Florini's research also looks at energy issues, which she says underlie most of the major problems that the world is grappling with today. "The flash points in the world are based on competition for fossil fuels. We are at the point where easy and readily accessible fossil fuel has been extracted, and we are now exploring deep under the ocean and in the Arctic, where international property rights are not well-defined."

One striking inequality is that the energy consumption needs of the world's top one billion

are not compatible with the rest of the world. "If all the seven billion people in the world had the same energy consumption pattern as the top one billion, the resulting pollution would make today's Beijing look like a clean and clear city," she muses. And with energy being one of the worst-governed sectors, coupled with deeply embedded processes and financial flows perpetuating the *status quo*, it is clear that transformational change is needed.

### RETHINKING CAPITALISM

Growing out of these two strands of research, Professor Florini is now embarking on an interdisciplinary project on how capitalism is evolving in Asia: how businesses can become deeply socially responsible and still remain financially profitable.

She sees potential for joint research with other social scientists and practitioners in Singapore and throughout Asia, to study how businesses are fundamentally changing in the way they understand themselves. "We need to look at what China is doing, for example. How do businesses see their role in Chinese society? That kind of expertise is badly needed," she observes.

What motivates her to carry on searching for solutions despite the seemingly insurmountable problems facing the world today? "I care so much because government action alone clearly will not solve these big problems, although it may codify solutions. Yet there is so much innovation in partnerships and new business models that no one can even keep track of it. *That's* where the potential is for rapid and transformation change." ■





## SECTION 2

# ACCOUNTING, FINANCE & ECONOMICS

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# FOREWORD

## Accounting, Finance & Economics

Once upon a time, numbers were said to solve all mysteries. The rise of big data, together with the deluge of financial or economic data, makes this probably truer than it ever was, but it comes with an interesting rider. Applying statistical tools to huge swathes of information still has certain limitations that researchers must learn to cope with, and, as the capital markets have discovered, this comes with another challenge — time. Together, big data and the deluge of financial data add yet another new dimension of complexity to the world of accounting, finance and economics.

In the essays that follow, leading academics and thought leaders in Accounting, Finance and Economics from SMU reveal the extent of the change and controversies currently being felt across a diverse spectrum of research interests. Spatial economics, urban and regional economics for example, have only just matured to a level whereby these changes can be studied rigorously. The emergence of integrated reporting is another. Auditors are once again under the spotlight, sometimes spectacularly failing to raise the red flag on bad accounting. Not that a new Enron is waiting in the wings, but in a nod to that famous scandal, firms found performing accounting tricks face more than ethical considerations: it will take them almost three years to fully regain the confidence of investors. And lastly, a current and intriguing topic of research is the impact of emotional stress on hedge fund managers, measured in terms of marital events as proxies for stress.

These essays review research studies into auditing, business networks, family-owned businesses as an economic phenomenon, ethical behaviour, spatial economics, the rise of the yuan, the use of panel data, econometric models, hedge funds, high frequency traders and short sellers in stock markets, investments in intangible capital and the application of sophisticated mathematical tools to extract information from options data.

A summary of each essay in this section is given below.



As people criss-cross the business world, they weave relationships across negotiation tables, through airport lounges and into boardrooms. Auditors of financial statements circulate widely in this world, yet when it comes to their clients they must remain above the fray. The closer they are to the clients they check, the more trust drains from the opinion they write, notes Zang Yoonseok in **Unveiling Informal Business Networks**.

A growing public concern is the impact on the independence of audit firms from non-audit services such as taxation and accounting. Lim Chee Yeow studies whether non-audit services affect the independence of auditors and the quality of their audit in **Who's Watching the Auditors?** In some cases, he says, auditors may get a deeper understanding of the firm they are auditing by providing non-audit services. He also queries how informal institutions such as national culture may affect the financial reporting.

In **The Importance of Internal Controls**, Goh Beng Wee investigates the benefits and consequences of internal controls to corporate organisations. Such controls range from the

segregation of duties, the authorisation of transactions, and the retention of records to physical safeguards. The Singapore experience, he says, is constrained by a lack of data in the local context because firms here are not required to report on internal controls systems.

Nearly 90 percent of all business enterprises in North America are family-owned, and family businesses also account for half of the United States gross domestic product (GDP) and employ more than half of its labour force, notes Chen Xia in **Encouraging Corporate Fair Play in Family-Run Businesses**. Her current studies focus on American family-owned firms because most of them are publicly traded, making it easier for her to obtain data. This kind of transparency is not available for Asian family firms, she says.

In **The Importance of Being an Ethical Company**, Dean of the SMU School of Accountancy, Cheng Qiang, cautions firms to fine-tune their corporate governance mechanisms to prevent unethical behaviour and take quick action once they are found. When a company revises and restates its financial statements due to errors in accounting, it shakes investor confidence and has profound consequences on the company's stock price and future earnings. Despite the compelling data, Cheng says the real challenge is to convince his peers of his findings.

Hsu Wen-Tai analyses urban landscapes using mathematical models in **Letting Cities Develop Naturally** to see what makes big and small cities different and how spatial relations affect the economic landscape. Growing evidence suggests that geography does affect economies – for example, inter-regional and international distance can affect trade between cities and countries. Optimal city development happens when markets are allowed to take their course, he says.

Chow Hwee Kwan studies how Asian countries manage their currencies in **The Yuan Goes Global** and the impact of these policies on their economics. A specific interest is China, which has recently sought to broaden the international use of the yuan. According to the Society for the Worldwide Interbank Financial Telecommunication (SWIFT), the coordinating organisation for international transactions, the yuan is now the fifth most-used currency for international payments. These developments have led to claims of a yuan bloc emerging in Asia, she says.

In **Giving Economic Data a Voice**, Su Liangjun explains the innovative ways that can enable more sophisticated analyses of panel data used to let 'the data speak freely'. He has high hopes for the future of econometrics. "The availability of more and more large dimensional data sets, or big data, will help us develop new statistical and econometric techniques, leading to more meaningful research in large dimensional panel data that can be used by applied researchers."

In **The Race Against Time**, Tse Yiu Kuen explains how the development of econometric models can provide us with a clearer picture of global markets using econometric models to isolate the phenomena affecting the tidal flows of the financial world. High-speed global trading presents a significant challenge for risk management. "Our models deal with second-by-second trading, but now high frequency trading happens nano-second by nano-second. That is the future for our research."

From epic tales spun around investment legends Ray Dalio and George Soros, to the secretive, high-octane world of Wall Street, the hedge fund has attained a worldwide notoriety for being an opaque, unwieldy beast. Melvyn Teo studies what makes them tick in **How Hedge Funds Beat the Market**. He reveals the strong link between geography and hedge fund performance. "We tried to push the envelope by asking: if physical distance matters, then cultural distance must also matter."

Retail investors might sometimes feel like meerkats living amongst cheetahs and hyenas when they trade in the stock market. Between the speed and technological power of high frequency traders, and the predatory behaviour of short sellers, it is no wonder their presence makes the average market participant wary. Ekkehart Boehmer uses the lens of financial econometrics in **Playing Fast and Furious in the Stock Market** to reveal some surprising insights into the roles of

high frequency traders and short sellers. His research suggests that short sellers do drive share prices towards their fundamental values.

In **Exploring the World of Corporate Finance**, Wang Rong delves deep into the complex world of international corporations to understand how they and their investors make decisions about money. Her research was mooted from the perspective of investors. “The theory of investment has mainly focused on investments in fixed assets. Our results suggest that it is important to take into account investments in intangible capital as well.”

Lim Kian Guan explains the use of sophisticated mathematical tools to extract information out of options data and provide more accurate risk estimates rather than rely on historical time series data in **Estimating Risks and Resolving Paradoxes**. The problem with existing methods, he says, is that they often do not capture ‘black swan’ events, unexpected events that have a significant, even catastrophic impact. But to use options data, requires some serious mathematical legwork, he adds. ■



# Unveiling informal business networks

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Research by Professor Zang Yoonseok is uncovering the implications of informal business networks between top executives and their independent auditors.

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As people criss-cross the business world, they weave relationships across negotiation tables, through airport lounges and into boardrooms. Auditors of financial statements circulate widely in this world, yet when it comes to their clients, they must remain above the fray. The closer they are to the clients they check, the more trust drains from the opinions they write.

To ensure auditors and their clients keep a safe distance between each other, regulators have issued phone book-sized regulations and standards. But to know everything about auditor-client networks is impossible, and even when we do see connections, it is difficult to ascertain if the relationship facilitates or endangers the audit.

In accountancy, eventually the numbers resolve all mysteries. Connecting the dots across business databases is how School of Accountancy Professor Zang Yoonseok sheds new light on previously unexamined business ties.

## **LINKING INFORMAL RELATIONSHIPS AND BAD ACCOUNTING**

Like investors and regulators around the world, Professor Zang was curious about why, despite their universally acknowledged importance and tight regulations, auditors sometimes spectacularly fail to raise the red flag on bad accounting.

Previous research and the standards followed by auditors focused on formal relationships that create obvious conflicts of interest for auditors, and the most apparent of these includes financial relationships – or prospects of landing a plum job at the client after the audit.

But the research appeared to overlook informal business and social networks between auditors and their clients, which could be just as important, explains Professor Zang, who joined up with colleagues in Korea and Holland to study the impact of these relationships on audit quality.

“We observed that many companies in the US liked to appoint board CEOs and CFOs from other companies in the industry, and we thought it would be possible to study how these networks affected the audit,” he notes.

The researchers used a database called Audit Analytics to identify firms that had switched auditors, and BoardEx, to identify CEOs or CFOs who knew the auditors from their membership on other boards. This work harvested a sample of 597 firms that switched auditors to Big 4 auditors over the period of 2003-2012.

Their results, published in a paper titled ‘The Downside of Network Ties between CEO/CFOs and Auditors through External Directorships’, revealed that when CEOs or CFOs have business ties with a new auditor through their directorship of another company, their companies were more likely to appoint connected auditors.

Perhaps more significantly, companies that appointed connected auditors also experienced poorer quality audits, compared to companies that appointed non-connected auditors. This means that they experienced more misstatements, an increased propensity to meet or just beat earnings benchmarks, and an increased magnitude of accounting

decisions made by management choices rather than business reasons – which is known in the industry as discretionary accruals.

Professor Zang suggests that two factors could be causing the drop in audit quality. One is familiarity, which could slowly eat away the auditor's professional scepticism. The second is compromised independence, due to the CEO's or CFO's 'bargaining power' over an auditor who also audits a company where the CEO or CFO is a director. "Some CEOs and CFOs are very powerful – they exercise big influences in board decisions. That is why it is always better to keep a good distance between auditors and executives," he stresses.

### **CONSERVATIVE ACCOUNTING – LESS ACCURATE BUT BETTER?**

In another example of bringing real world insight into areas previously only examined through theory, Professor Zang's empirical research has also uncovered the impact on audit quality of another controversial change in the accounting world – the move away from conservative accounting.

Under a conservative accounting approach, companies are slower to recognise profits and faster to acknowledge losses in the reported accounts. In recent years, standard setters have steered away from this seemingly prudent approach in favour of real-time accuracy – for example reporting the fair market value is favoured over reporting historical-based assessments.

In theory, auditors prefer conservative accounting so that companies will not hold on to bad news until the last possible moment.

Putting this theory to the test, Professor Zang and his colleagues used audit-related information from the Audit Analytics database for the period of 2000-2010, and merged it with other data to obtain financial and stock return variables.

Their findings, in the article published in *The Accounting Review* 'Client Conservatism and Auditor-Client Contracting' with M. L. DeFond and C.Y. Lim, pointed to benefits not previously appreciated with conservative accounting. They found that auditors of more conservative

clients charged lower fees, issued fewer ongoing concern opinions, and resigned less frequently.

More opportunities to investigate factors affecting audit quality could come with further changes to financial reporting and auditing rules, says Professor Zang. These include proposals in the US to disclose the name of the individual audit partners in charge of the audit, rather than just the name of the audit firm.

"With more information about an individual's background, social interactions, and educational background, we could do more interesting research about the impact of networks on audit quality," he says.

The effect of informal business networks on audit quality might be particularly important to markets with limited pools of directors, like Singapore, says Professor Zang. "Companies like to find directors with experience in the industry, and this creates many connections across many companies. If we do not pay close attention, independence could be endangered." ■

# Who's watching the auditors?

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Professor Lim Chee Yeow is studying whether the provision of non-audit services affects the independence of auditors and the quality of their audit work.

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Since the spectacular collapse of US energy giant Enron Corporation in 2001, and subsequently its audit firm Arthur Andersen, audit companies have faced increasing pressure to remain unbiased and independent of their clients. However, a growing public concern is the impact of non-audit services offered by audit firms on their independence.

Non-audit services include compliance-related services such as taxation and accounting advice, as well as assurance-related services like due diligence, explains Professor Lim Chee Yeow of SMU's School of Accountancy. "The profit margin of non-audit services is much higher than for audit work, and in the US, audit firms earn much more from non-audit services than from audit services," he says.

Because of this, regulators are increasingly concerned that the provision of non-audit services could end up compromising auditor independence, and US regulators have even moved to ban the provision of certain non-audit services by auditors.

Professor Lim is interested to find out if this ban is indeed warranted. He describes a key question of his research, "Does the provision of non-audit services, particularly by the expert auditors, affect the independence of auditors and the quality of their audit work?"

## **NON-AUDIT SERVICES AND AUDIT INDEPENDENCE**

He outlines two opposing points of view. On the one hand, auditors who are attracted to the lucrative income from non-audit services may give in to client demands, thus compromising

their independence. "Bonding between the auditor and the client could become too close, particularly with the provision of non-audit services," Professor Lim says.

On the other hand, by providing non-audit services, auditors may get a deeper understanding of the firm they are auditing. "Conversely, non-audit services allow the audit firm to better understand the client, their operations and their business model, which means they are better able to audit the company. This is known as the knowledge spillover effect," he says.

To find out which hypothesis was backed by data, Professor Lim examined audit-related data available from the Audit Analytics database. He first identified 'expert auditors' in a wide range of industries, defined by the market share within their respective industries. "Expert auditors care very much about their reputation and about their exposure to potential litigation. These firms also have deep knowledge about their industry norms and accounting rules."

Professor Lim explains that several other studies have found no relation between the provision of non-audit services and audit quality. However, he discovered in his research that for these companies, the provision of non-audit services by the expert auditors led to an increase in the quality of their audit.

He also examined how auditor quality matters in countries with varying levels of investor and legal protection. This is particularly important for companies and investors interested in putting money into developing countries where the legal environment may be weak. To address this issue, he examined



discretionary accruals, a common financial reporting measure of audit quality.

“We found that when the legal environment is strong, when investors are already well protected, the auditor quality is not that important. But when the legal environment and investor protection is weak, the benefit of hiring the best quality auditors is highest.” He explains that this meant companies moving into developing countries would do well in engaging a higher quality auditor.

### THE IMPACT OF NATIONAL CULTURE ON FINANCIAL REPORTING

While formal institutions such as a strong legal system affect accounting and audit practices, Professor Lim is also interested in how informal institutions such as national culture may affect the financial reporting. “The reason why I’m interested in the ‘softer’ aspects of this field is because there haven’t been many studies in this area and because culture is intangible and difficult to measure.”

He looked at differences in culture and how these affected accounting conservatism as well as risk-taking behaviour. He used two measures of cultural differences developed by Dutch social psychologist Geert Hofstede: firstly, individualism or how individualistic a person or a society is, and secondly, uncertainty avoidance, which refers to appetite for risk.

“Our hypothesis is that if a society is more individualistic, then risk-taking increases and financial reporting is less conservative. If uncertainty avoidance is high, risk-taking decreases and financial reporting is more conservative.” Professor Lim said that overall, the data examined was consistent with their hypothesis, showing the importance of culture on accounting and risk.

“Our work shows that financial reporting is affected not only by formal institutions but informal institutions also have first-order effects on aspects such as risk-taking and accounting conservatism,” he says.

“Following the financial crisis, many regulators are now concerned about risk-taking. The thinking is to have more regulations to prevent

banks from being too aggressive in taking risks. But our research shows that apart from formal measures to control risk-taking, fundamental cultural aspects play an important role in determining risky behaviour. Regulation is not everything.”

Following on from his work into the link between national culture and financial reporting, Professor Lim is studying the correlation between social trust and tax avoidance. He draws data from the World Values Survey, a global project that measures trust among people as well as trust between citizens and the government, and how they change over time.

“Tax avoidance is a particularly important issue because regulators are concerned about the loss of government revenue. Our basic finding is that if trust is high within the society, managers are likely to conform to social norms and refrain from actions that may betray the trust placed on them by the society, so they are more likely to pay their share of taxes,” he says. ■

# The importance of internal controls

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Professor Goh Beng Wee investigates the benefits and consequences of internal controls to corporate organisations.

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In 2001, a scandal involving former US energy giant Enron Corporation broke out and shocked the world with sordid tales of how its management had exploited the company's lack of robust internal controls to conceal staggering amounts of debt. Enron's mismanagement not only led to its collapse but also that of its auditor Arthur Andersen, which until then had been one of the 'Big Five' accounting firms.

The saga highlighted the importance of internal controls – processes that organisations put in place to ensure that corporate objectives are met under the conditions of reliable financial reporting and compliance to laws in companies. According to Professor Goh Beng Wee from the School of Accountancy, such controls range from the segregation of duties, the authorisation of transactions, and the retention of records to physical safeguards.

In 2002, the Sarbanes-Oxley Act was passed in the US to curb poor internal control systems. However, the Act was met by fierce resistance from companies that were reluctant to be saddled with additional processes.

## **DEMONSTRATING THE WORTH OF INTERNAL CONTROLS**

In one of his studies conducted with Professor Dan Li from Tsinghua University, China, Professor Goh examined how internal controls correlate with accounting conservatism. The latter was argued to increase the usefulness of financial statements by imposing stronger verification requirements for economic gains than for economic losses, thereby reducing the likelihood that firms overstate net income.

According to Professor Goh, firms with a strong internal control environment (e.g., strong

tone-at-the-top and/or good internal control culture) are more likely to understand the role of conservatism in contracting and in reducing agency conflicts. Conversely, to the extent that firms are committed to producing conservative reports, strong internal controls can facilitate this process. This is because by emphasising verifiable outcomes, the financial reporting system supplies a rich set of variables that can be used for contracting purposes. By reducing unintentional errors in the reporting of book value or accounting earnings, strong internal controls thus provide more comfort to the board of directors, such that conservatism has been used effectively for contracting purposes and in monitoring managers.

"We found that firms that exhibited internal control weaknesses tend to be less conservative with their financial reporting. However, when they remediate their internal control weaknesses, accounting conservatism appeared to have increased," shares Professor Goh who specialises in research on the value of internal controls to companies, investors and policymakers. "Our finding that strong internal controls incentivise firms to be conservative in their financial reporting, instead of overstating accounting numbers to look good, should be of high relevance to investors."

In another study, Professor Goh found that internal controls had implications beyond simply improving a firm's financial reporting. Although such controls were expensive to put in place, he found that they benefited operational efficiency.

"Many critics have questioned whether the perceived benefits commensurate with the high costs of implementing stringent internal reporting requirements," he notes. "Surveys and anecdotal evidence have indicated that such

measures would place heavy burdens on companies, particularly small firms, as they would struggle to cope with the increased costs of compliance, implementation and auditing.”

In consideration of these concerns, Professor Goh, together with fellow colleagues Professors Cheng Qiang and Kim Jae Bum, use a method known as frontier analysis to investigate the relationship between internal controls and operational efficiency. Although less commonly applied to accounting research, this methodology has been used extensively in operational management to evaluate the organisational efficiency of firms.

“We found that effective controls also improved operational efficiency,” notes Professor Goh. “In fact, companies with a greater demand for higher quality information for decision making and with more severe weaknesses are likely to benefit more from effective internal controls, at least in terms of improving their operational efficiency.”

### INTERNAL CONTROLS IN SINGAPORE

So far, Professor Goh’s work on internal controls has focused on firms based in the US. While he is interested to extend his research focus to Singapore, he is constrained by a lack of data in the local context because firms here are not required to report on internal controls systems. External auditors are also not required to audit these mechanisms or provide opinions on them.

“Although auditors in Singapore do look at internal controls as part of the regular audit process, the purpose is to determine how much substantive testing (i.e., procedures used for checking a random sample of transactions for errors and comparing account balances to find discrepancies) will be needed in the audit. Any internal control weakness that is detected by the auditors will have to be communicated in writing to the firm’s management or the audit committee. However, it is not compulsory for the firm to report this weakness in its financial reports or to follow up on it,” says Professor Goh.

The main reason for the lack of internal controls provisions in Singapore is due to cost

issues, he notes. “It is very costly for firms to apply strong internal measures and for time-constrained auditors to conduct checks.”

He thinks that the absence of Enron-like sagas in Singapore indicates the presence of effective self-regulating mechanisms here. “However, there remains a risk that internal controls within firms are not robust and this may put investors or shareholders at a disadvantage,” he cautions.

### CREATING VALUE WITH INTEGRATED REPORTING

Even if Singapore does not go the way of regulating internal controls, there is a new area of quality assurance called integrated reporting, which Professor Goh would like to investigate in the future.

According to the International Integrated Reporting Council, an integrated report communicates how an organisation’s strategy, governance, performance and prospects create value in the short, medium and long terms in the context of its external environment.

“Integrated reporting is broader than financial reporting and value creation is a key feature. An integrated report includes aspects such as sustainability; for example, how a company contributes to social responsibility as well as its workers’ health and well-being,” says Professor Goh.

Given the high cost of producing an integrated report (which in part is due to its broad scope), he thinks that cost-benefit trade-offs would be a primary concern to many people. “I think local financial regulators and accounting bodies will be keen to know whether integrated reporting is a worthwhile endeavour for firms here. This is an area that I would like to conduct research on,” he enthuses. ■

# Encouraging corporate fair play in family-run businesses

Professor Chen Xia studies corporate governance and financial management of family firms.

If the term ‘family business’ conjures up images of your local mom-and-pop store, you may be surprised at the huge part that family-owned companies play in the world economy; they account for more than a third of Fortune 500 companies, and half of the 1,204 unique firms that make up the S&P 1500 index.

Most companies are subject to the ‘agency problem’, which arises from a conflict of interest between the company’s management and its shareholders. The manager, serving as an agent for the shareholders, is expected to make decisions that will maximise shareholder wealth. Managers, however, also have an interest in maximising their own wealth.

This problem is exacerbated in family-owned businesses, which have an incentive to promote family interests. “To ensure that family members do not take advantage of other shareholders, it is important to have good monitoring and control in family firms,” says Professor Chen Xia of SMU’s School of Accountancy, who studies corporate governance and financial management of family-owned businesses.

Professor Chen’s interest in family firms began while she was pursuing her doctorate at the University of Chicago, US. It was there that she became aware of the importance of family-owned businesses not only to corporate America but also to the country’s entire economy. Nearly 90% of all business enterprises in North America are family-owned, and family businesses also account for half of the US GDP and employ more than half of its labour force.

Professor Chen says that her studies focus on

American family-owned firms because most of them are publicly traded, making it easier for her to obtain data. This kind of transparency is not available for Asian family firms. “Asian family-owned firms tend to be under tighter control of the family, the ownership structure tends to be more complicated, the financial reporting may be more opaque,” she says.

## THE CASE FOR SEPARATING FAMILY OWNERSHIP FROM MANAGEMENT

One of the worst manifestations of the agency problem is the failure to replace a poorly performing CEO. And CEO turnover decisions are crucial because they affect a firm’s operating, investing and financing activities.

If a CEO who is not a family member (a ‘professional’ CEO) performs poorly, family members tend to step in and replace him or her. But these dynamics change once a family member becomes the CEO. “If a family CEO is doing a poor job, he or she may not get removed quickly because of family protection and interest. This can be problematic,” Professor Chen explains.

In a study, Professor Chen, together with her long-time collaborators Professor Cheng Qiang at SMU and Professor Dai Zhonglan at the University of Texas in Dallas, US, examined the impact of a founding family’s presence on CEO turnover decisions. They did this by measuring CEO turnover-performance sensitivity, or the correlation between CEO turnover and performance. In other words, given his or her poor performance, how likely is the CEO to be removed?

“If CEO turnover-performance sensitivity is low, that is, whether a CEO will be removed or not does not depend on the firm performance, there may be something wrong with the firm’s governance because incapable CEOs are left too long in the position,” Professor Chen says.

Professor Chen and her fellow researchers collated data from 1,865 firms in the S&P 1500 Index between 1996 and 2005, using announcements from the business news aggregator website Factiva to identify CEO turnovers and understand the reasons behind them. They then performed statistical analyses to determine if CEO turnover-performance sensitivity varied across firm types. They found that family firms managed by professional CEOs indeed showed higher CEO turnover-performance sensitivity than family firms managed by family members.

“Professional CEOs in family firms have higher CEO turnover-performance sensitivity because of family monitoring,” Professor Chen says. In earlier work, Professor Chen and her collaborators also found that American family firms with professional CEOs were less subject to agency problems than even non-family firms, due to the founding family’s effective monitoring of management.

In summary, their research showed that family ownership, when separated from management, can ease agency problems. But when family members are combined with management (through the appointment of a family CEO, for example), this can aggravate agency problems.

### **DEVELOPING INCENTIVES TO ENCOURAGE GOOD CORPORATE GOVERNANCE**

Although experts believe the agency problem cannot be completely eliminated, most companies try to alleviate it by implementing measures that encourage managers to serve the shareholders’ best interests. These include incentives such as performance-based compensation to encourage managers to maximise profit. Shareholders can also directly influence managers, and have the power to fire a non-performing manager.

According to Professor Chen, however, such solutions may not necessarily apply to family

firms. “Family firms are quite different from other firms. Family members own significant stake, are in tight control of the firms, and have long investment horizons. These features all have important implications for firm decisions and performance,” she explains.

Using her insights into the unique workings of family firms, Professor Chen hopes to develop incentives and effective monitoring systems to address the corporate governance challenges faced by these firms. ■

# The importance of being an ethical company

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Firms must fine-tune their corporate governance mechanisms to prevent unethical behaviour and take quick action once they are found, says Professor Cheng Qiang.

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When a company revises and restates its financial statements due to errors in accounting, it shakes investor confidence and has profound consequences on the company's stock price and future earnings. In some cases, these errors may be intentional, whether they involve outright fraud or managers wanting to report higher earnings to placate investors.

Professor Cheng Qiang, Dean at SMU's School of Accountancy, studies the phenomenon of companies engaging in unethical behaviour. "Why do they do this? Why don't they realise the consequences of their behaviours and design better mechanisms to address such behaviours?" he asks.

His research focuses on governance issues as well as how to fine-tune corporate governance mechanisms, such as CEOs' employment and severance pay agreements, to combat unethical and financially damaging behaviour.

## **BUILDING UP CREDIBILITY TAKES YEARS**

In their research study that was published in 2014 in *The Accounting Review*, 'Is the Decline in the Information Content of Earnings following Restatements Short-Lived?', Professor Cheng and his co-authors found that firms which had issued material restatements experienced a significant decrease in the credibility of earnings for up to three years following the announcement.

"We found that there were severe consequences if a firm performed accounting

tricks. It took almost three years for it to fully regain investors' confidence. Also, if investors didn't trust the company, they would be unwilling to fund its future projects," he says.

Although many companies are aware of this, the problem often lies in delayed intervention. Professor Cheng's research showed that companies that did not take prompt action experienced a prolonged dip in investor confidence. "Companies need to see the outcome before they react. Some companies that have restated their numbers resorted to firing their CEOs, or replacing their auditors and board members. This is too late. Instead of reacting to the issues, what should they do to prevent it from happening in the first place?"

With his research receiving widespread media attention - it was featured in both *The Wall Street Journal* and *The CPA Journal* - Professor Cheng is optimistic that more people will recognise the need to design better mechanisms to prevent unethical corporate behaviour. "The tricky part is to design corporate governance in such a way that managers will not have the incentive to engage in unethical behaviour," he notes.

## **DEALING WITH MANAGER 'SHORT-TERMISM'**

Addressing managerial 'short-termism' (or an excessive focus on short-term results at the expense of long-term interests) has been an important issue for many companies, as unethical

actions are often motivated by the urgency for short-term gains over long-term accountability.

In another study published in *The Accounting Review*, 'CEO Contractual Protection and Managerial Short-Termism', Professor Cheng examines the impact of CEO contractual protection on managerial 'short-termism'. He and his co-authors found that firms with CEO contractual protection in the form of employment and severance pay agreements were less likely to engage in real earnings management. This signalled a deviation from optimal operation and investment strategies. Companies also tended to adopt a longer term approach as the duration and monetary strength of CEO contractual protection increased.

"In other words, if the CEOs cannot be fired for three to five years, they are likely to do their best in the longer term, and feel less pressed to engage in short-term, myopic behaviour to please shareholders and board members," he explains.

### **INFLUENCING CORPORATE ACTION**

Despite the compelling data, Professor Cheng says the real challenge is to convince his peers of his findings. "Much of this stem from their reluctance to accept research challenges the existing paradigm. It takes very rigorous analyses to convince others that what we document is not driven by biases. If our results are different or inconsistent with other findings, people will ask why," he says.

He is confident though, that his research on corporate governance and disclosure will continue to make an impact on the field. He hopes that managers will look at his findings and think about how to design better governance mechanisms that are in the best interests of stakeholders, not just themselves.

"It would really hearten me if my research can shed some light on the costs and benefits of governance mechanics, help researchers gain a better understanding, and enable companies to design better governance mechanisms," he says. ■

# Letting cities develop naturally

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Professor Hsu Wen-Tai uses mathematical models to study urban landscapes and what makes big and small cities different.

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A look at the world map tells us that countries and cities vary greatly in size, and that there are many more small cities than there are big ones. Interestingly, such uneven distribution of city sizes can be quite accurately described by a mathematical relationship known as the power law. For example, the population of the largest city in a country is approximately twice the size of the second largest city and thrice the size of the third largest one.

Social scientists have struggled for a long time to find a reasonable explanation for such a regular pattern. Some popular theories are based on the idea that cities grow at random rates. In other words, large cities will only develop when a sequence of conducive events occurs over the course of history. However, given that the probability of this happening is small, big cities are comparatively rare.

The problem with these random growth models is that spatial relationships among cities typically have no effect on city size distribution. This notion is questionable not only because cities exist in geographical space, but also because growing evidence suggests that geography does affect economies – for example, inter-regional and international distance can affect trade between cities and countries.

## A MODERN UPDATE TO A CLASSIC THEORY

Professor Hsu Wen-Tai of the School of Economics has a deep interest in how spatial relations affect the economic landscape. His work has provided an updated explanation of the power law to acknowledge the importance of geographical relationships among cities.

Professor Hsu's model is based on central place theory, an idea that was proposed decades ago to explain the size and distribution of human settlements, but which has seldom been formalised.

The key idea behind the theory is that goods and services provided by cities vary in economies of scale. Goods and services that cater to large numbers of people (such as stock exchanges, concert halls and stadiums) are only found in a few places, while those that cater to smaller markets (such as petrol stations, convenience stores and post offices) are more widely available.

As large cities provide a much wider range of goods and services, smaller cities are usually located in the market areas of large cities so that they can tap on the supply of goods which they lack. According to central place theory, these factors drive the differential development of large and small cities.

"The two papers that I have written lay a modern microeconomic foundation for central place theory to explain the different locational patterns of different sized cities and how these patterns are intertwined in a hierarchical way. The underlying economics is a combination of competition among firms and the pivotal difference among industries in terms of the scale of the markets that they serve. The hierarchy of cities so formed is called a central place hierarchy," he notes.

In addition to formalising the central place theory, Professor Hsu's main contribution is the finding that the power law can emerge from a central place hierarchy under quite modest conditions.



### LETTING THE MARKETS TAKE THEIR COURSE

Professor Hsu's research sports a key theme: the unevenness of the urban landscape is actually a natural phenomenon driven by the economy. Pushing back against these natural agglomeration forces – as can happen when governments implement unnecessary development initiatives in smaller cities, for example – may prove counter-productive.

“Although there are numerous externalities involved in the formation and development of cities, it appears that optimal city development happens when markets are allowed to take their course. There are many examples of failed public investments in poor regions because decision makers ignored the fact that markets tend to cluster in areas where goods and services are already present,” he explains.

“You wouldn't want every region in a country to have a science park because multiple centres will crowd out each other's market. In the end, only one centre will succeed or none at all. Yet, irrational policies like this occur because of political pressure from poor regions, especially when such regions become pivotal areas during elections.”

### TRANSLATING A LOVE FOR MAPS INTO A CAREER

When asked what would be the next major research focus in spatial economics, Professor Hsu notes that China and India, with their rapidly changing human and economic landscapes, will be the most exciting regions in which to study spatial economics. Although the US and Europe underwent similar urbanisation in the past, the disciplines of urban and regional economics have only just matured to a level whereby these changes can be studied rigorously. The other powerful enabler is modern computing capacity.

For Professor Hsu, part of the appeal of economics lies in the field's ability to explain human behaviour from the perspective of incentives and market interactions. “Both urban and regional economics, as well as international trade, are fields that are relatively applied, meaning that it has a lot to do with real

life. Imagine how beneficial it would be if we can find a compelling theory that allows people to comprehend what is going on in the real world,” he says.

However, the motivation behind his interest in spatial economics goes deeper than that. “When I was a kid, I used to stare at maps, scrutinising the details and imagining what went on in real life behind those maps. I like to observe how people live their lives in different ways, in different geographical areas,” he shares. ■

# The yuan goes global

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Professor Chow Hwee Kwan studies how Asian countries manage their currencies, and the impact of these policies on their economies.

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Currency exchange rates probably only concern most of us just before we go away on holiday. On a macroeconomic level, however, exchange rates not only affect the global competitiveness of a country's exports, it also contribute to the stability of its trading and investment environment. This is particularly the case for heavily export-dependent economies, which are typical of Asian countries.

"Before the 1997-98 Asian financial crisis, the region was in practice a dollar bloc. The *de facto* pegging of East Asian currencies to the US dollar led to the problem of currency mismatches that contributed to the crisis," says Professor Chow Hwee Kwan, at SMU's School of Economics.

Although the crisis forced some countries to temporarily abandon the dollar peg, exchange rates in the region quickly went back to tracking the US dollar in its aftermath. With the US dollar as an external anchor, regional exchange rates stabilised. Since trade in parts and components is particularly sensitive to volatility in exchange rates, this stability aided the development of regional production networks, says Professor Chow.

The managing of currency exchange rates is thus a key policy decision that governments do not undertake lightly. Professor Chow's research focuses on how Asian countries manage their currencies, and the impact of these policies on their economies.

## THE YUAN AS A GLOBAL CURRENCY?

One of Professor Chow's research interests is China, which has sought to broaden the international use of the yuan. China's use of the

yuan for cross-border transactions reached 9.95 trillion yuan (US\$1.63 trillion) in 2014, accounting for nearly a quarter of all its cross-border transactions. According to the Society for the Worldwide Interbank Financial Telecommunication (SWIFT), the coordinating organisation for international transactions, the yuan is now the fifth most-used currency for international payments.

These developments have led to claims of a yuan bloc emerging in Asia. Professor Chow's research shows that as the yuan gradually delinked itself from the US dollar in the aftermath of the 2008 global financial crisis, it indeed exerted a greater influence on the movement of regional currencies. But it has yet to replace the US dollar, which as the incumbent pre-eminent international currency still enjoys the advantage of network effects.

Some economists who previously claimed that the yuan has already surpassed the US dollar as Asia's key reference currency did not address two important issues in their analysis, says Professor Chow. Firstly, China still benchmarks the yuan to the US dollar even when it exited from a fixed exchange rate system, thus making it practically difficult to distinguish between fluctuations in the two currencies. Secondly, the yuan and other Asian currencies are exposed to common regional shocks, and these tend to exaggerate the influence of the yuan on regional exchange rates.

"I applied an alternative econometric methodology that overcomes these two problems in order to produce better estimates of the relative influence of *renminbi* (yuan)

and the US dollar on Asian currencies,” explains Professor Chow.

Despite China’s efforts to promote the yuan as an international currency, its value remains tightly controlled by Beijing. “China needs to reform its domestic financial sector and liberalise its capital account before the renminbi (yuan) can become a regional lead currency,” she says.

### READING GLOBAL DEVELOPMENTS TO FORMULATE RESEARCH QUESTIONS

Prior to her arrival at the SMU School of Economics, Professor Chow worked in both the public and private sectors. She has also consulted for multilateral organisations such as the Asian Development Bank and the ASEAN+3 Macroeconomic Research Office on various projects. This diverse professional experience has shaped her approach to her research.

“My experience outside academia helped me see the practical relevance of certain academic research and raised my interest in applying research techniques to investigate policy-related questions,” she says.

To answer her research questions, Professor Chow says it can be challenging to obtain economic data that spans a sufficiently long time period to allow for patterns or correlations to emerge. “Since my research is mostly of an empirical nature, the availability of data that are comparable across different countries is vital,” she notes.

And as was the case for the China study, alternative methodologies such as the one she proposed may provide a different perspective to the research question, she says.

### ANTICIPATING FAR-REACHING EFFECTS OF MONETARY POLICY CHANGE

As a future research question, Professor Chow is interested in how changes in monetary policy in the West will impact Asia.

To deal with the fallout from the 2008 global financial crisis, Western countries resorted to unconventional measures: the US and Britain, for example, implemented quantitative easing, a process in which new money is created by central banks and used to buy financial assets such as

government bonds. This measure increases the amount of cash in the system and encourages financial institutions to lend to businesses and individuals, thus spurring growth.

After several years of this, the US announced that, having met its targets for reducing inflation and unemployment, it would end its quantitative easing programme. Since quantitative easing has also led to increased capital flow into emerging markets, including Asian economies, monetary authorities in Asia are concerned about how this impending normalisation of monetary policy will affect them, Professor Chow explains.

“It would be interesting to research on the impact in Asia of such unwinding of unconventional monetary policies, as well as consider policy implications,” she says. ■

# Giving economic data a voice

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Professor Su Liangjun is developing new techniques in econometrics to provide a more realistic understanding of the economy.

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Even before the big data deluge, economists already had access to oceans of economic data, but the sheer volume and complexity drove economists to form assumptions that might fail to get the true story out of the data.

Thanks to advances in econometrics, which use statistics to test the reality of economic models, economists are gradually getting a clearer picture of how the economy works.

Working at the forefront of these advancements is Professor Su Liangjun from the SMU School of Economics. He endeavours to remove as many assumptions as possible from econometric models so that they produce a more realistic explanation of the economy.

## LETTING THE DATA SPEAK FREELY

“The problem is that we cannot analyse the full complexity of economics and human behaviour all at once, so we simplify the behaviour to fit it into models,” says Professor Su.

Similar to economists’ infamous assumptions that humans are always rational and utility-seeking, econometricians also assume that relationships between data are simpler than in real life. Econometric models often assume that data is normally distributed, or that two variables have a linear relationship. These assumptions mask the real story about why an economy is behaving in a certain way, such as why it has a high savings rate or is experiencing growth.

Professor Su has developed innovative ways to unpick these assumptions and “allow the data to speak”, in particular by enabling more sophisticated analyses of panel data.

Panel data is a collection of multiple observations over time about people, companies or other economic agents, in relation to economic variables such as interest rates, savings rates and foreign investment, to name but a few. Analysing panel data to establish cause and effect is challenging because the variables are influenced not only by each other but also factors outside of the data. Moreover, forming panel structures involves sorting hundreds or even thousands of individual economic agents into the right groups according to their common parameters. These challenges result in econometricians having to resort to making assumptions.

“Traditionally, econometricians assume that relationships among economic variables in panel data are homogeneous, i.e., they remain the same in any context,” Professor Su explains. “For example, they assume that democracy affects economic growth in the same way across all countries over a long historical period. This assumption allows them to run a linear model of economic growth rate on a democracy variable with some other control variable by assuming the slope in the linear model is the same across countries.”

The major challenge, Professor Su notes, is to confront econometric models directly with economic data by removing as many restrictive assumptions as possible. Such a model will be flexible enough to capture the reality and yield results that can be interpreted in meaningful ways, he says.

## NOT EVERYTHING IS THE SAME, BUT NOT EVERYTHING IS DIFFERENT EITHER

While Professor Su wishes to challenge

assumptions of homogeneity in these relationships, he points out that it is just as difficult to assume the opposite. If one assumes that the effects are different in every country, the data becomes too sparse and disparate to analyse.

To solve this dilemma, Professor Su proposed a middle ground for grouping economic agents (such as countries) according to what the data says, rather than based on arbitrary groupings like geographical regions. The challenge is how to determine these groups in the first place.

Professor Su made this key breakthrough in a surprising place. He recounts how he had visited fellow econometricians in the University of Colorado Boulder in the US to learn about the statistical tool, Least Absolute Shrinkage and Selection Operator, which is also known as LASSO. At the airport on his way home, he had a brainwave that LASSO could help him structure panel data sets because it was also designed to help find patterns in disparate data.

This opened up a whole new perspective, particularly with regard to economic regions, says Professor Su. In a 2013 study published in *Econometric Theory*, he found that even among a small group of OECD (Organisation for Economic Co-operation and Development) countries, there were differences in how physical capital, human capital and labour force growth affected the economy.

And in a 2014 study with peers at Yale University, Professor Su and his colleagues studied a sample of 57 countries according to how the savings rate was influenced by inflation rate, real interest rate and per capita GDP. The study showed that unlike the common assumption at that time, not all Asian countries were good savers compared to European countries.

### **STUDYING ECONOMIC RELATIONSHIPS OVER TIME**

It is not only geographical boundaries that Professor Su and his fellow econometricians are breaking down but also boundaries of time, which is especially important given the profound changes in economies across the world.

“My view is that economic relationships always depend on the landscape they are operating in. Due to changes in preference, technological progress, or policy interventions, economic relationships may change over time. My colleagues and I developed some econometric methodologies to identify potential structural changes among economic relationships and applied it to economic data,” he shares.

In a collaboration with a colleague from Shanghai Jiao Tong University, Professor Su found that foreign direct investment (FDI) affects economic growth differently over time. He found that before the 1997 Asian financial crisis, the relationship between FDI and economic growth fell significantly compared to before the crisis.

Prof Su has high hopes for the future of econometrics. The liberation of economic models from blurring assumptions combined with new technology and the emergence of big data could turn econometrics into a powerful economic tool.

“The availability of more and more large dimensional data sets, or big data, will help us develop new statistical and econometric techniques, leading to more meaningful research in large dimensional panel data that can be used by applied researchers.” ■

# The race against time

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Professor Tse Yiu Kuen is developing econometric models that can provide us with a clearer picture of global markets.

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Having broken through most geographical borders, the capital markets have moved on to a new frontier – time. Computing technology has pushed trading well beyond the second-by-second barrier, forcing analysts and investors to grapple with yet another dimension of complexity as they seek to manage their risks.

Mastering the complexities of time, place and market movements is Tse Yiu Kuen, Professor of Economics at SMU. He develops econometric models to isolate the phenomena affecting the tidal flows of the financial world – the inter-continental relationships and daily shifts of stock markets, currency exchanges and interest rates.

## IDENTIFYING CORRELATED ACTIVITIES ACROSS MARKETS

For many people, econometrics conjures up thoughts of esoteric and complicated formulas and algorithms. After all, the application of statistical models to economic theory does seem like an intimidating combination. Yet econometrics could prove essential to our understanding of the markets as the bustle and shouts of trading floors succumb to powerful algorithms trading quietly at a speed and complexity beyond human processing power. A few seconds of activity in New York, US, might significantly affect markets in Singapore or Hong Kong.

High-speed global trading presents a significant challenge for risk management. Even the most basic of investment principles, i.e., not to put all eggs in one basket, is getting more complicated. What if the fate of one basket hangs on the other?

“If two markets are moving in tandem, then you are not diversifying at all,” says Professor Tse. “To know whether they are sufficiently diversifying, financial analysts should understand how different markets are correlated.”

Finding these relationships amongst the tangle of global markets is difficult, but econometrics can shed light on the threads that tie the markets together. Professor Tse has developed econometric models to identify correlated activities among multiple markets, for example between exchanges in Hong Kong and Singapore.

“In the 1990s, some companies moved from Hong Kong’s capital market to Singapore’s,” recounts Professor Tse. “We developed a model to examine changes in Singapore’s Straits Times Index and Hong Kong’s Hang Seng Index before and after this trend, and found a stronger correlation after the companies had moved.”

But even as we get a clearer picture of global markets, they are being wrapped in a fog of speed. Professor Tse says that while no one knows exactly, it has been estimated that high frequency trading forms as much as 70% of trading volume in the New York Stock Exchange. Professor Tse’s research helps to clear the fog in delineating the pattern of volatility, a key element of risk.

## THE LUNCH BREAK PROBLEM

“The great difficulty we have had to overcome is intraday periodicity. This is a statistical way to describe different trading intensities throughout the day,” he explains. “Market activity is very active in the morning, and even though

we are looking at New York where they don't stop for lunch, the activity falls off, then picks up again at closing."

Analysts need to clear away these daily activity fluctuations to understand the market factors that cause volatility in stock prices, he says. His research has explored various ways of estimating intraday volatility more reliably, such as in his 2012 paper, 'Estimation of High-Frequency Volatility: An Autoregressive Conditional Duration Approach' in the *Journal of Business and Economic Statistics*. Professor Tse has achieved this by applying a 'time-transformation function' method, which transforms real time to hypothetical time.

"This [model] creates a hypothetical day in which activity is uniform from opening to closing, allowing researchers to more accurately estimate volatility," he describes. "Other methods can only measure volatility over a day, but now we can estimate it over an hour."

One can use this model to derive a more reliable and accurate assessment of whether other factors, such as insider trading and regulatory requirements, are causing volatility, says Professor Tse.

### THE 'VOLATILITY SMILE'

Using this model, Professor Tse's empirical analysis has found that intraday volatility exhibits a 'volatility smile', and his methods allow us to see the real smile rather than one distorted by daily activity fluctuations, as explained in his 2014 paper, 'Intraday periodicity adjustments of transaction duration and their effects on high-frequency volatility estimation' published in the *Journal of Empirical Finance*.

Volatility is highest in the morning. It then drops in the afternoon but rises to complete the smile at the end of the day. "Traders are reacting to news that have accumulated over the night; and then towards closing, they are digesting what has happened over the course of the day," he says.

According to Professor Tse, intraday volatility affects high frequency traders who go in and out of the market many times a day, instead of traditional traders, such as those who

operate mutual funds and generally trade far less frequently.

In fact, Professor Tse's model is most useful to traders who need to estimate their 'Value-at-Risk' over a short intraday period, which is also known as 'intraday VaR'. While traditional financial analysts assess the volatility risks in their portfolio day by day or week by week, high frequency traders may need to know their volatility exposure over a horizon as short as three hours.

Even within this narrow window, real-time analysis is possible, he says. "Although it requires a lot of steps, my model can be used in real-time, using the Monte Carlo method," he explains, referring to the statistical technique of generating hypothetical data many times over to estimate what might happen in reality. And Professor Tse's work is improving the risk management tools available to analysts in this short timeframe. He demonstrates how his method outperforms earlier models in a 2015 paper, "Intraday Value-at-Risk: An asymmetric autoregressive conditional duration approach" published in the *Journal of Econometrics*.

Fortunately, data is not a problem. For a decade now, stock exchanges have opened up trading data in real time, so researchers can study 'tick by tick' data to examine trends, be it over a year or a day.

But even econometric models require more developments in order to catch up with the speed of modern trading, says Professor Tse, with an eye on the future of his field. "Our models deal with second-by-second trading, but now high frequency trading happens nano-second by nano-second. That is the future for our research." ■



# How hedge funds beat the market

From epic tales spun around investment legends Ray Dalio and George Soros, to the secretive, high-octane world of Wall Street, the hedge fund has attained a worldwide notoriety for being an opaque, unwieldy beast. Professor Melvyn Teo studies what makes them tick.

The secretive world of hedge funds has gained a notorious reputation in popular culture. From Martin Scorsese's Oscar-nominated film *The Wolf of Wall Street*, to Bernie Madoff's scandalous ponzi scheme, an aura of mystery seems to surround these financial entities.

It is precisely the enigmatic nature of this space that makes it interesting to Melvyn Teo, Professor of Finance and Deputy Dean (Faculty & Research) at SMU's Lee Kong Chian School of Business. "The attraction for me was that very little is known about hedge funds; they are not immediately very transparent and a lot of misconceptions exist about these financial market players. I wanted to understand them better," he says.

## GEOGRAPHY AND HEDGE FUND PERFORMANCE

Professor Teo is best known for his work on the geography of hedge funds. By analysing the different performances by funds invested in Asia from Asia, versus funds invested in Asia from locations further afield like the US and the UK, he found that hedge funds with a physical presence (head or research office) in their investment region outperformed other hedge funds by 3.72% per year. While the local information advantage was pervasive across all major geographical regions, it was strongest for emerging market funds and funds holding illiquid (that is, not easily converted into cash) securities.

"We tried to push the envelope by asking:

if physical distance matters, then cultural distance must also matter," Professor Teo says. He tested whether native Japanese speakers had an advantage over non-native speakers. "Japan is a good place to test because it is a notoriously closed society. It is tough for non-Japanese to understand cultural nuances, various phrases and other things. We found that native speakers outperformed non-native speakers by roughly 5% per year," he says.

Not content with these findings, Professor Teo then asked why, when proximity matters so much, do more hedge fund managers not set up shop in Asia to invest in Asia. "We wanted to know what hedge funds care about and found that they care about performance, raising capital and raising funds on favourable terms."

His research showed that distant funds, especially those based in the US and UK, are able to raise more capital, charge higher fees and set longer redemption periods, despite their underperformance relative to nearby funds. Distant funds trade investment performance for better access to capital, he found.

## THE LIQUIDITY RISK OF HEDGE FUNDS

A big concern is that the hedge fund industry suffers from an asset-liability mismatch, that is, a disparity between the liquidity that hedge funds say they can provide and the liquidity of their underlying assets. "It is a game they play, where they take on lots of risk to attract



more investors, in turn, to attract higher returns,” he says.

During the 2008 financial crisis, limits placed on the withdrawal of fund capital by investors, or suspended redemption, caught many by surprise. Professor Teo decided to study hedge funds that offer favourable redemption terms (that is, monthly redemptions or better), looking for instances when hedge funds take on excessive liquidity risk.

“We investigated this phenomenon and asked which hedge funds play this game more often, and when this is more dangerous for the fund manager. We sorted the universe of hedge funds by liquidity risk of underlying portfolios, and teased the data out by running a regression on past returns,” Professor Teo explains.

What he found was that within this group of purportedly liquid funds, high net inflow funds subsequently outperformed low net inflow funds by 4.79% per year after adjusting for risk. He went on to test whether there was a corresponding drop in returns in next one or two months when investors redeemed from hedge funds. “We found that those with greatest redemptions subsequently underperformed those with less redemptions,” he says. The take-home message for investors: make sure that the liquidity risks of the hedge funds’ underlying assets match the redemption terms that they offer to investors.

Professor Teo also found that funds with strong incentives to raise capital, low manager option deltas and no co-invested manager capital are more likely to take on excessive liquidity risk. “These are the hedge funds with the least incentive alignment. Performance fees, in general, help with incentive alignment and hedge funds that feature lower performance fees are more likely to play this game. You also find it in funds where the manager does not invest personal capital alongside investors. Smaller funds also care more about raising capital and are more likely to overstretch themselves.”

### **EMOTIONAL STRESS IN HEDGE FUND MANAGERS**

Professor Teo is currently researching the impact of emotional stress on hedge fund managers. “I use marital events as proxies for stress, namely

the impact of divorce and marriage on hedge fund performance.” Intriguingly, his preliminary research shows that hedge funds suffer 6-8% drops in returns when a fund manager goes through a divorce and 4-5% when he or she gets married.

While the first finding is unsurprising, the latter usually causes surprise. “While early marriage is usually a time of harmony, fund managers get distracted in a lot of ways. There are more household things to think about and more activities outside of work. Yet some fund managers need to focus on their work 24/7. They must react to world events at any time of day. The negative impact of marriage on hedge fund performance is strongest on those who are trading-oriented, like macro funds and commodity traders,” he says.

Ultimately, Professor Teo is interested in how hedge funds beat the market. “It is not easy to do that. How do these very sharp minds use information techniques that no one else uses to consistently beat the market? How did the gods of the investment management world, like Ray Dalio and George Soros, overcome all odds to get to where they are now? To be able to get to the bottom of that, in my view, is the holy grail,” he muses. ■

# Playing fast and furious in the stock market

Surprising insights into the role of high frequency traders and short sellers revealed by Professor Ekkehart Boehmer's research.

Retail investors might sometimes feel like meerkats living amongst cheetahs and hyenas when they trade in the stock market. Between the speed and technological power of high frequency traders, and the predatory behaviour of short sellers, it is no wonder their presence makes the average market participant wary.

Yet, the analysis of terabits of trading data has provided evidence for the value of short sellers and high frequency traders to the market's ecosystem, says Professor Ekkehart Boehmer of SMU's Lee Kong Chian School of Business.

Through the lens of financial econometrics, he has discovered that they contribute to more transparent and accurate share prices in the stock market, something that policymakers and investors may ultimately benefit from.

"People were wary of high frequency trading and short selling because they were new and unprecedented. However, profitable trading strategies such as short selling and high frequency trading can have positive effects that people do not understand," says Professor Boehmer.

## SELLING SHORT CORRECTS OVER-PRICING

Issuers are not fond of short sellers because they thrive on falling prices. By selling shares that they have either borrowed or do not own yet, short sellers can profit by eventually buying the shares, if and when their price has fallen.

This may sound predatory, but the theory in defence of short sellers is that they contribute to a market's ultimate goal - the trading of shares at a company's true value. "While short sellers

typically depress prices, they can be valuable in correcting over-pricing. The basic question is whether this is justified or whether short sellers drive prices too low," explains Professor Boehmer.

For the most part, his research suggests that short sellers do drive share prices towards their fundamental values. This research is expounded in three of his papers, 'The good news in short interest', which was the winner of the Fama/DFA Prize for the best paper in the *Journal of Financial Economics* in 2010, 'Short selling and the price discovery process', which was published in the *Journal of Finance* and runner up in the Review of Financial Studies Best Paper Award 2014, and 'Which shorts are informed?', published in the *Journal of Finance* in 2008.

## HIGH FREQUENCY TRADES AND MARKET LIQUIDITY

The development of high frequency trading was similarly controversial because it was thought that the few who could use the technology had an unfair advantage over others. Yet this grumble has lessened as the technology behind it has become more widely available, Professor Boehmer says.

High frequency trading's own claim to usefulness is that it makes the market more liquid - which in theory drives prices closer to their true value. For example, high frequency trading allows more trades in response to more news, providing more information and so more accurate prices. On the other hand, fast trading also appears to make prices more volatile, which

in turn makes arbitrage trading – which brings prices towards their true values – more costly and thus less effective.

That is the theory anyway, and it is not without risks of a high-speed crash when high frequency traders collectively hit speed bumps in the road, Professor Boehmer warns.

Using data from Canadian securities regulators covering five stock markets between 2010 and 2011, the research team tracked the behaviour of individual traders on an anonymous basis, to understand how each reacted to news entering the market. Somewhat surprisingly, the study observed a low correlation between the different high frequency traders' reactions to the same news, thus providing enough diversity in reaction to immunise the market from meltdowns caused by small news.

“High frequency traders compete with each other, rather than just copy each other, and in the process improve liquidity,” says Professor Boehmer, who described his findings in the 2016 paper, ‘Correlated High-Frequency Trading’.

### **THE DELUGE OF FINANCIAL DATA**

Researching at the edge of the markets involves significant challenges, Professor Boehmer points out. Not least of which is applying statistical tools to huge volumes of information – creating limitations that researchers must learn to cope with.

“You cannot generate your findings quickly. While computer power is increasing, the volume and speed of market data is also increasing. So you have to be comfortable with the technology and treat your data very carefully, as processing large volumes of data is prone to errors. So we replicate each other's research to avoid mistakes.”

Ultimately, he hopes that these findings will help regulators, policymakers and retail investors to build and participate in a fair and transparent market.

“The best policymakers can do is to create an environment and rules that promote competition, which in turn generates innovation and liquidity. Liquidity is not so important to investors who transact only occasionally, but transaction costs matter a great deal to large volume traders, such

as some mutual funds and other asset managers. And a higher return for these traders' leads to better returns for their investors, so it's a win-win to have them operating in the market.” ■

# Exploring the world of corporate finance

Professor Wang Rong delves deep into the complex world of international corporations to understand how they and their investors make decisions about money.

In 2006, Professor Wang Rong was just finishing her PhD in Finance at Washington University in St Louis, US. That year, she published her first, yet most cited, paper, 'Corporate Financial Policy and the Value of Cash'. Up until that point, much research had already been done on how companies financed their overall operations and growth. Having observed that there were relatively few studies on the value shareholders place on firms' cash holdings, she set out to examine this. "My paper investigated the cost-benefit trade-offs for holding cash in a firm," she says.

"Cash holdings are very important for firms. Without cash holdings, a firm won't be able to maintain its regular operations. Therefore, having the minimal amount of cash for maintaining normal operations is critical to firms. However, if a firm holds more cash than what is required for its operating and investment needs, there is a higher probability of fund wastage. In this case, extra cash holdings become a liability to shareholders," she explains.

## THE VALUE OF COMPANY CASH HOLDINGS

Together with a colleague from Washington University, Professor Wang then developed a methodology that used stock market returns to measure how shareholders valued changes in firms' cash holdings. Generally, it would suggest that shareholders were in favour of cash holdings when stock prices responded positively to the increase in cash holdings, whereas smaller movements in stock prices implied that

shareholders tend to place less value on increase in cash holdings.

Their study also revealed that shareholders did not value cash holdings in firms that held too much cash. On the other hand, shareholders valued more cash holdings in firms that had difficulty raising money in capital markets. The value of a dollar held by a firm thus decreased or increased accordingly. According to Professor Wang, this methodology has since been widely used by other researchers. The same methodology can also be used to examine changes made by firms related to a variety of other financial policies.

One year after finishing her PhD, she was appointed Assistant Professor of Finance at SMU's Lee Kong Chian School of Business. Since her appointment at SMU, Professor Wang has published several more top-tier research papers. In 2008, she won the Best Paper Award at the Asia-Pacific Financial Market Conference.

## GAUGING THE EXPERTISE OF FINANCIAL ANALYSTS

In 2012, she collaborated with counterparts in the US to conduct a novel study, which received much attention from practitioners. Titled 'Analysts' Industry Expertise', the study compared the across-industry expertise to within-industry expertise of financial analysts. The former referred to the analysts' ability to rank industries relative to each other, whereas the latter referred to their ability to rank firms within a single industry.

"Prior to this, there was no paper which

examined the across-industry expertise of analysts,” says Professor Wang.

The research team explored industry recommendation data available on the Institutional Brokers’ Estimate System, which gathered estimates made by stock analysts on the future earnings of the majority of US publicly traded companies.

Professor Wang explains that analysts evaluate an industry using a bottom-up and/or a top-down approach. In the bottom-up approach, they collect information from different firms in an industry and then aggregate and analyse that information to look for common trends in the industry. In the top-down approach, their strategies for recommending the movement of investments from one sector of the economy to another are mostly driven by the sensitivities of different industries to macroeconomic shocks.

“Our research was mooted from the investors’ perspective,” shares Professor Wang. “We found that analysts had across-industry expertise and investors should listen to analysts’ opinions on industries. Investors should take into account both industry recommendations and firm recommendations when making investments,” she says.

### **INTANGIBLE CAPITAL AND THE GLOBAL ECONOMY**

Professor Wang’s current focus is on investigating why capital expenditure of US firms decreased by more than half from 1980 to 2012. A fundamental driver of economic growth, capital investment is critical for firms to survive and grow. Professor Wang and her colleagues from SMU’s Lee Kong Chian School of Business are interested to know whether declines in capital expenditure correlate with declines in investment opportunities and cash flows, or whether such declines only happen to certain kinds of firms.

So far, their findings reveal that the decline was pervasive across industries and firms of different characteristics. “We think the decline was related to the increasing importance of technology, intangible capital and economic globalisation, which had changed the process of firm production,” she observes. Intangible capital

includes human capital, organisational capital and patents, for example. It is more difficult to place a value on intangible capital than on fixed assets, she explains.

Firms used to respond to investment opportunities by investing in fixed assets. Nowadays, they tend to invest more in intangible capital such as organisational capital and human capital. A good example of this is how some firms are increasing their expenditure on research and development. Professor Wang and her colleagues discover that intangible capital is significantly related to firm investment levels. Globally, firms in economies with development levels similar to the US tend to show declines in capital investment and rises in investments in intangible capital. Firms in fast-growing emerging economies, on the other hand, continue to focus more on capital investment.

These findings are important because they help researchers understand corporate investment behaviour. “The theory of investment has mainly focused on investments in fixed assets. Our results suggest that it is important to take into account investments in intangible capital as well,” notes Professor Wang. “The economic growth model has changed, and so has corporate investment behaviour. In the past, firms relied more on fixed assets for growth. But in recent years, investments in human capital and technology have become more crucial to the success of firms.”

Fuelled by her interest in issues related to managing corporations, Professor Wang chooses corporate finance as her primary research specialisation. “There are so many questions we can study in this area that are closely related to real life. My main areas of interest are related to firms’ financing and investment decisions,” she says. “I would like to engage in multi-disciplinary research activities with fellow SMU colleagues who specialise in accounting and management. This will enable me to address finance-related issues from a new perspective,” she says. ■

# Estimating risks and resolving paradoxes

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Professor Lim Kian Guan uses sophisticated mathematical tools to extract information out of options data and provide more accurate risk estimates.

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All of us have to estimate risk in our daily lives, from crossing the road to sharing personal information on the Internet, with varying degrees of repercussion. But for large organisations such as banks and governmental financial institutions, the failure to accurately forecast risk could have an effect that is nothing short of catastrophic.

Recognising the need for regulation in the financial sector, groups such as the Basel Committee on Banking Supervision have proposed international standards, such as the Basel I, II and III accords. In essence, these guidelines help banks to predict the amount of risk and stipulate a level of capital that they should hold to relate to the expected financial and operational risks.

“A lot of banks still rely on the methods based on the internal model-based approach to evaluate market risk, which basically boils down to using historical time series data. The banks collect price data on assets which they have positions in, and from those historical prices, they will use econometrics methods to estimate risk,” explains Professor Lim Kian Guan from SMU’s Lee Kong Chian School of Business.

“But all these methods require two things: firstly, an assumption of a specific time series model, and secondly, a restricted number of parameters, which means that the predictions are not flexible enough to account for the all changes in the marketplace. In that sense, it is still not very satisfactory,” he says.

## **CALCULATING RISK FROM STOCK OPTIONS DATA**

The problem with existing methods is that they often do not capture ‘black swan’ events, a concept popularised by writer Nassim Nicholas Taleb to describe unexpected events that have a significant impact.

“We’re talking about drastically bad, huge losses several standard deviations away from the mean,” Professor Lim says. “These catastrophic events are represented by the extreme tails of the probability distribution curve. Unfortunately, they are currently not very well predicted because people have been using stationary distributions such as normal distributions to estimate risk, which do not reflect events at the extreme tails.”

Seeking a more accurate way to calculate risk, Professor Lim turned to options data. An option gives the buyer the right, but not an obligation, to buy or sell a particular asset at a specified price by a fixed date. By using a mathematical framework, it is possible to extract information on moments of the underlying asset prices from the options. These moments refer to quantities such as mean, variance, skewness and kurtosis, he says.

“Rather than just relying on the history of stock prices for example, using information on stock options allows us to infer a lot more about the underlying risks. Furthermore, we can extract information on several moments at any one point in time, which can change as soon as the next set

of liquid data is available for updating. This gives us a lot more information which makes the estimation of risk more robust,” he explains.

“One of the methods I have used involved taking four moments and fitting them into a generalised hyperbolic distribution. A lot of research in the past was only using two moments, but with four moments you can catch very nice extreme tails which are the bane of the problems in analysing systemic risk. From the generalised distribution, after transformation by a calibrated Radon Nikodym derivative, you can then calculate many risk measures such as Value-at-Risk and Conditional Value-at-Risk.”

### **MATHEMATICS, THE COMMON LANGUAGE**

In order to use options data, however, some serious mathematical legwork is required. Traditionally, the historical time series data used to calculate risk follows empirical probability distribution, or the actual likelihood that the banks measure to make their forecasts. Options data, however, yield the underlying moments that do not follow empirical probability distribution, falling instead under a different distribution known as the equivalent Martingale measure.

“Therefore, using options data requires some technical treatment to relate the empirical distribution and the equivalent Martingale measure, an endeavour which is by no means trivial. In other words, every time we use derivatives like options to give us more information, we need to tie the two sets of probabilities together so that they will give us a better richer idea of the risk situation,” Professor Lim says.

Although mathematicians and statisticians were the first to work on the problem of relating the two types of probability distribution, Professor Lim notes that the field has seen growing interest in the last decade from economists seeking to address anomalies that have so far eluded explanation.

“For example, the standard asset pricing model doesn’t quite explain the excess volatility observed in the market where the predicted patterns of consumption are too smooth. There is also the issue of excess put premium. So there’s a whole rich tapestry of problems that financial

economists have been working on that could potentially be solved by an understanding of the relationship between empirical and risk neutral distributions,” he notes.

### **OF PARADOXES AND PARADIGMS**

Perhaps one reason that economists are only just beginning to resolve anomalies using a mathematical approach is that the two fields think of the same problems in two very different paradigms, Professor Lim muses.

“I certainly hope to see that the set of problems economists are working on based on what they call pricing kernel puzzle can be understood in terms of what the mathematical probabilists call topological distance between the empirical and equivalent martingale measures. I hope to see some unification so that we can talk in two different languages but can still understand each other.

“Not only would this understanding help us grasp the issue of risk in a richer way, but it could also explain what are currently thought to be paradoxes, which to me are not really paradoxes but just problems which we have not yet solved. To me, this is the most interesting part of the research, and I think the whole area will see some exciting breakthroughs soon,” he says. ■





SECTION 3

# LAW, MANAGEMENT & SOCIETY

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# FOREWORD

## Law, Management & Society

The globalisation of the legal profession is a relatively new development, and Singapore has proactively positioned itself to play an increasingly prominent role in international legal and dispute resolution issues, especially involving commercial trade. In 2013, Singapore's courts considered more than 1,500 foreign cases in their judgments from countries such as Australia, Malaysia, Canada, India, Hong Kong, New Zealand, the United States and South Africa. This was five times as many foreign cases compared to 20 years ago. In 2015, the country launched the Singapore International Commercial Court, further strengthening Singapore's position as an Asian and global centre for the resolution of international commercial disputes. Many countries are increasingly looking at Singapore's approach to handling cross-border legal disputes.

Leading academics from SMU's School of Law believe there is a greater need for the contextualisation of the law in Asia. One such example is the SMU School of Law research exploring how best to adapt Western-derived corporate governance frameworks for this region.

Essays that follow delve into criminal justice systems and global justice, the call for national action plans on business and human rights, and how trade deals affect the public's access to affordable medicines and healthcare. Other essays in this section discuss China's impact on the rest of the world's trade and its record in global trade organisations, the effectiveness of legal frameworks in mergers and acquisitions when transplanted to Asia and the non-delegable duty of care.

Authors in this section also write about the determination of who is legally answerable for a wrong in the civil context, Singapore's transformation from a legal backwater to a hub for international commercial dispute resolution and other law specialties, how legal practice, especially defamation, has changed in response to the Internet and technology, as well as the legal rights of people who own virtual assets such as bitcoins, carbon credits and online games.

One SMU legal scholar notes that as technology continues to evolve, the intersection of the Internet, reputation and defamation law will continue to be a fruitful area of research for many years to come. Another highlights that the voice of the future is heard in the call for the creation of networks to enable young graduates to develop academic and professional careers in ways that are more exciting and less conventional than what they would have otherwise done.

A summary of each essay in this section is given below.



In **Bringing Justice Across Borders**, Mark Findlay highlights the need to study how criminal justice systems can better serve victim communities to enable them to more effectively participate, and be satisfactorily involved in their justice outcomes. This would assist institutions such as the International Criminal Court in delivering justice more effectively. At the global level, he says, the interest of victims should be more prominent than at the nation and state level.

**Guiding Economic Growth Through National Action Plans: Protect, Respect and Remedy** is a unique United Nations-commissioned academic research collaboration that made recommendations on the prevention and mitigation of business-related human rights abuses in the Global South. Many indigenous communities, for example, face forced displacement from their

lands by multinational companies, notes Mahdev Mohan, one of the two principal investigators of the joint team from the CAL-SMU Coalition for National Action Plans on Business and Human Rights. He believes that national action plans can assist in the resolution of matters, especially in the absence of bilateral agreements among Asian countries.

In **Dollars and Drugs**, Locknie Hsu studies how trade deals affect the public's access to affordable medicines and healthcare. The negotiations and compromises leading up to the historic ASEAN Economic Community (AEC) agreement have highlighted a growing issue—how trade treaties can affect people's access to healthcare and medicines; and in ways that are not always for the better. Hsu zeroes in on one particular, under-discussed issue of trade treaties, namely the tensions between governments' economic and public health goals when leaders sit at the negotiating table.

In **China: Rule-Taker, Rule-Shaker or Rule-Maker?** Henry Gao draws on research that shows that while China's size means its actions can have outsized effects on the rest of the world's trade, its record in global trade organisations suggests that it may not want to rock the boat too much. Instead, he says, China will most likely focus on refining the technical rules that fine-tune the system. If China takes a disruptive approach in the World Trade Organisation (WTO), for instance by simply opposing everything the United States says, or if it abandons the WTO and creates its own system, he adds, it would be disastrous especially for smaller countries like Singapore.

In **Mergers & Acquisitions: The Asian Way**, Wan Wai Yee studies the laws that govern mergers and acquisitions in Asia's fast-changing landscape. Using real-world data to understand the effectiveness of the transplanted Anglo-American governance laws and practice in the Asian context, she concludes that the enactment of more laws and more stringent regulations may not be enough. Transactions are complex, but what if the presence of advisors adds a stumbling block to the very transaction they are supposed to facilitate?

When parties outsource duties to independent contractors who then carry out the work negligently, is the hiring party also responsible? In **The Blame Game**, Low Kee Yang discusses the thorny issue of non-delegable duty, which refers to an obligation that cannot be outsourced to a third party. Using the Woodland case as a starting point, he proposes an interesting new principle: that the duty of care is non-delegable, and that a principal can be held liable for his representative's negligence.

Lee Pey Woan's research sits at the intersection of civil and corporate law. In **Who's Wrong, Whose Liability**, she argues that we should not simply transfer what works for criminal law into the civil context. One particularly interesting application of her research on accessory liability in the civil context lies in the field of intellectual property rights infringement; specifically websites that make it easier for users to download movies illegally. Penalties are not purely legal issues, she adds, and collaboration with colleagues from diverse research backgrounds enables a better understanding from both psychological and business perspectives on how users would respond to different penalty systems.

In **Asia's Legal Tiger**, Goh Yihan, Dean of SMU's School of Law, discusses the transformation of Singapore from a legal backwater to a hub for international commercial dispute resolution and other law specialties, and where will it go from there. The growing globalisation of Singapore's legal profession presents both opportunities and challenges. A look at the country's legal history over the past 200 years, and especially in the past 50 years, suggests how it might find its footing in an evolving legal landscape.

In **When Punches Fly in Cyberspace**, Gary Chan examines how legal practice has changed in response to the Internet and technology, particularly with what constitutes defamatory meaning in online media being of particular interest. He highlights a local case where the judge had to decide whether the different comments and threads in response to a Facebook post could be regarded

collectively as a single publication. Suing the search engine is a tantalizing prospect as an alternative to suing the person who wrote the original defamatory materials.

In **Making Sense of Virtual Assets**, Kelvin Low reveals that while the legal rights of people who own intangible assets are sometimes remarkably ill-defined and poorly studied, the situation is even more problematic for those with virtual assets. The rights of people who deal in assets such as digital currency bitcoins, carbon credits and even virtual assets in massively multiplayer online games are often much less well defined. Legal ambiguities in the European Union carbon credit trading system, for example, are detrimental to its purpose, he says. ■





# Bringing justice across borders

Professor Mark Findlay highlights the need to study how criminal justice systems can better serve the victims of war crimes and calls for more cross-disciplinary research in the legal field.

As conflicts around the world continue to span multiple countries, criminal justice systems too have evolved to become international institutions. But how do these international institutions regulate transnational crime, and to what extent do alternative justice processes satisfy the interests of legitimate victims?

Eager to find practical solutions to the complex problem of global justice service delivery, Professor Mark Findlay from SMU's School of Law has extensively researched this topic, talking to families and victims of genocide, war crimes and crimes against humanity. His research focuses on the constituency of global justice, interrogating how victim communities can more effectively participate and be satisfactorily involved in their justice outcomes. The applied dimension of this research is to assist institutions such as the International Criminal Court in delivering justice more effectively.

## VICTIMS DO NOT SIMPLY WANT RETRIBUTION

Professor Findlay's early research focused on the unique features and challenges of global justice versus nation-state level crime and security issues. "A crucial distinguishing feature of international criminal justice was the magnitude of crimes we were dealing with. At a global level, the interest of victims should be more prominent than at the nation and state level," he says.

The need to recognise and satisfy legitimate victim interests at the global level has motivated his current research direction, where he analyses the critical processes for determining and discriminating what victims really want. "Whether

they are victims of genocide or war crimes, what do victims rightfully expect the system to produce? How can we expand opportunities for them to participate? And how do we balance that against the protection of the accused?" he asks.

His findings show that victims demand more than just prosecution and punishment of offenders for their actions. "They are looking for their stories to be told, and to be offered some peace and security that was not available at the time they were harmed." He gives an example of a refugee who had suffered under paramilitary fighting. When asked what she would want most, she simply asked for safety, so that she would not have to live constantly in fear.

"The thought of hundreds of thousands of people getting up every day without the comfort of safety is a challenging concept," he says. This knowledge motivates Professor Findlay to study alternative outcomes that the justice system could focus on. A 2013 book he wrote, titled *International and Comparative Criminal Justice: A Critical Introduction*, examined these issues from a wide cultural perspective.

## THINKING BEYOND BORDERS

Similarly, Professor Findlay hopes that his other book *Contemporary Challenges in Regulating Global Crises*, which was also published in 2013, will stimulate readers to think about issues beyond their immediate national context and to consider their responsibilities as global citizens.

"Some of the methods we use to regulate our lives and society seem to cause more problems

than they solve,” he says. Citing countries that regulate migrant labour through the use of limited immigration for residency and work, he explains that saying to migrants they can work in a country but only under very limited conditions creates dangerous social and market vulnerabilities because these workers do not feel secure. Linking labour to residency without stringent regulation of workplace relations can lead to the development of labour black markets, and a surge in undocumented workers who tend to work in unsafe conditions.

Good regulatory intentions may have resulted in vigorous inspection of employment facilities to discover and protect undocumented workers, as seen in the EU. However, undocumented workers face deportation if they are exposed, often leading them to live in terrible conditions just to evade the authorities. “The paradox is that sometimes we unwittingly do things that exacerbate problems for migrant workers, especially when labour and migration regulations intersect,” he notes.

#### **MORE COLLABORATION IN LEGAL RESEARCH**

Quoting Professor of Jurisprudence William Twining from the University College London, UK, Professor Findlay says that legal academics need to focus on two things in their work. First, they must recognise themselves as writers and as researchers. “We must be able to communicate what we know to as many people as possible. Charles Dickens, in his novel *Bleak House*, says that lawyers speak a mysterious language so we can charge more money. We need to open our skills up to more accessible communication.” Second, legal researchers need to confront alternative views and explanations as they work in a wider world.

Professor Findlay advises that legal academics must focus on relevance if they do not want to be left out of the regulatory mix. “In the case of intellectual property for example, I confront my students with the realisation that every one of them commits criminal activities every day. They download things unlicensed from the Web and don’t think anything of it. Most people under 30 years old don’t seem to respect

IP regulations.” As such, trying to punish people for downloading is not viable, he says. “Lawyers need to help people with patents and trademarks to negotiate more creative ways of sourcing and transacting the wealth that IP should produce. Instead of trying to exclude people from access, they should try to create opportunities for people to gain access within realistic regulatory regimes,” he continues.

One way to generate better outcomes is by encouraging legal academics to cross-fertilise. “We need to look at practical ways to solve problems by sharing the regulatory challenges. Some lawyers don’t like this, as they view their reputations as made and marketed by specialising in narrow fields. But we are living in a world that is very much cross-disciplinary, and it is important for young and mid-career academics to engage in other ways of thinking.”

Although he finds that many students are still attracted to law school because they want to make money, it is becoming clear that this will not be their professional experience even in the middle term. “The nexus between a university degree and a good job is not going to be so absolute in the future,” he says. “When I arrived in Singapore in 2009, I looked at the ways in which young lawyers approached their training, and I was anxious to offer them other forms of critical thinking.”

With that in mind, Professor Findlay sees himself working with mid-career and developing legal academics to uncover opportunities in new areas of research. “I want to create a network that enables young graduates to develop academic and professional careers in ways that are more exciting and less conventional than what they would have otherwise done,” he says. ■

# Guiding economic growth through national action plans: Protect, respect and remedy

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A unique United Nations-commissioned academic research collaboration has issued recommendations on the prevention and mitigation of business-related human rights abuses in the Global South.

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On December 31, 2015, the Association of South East Asian Nations (ASEAN) Economic Community (AEC) was formally launched with the aim of leveraging the region's US\$2.6 trillion market and 622 million people to create one of the largest economies in the world. The AEC is already a major market for foreign investment. In 2014, ASEAN attracted US\$136 billion in foreign direct investment (FDI), accounting for 11% of global FDI flows.

The region's rapid economic development presents opportunities and challenges to countries and corporations alike. In 2012, the United Nations (UN) appointed a coalition of Asian and African academic institutions to formulate guidance on how to develop national action plans in the Global South (comprising Africa, Latin America, and the developing Asia, including the Middle East) to protect human rights that may be impacted by business conduct. Their final report, submitted to the UN at the end of 2015, emphasises the fact that some human rights concerns in the Global South are remarkably different from those faced by the Global North (comprising the US, Canada, Western Europe and the developed parts of East Asia), and require special attention and analysis.

"Our report makes it clear that guidance on implementing national action plans cannot have a one-size-fits-all approach," says

Professor Mahdev Mohan, from SMU's School of Law, and one of the two principal investigators in the coalition.

The CALS-SMU Coalition for National Action Plans on Business and Human Rights was jointly led by the Centre for Applied Legal Studies (CALS) at South Africa's University of the Witwatersrand and SMU's Asian Business & Rule of Law Initiative, which Professor Mohan directs.

## INVOLVING AND LEARNING FROM STAKEHOLDERS

The centrepiece of the coalition's three-year investigation was two workshops held in Bali, Indonesia and Pretoria, South Africa, which focused on tapping into the perspectives of various Global South stakeholders on business and human rights. The workshops also aimed to identify individuals and organisations that can support the UN's mission to embed national action plans on these issues in both regions.

"Significantly, most stakeholders [in the Bali workshop] were supportive of the idea of Asian countries implementing national action plans on business and human rights. By and large, there was also consensus that unprecedented economic growth in Asia driven by multinational corporations must go hand-in-hand with the promotion and protection of human rights," says Professor Mohan.



One problem resulting from rapid economic growth that will benefit from a national action plan, he explains, is that of trans-boundary haze pollution. “Haze pollution has impaired the health of millions of people in the region. It has compromised the safety of aircraft, and has also damaged ASEAN’s regional economy. Haze pollution last year cost Singapore an estimated S\$700 million (US\$494.38 million; 2015) in losses. The large quantities of carbon dioxide released from forest fires in Indonesia have also set back ASEAN’s efforts to mitigate global climate change,” he explains.

But this is only one of a multitude of issues that need to be addressed. Many migrant workers in Asia are subject to severe discrimination as well as the denial of freedom of movement and basic economic, social and cultural rights. In most cases, bilateral agreements also do not exist among Asian countries to adequately protect the rights of their workers in host countries.

Many indigenous communities face forced displacement from their lands by multinational companies without adequate consultation and compensation. Unsustainable land use by these companies can cause or contribute to environmental degradation, leading to adverse impacts on health, access to clean water and sources of livelihood. Finally, many victims of business-related human rights abuses often lack access to independent courts and commissions, or non-judicial grievance mechanisms.

The Bali workshop included stakeholders from government, business and civil society. Many believe that progressive businesses need to play a central role in developing national action plans in the region. Also, the concept of corporate social responsibility needs to shift from voluntary philanthropy to one that is based on an awareness of the important role businesses must play in protecting human rights.

### GLOBAL SOUTH COMMONALITIES AND DIFFERENCES

Asian stakeholders emphasised the importance of developing both regional and national action plans to protect human rights as they relate to business. But among African stakeholders,

a stronger emphasis was placed on national plans as some felt that the continent is too diverse for the development of regional plans at this stage. Nevertheless, the CALS-SMU coalition noted that economic integration is an objective of the African Union and that this needs to be kept in mind for the long-term.

African stakeholders stated that government officials tend to see national action plans as obstacles to investment when they relate to business and human rights. Because of this, the civil society needs to play an important role in pushing for comprehensive policies. Also, progressive businesses in Africa may support the development of a national action plan if they see it as a means to stop local companies from exploiting cheap labour and thus undercutting them in the market.

The Pretoria workshop also emphasised that it was important for African businesses to strike a balance between endorsing gender equality and respecting cultural and traditional values within society. While the African Women’s Charter and the Southern African Development Community Protocol on Gender and Development stressed that tradition and culture should not be allowed to impair the rights of women, a national action plan could further guide businesses on progressively influencing gender norms in African societies, said the stakeholders.

### CONVERTING WORDS INTO ACTION

The CALS-SMU coalition released a set of recommendations to translate into practice titled *UN Guiding Principles on Business and Human Rights*, which was endorsed in 2011. These principles are based on three ‘pillars’: the duty of the state to protect human rights, the responsibility of businesses to respect human rights, and the right of victims of business-related abuses to have access to remedy.

“Due to the unique economic, social and political realities of the Global South, existing remedies and grievance mechanisms that are available to victims of human rights abuses are often fragmented and not easily accessible,” says Professor Mohan. “In our report, we recommend that processes involving national action plans in

the Global South should first identify gaps in existing legislative and regulatory frameworks and the reasons for the failure to enforce them.”

The CALS-SMU coalition represents the first collaboration between two universities in Asia and Africa where business and human rights issues are identified within each region and then brought together to present a collective Global South position on this topic, explains Professor Mohan. “It’s the first project of its kind where there is significant collaboration across two geographical regions to address a common issue,” he says.

“This cross-border coalition’s final report will inform the UN Working Group’s guidance to UN member states and other actors at the UN Human Rights Council and other forums to better ensure accountability for human rights violations in the context of business activities,” adds CALS director, Professor Bonita Meyersfeld.

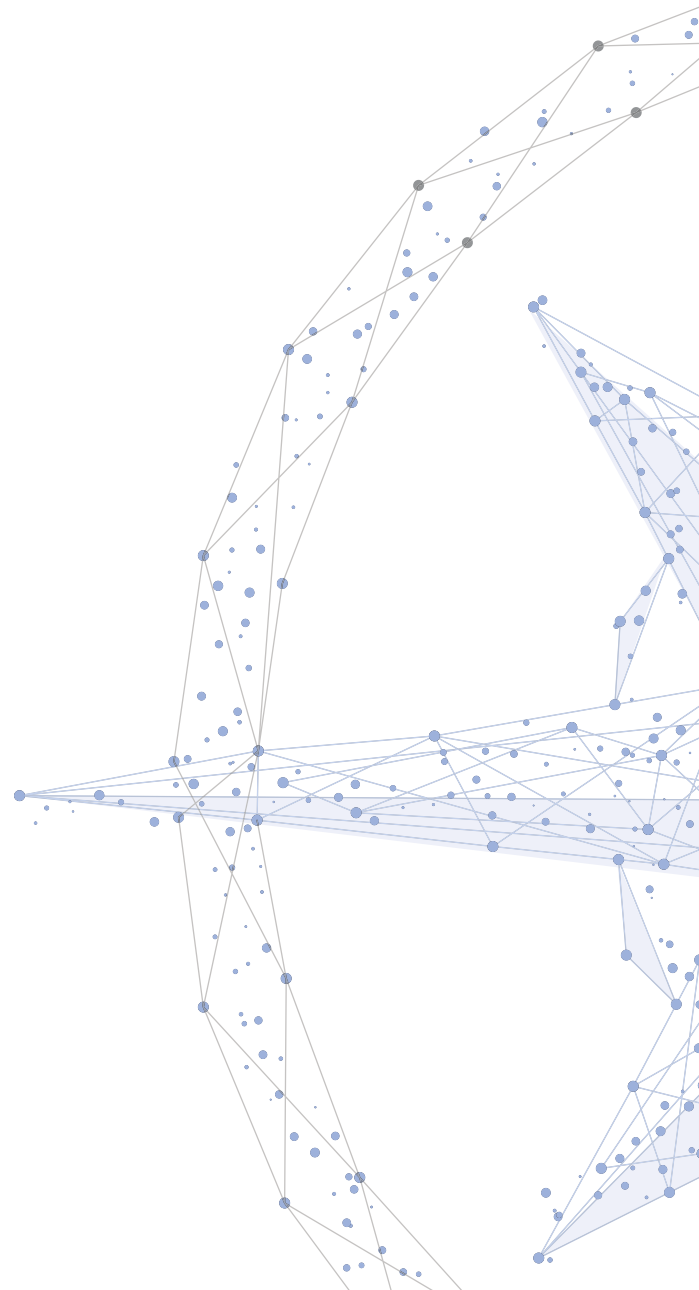
### GOING FORWARD

Progress is being made. South Korea, Indonesia and the Philippines, for example, are in talks with relevant stakeholders to start the national action plans process. Malaysia’s national human rights institution, SUHAKAM, has released a strategic document to provide policy guidance for the formation of a national action plan. At the Bali workshop, a well-known member of the Myanmar Investment Commission, Professor Aung Thun Thet, announced the country’s intention to develop a national action plan.

In Africa, Mauritius and Nigeria have reportedly begun developing national action plans, while national human rights institutions in Ghana, Mozambique, South Africa and Tanzania have begun capacity building and gap analysis on business and human rights issues. Research reveals that forward-thinking businesses and business associations in Africa and Asia also agree that sustainable development is necessary and has a crucial role to play in devising and implementing national action plans.

“I am convinced that the outcomes of this research report will inform the progressive update of our guidance document and assist the UN Human Rights Council and state parties

to develop context-specific and sustainable national action plans that resonate with the nations of the Global South as much as they do with those of the North,” says Michael Addo, Professor of Law at the University of Exeter, and a member of the UN Business & Human Rights Working Group which had commissioned the CALS-SMU collaboration. ■





# Dollars and drugs

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Professor Locknie Hsu studies how trade deals affect the public's access to affordable medicines and healthcare.

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At the end of 2015, ASEAN countries became closer to one another as part of the new AEC. Under the trade bloc's economic integration arrangements, their citizens will find it easier to do business in other ASEAN countries, import and export goods, and find jobs in the region.

The negotiations and compromises leading up to the historic agreement, however, have also highlighted a growing issue - how trade treaties can affect people's access to healthcare and medicines; in ways that are not always for the better.

Professor Locknie Hsu, at the SMU School of Law, is particularly interested in the intricacies of such treaties. She specialises in international trade and investment law, and is part of a working group of ASEAN representatives that seeks to facilitate cross-border trade by harmonising commercial laws across these countries.

"As ambitious agreements throw the connection between trade and health into even sharper relief, countries will have to grapple with the difficult task of balancing their desire for economic growth with ensuring affordable and accessible healthcare and medicines for their citizens," she says.

## BALANCING HEALTHCARE AND ECONOMIC GOALS

In a 2015 paper titled 'Regulatory Flexibilities and Tensions in Public Health and Trade - An Asian Perspective' published in the *Asian Journal of WTO and International Health Law and Policy*, Professor Hsu zeroes in on one particular, under-discussed issue of trade treaties, namely the tensions between

governments' economic and public health goals when they sit at the negotiating table.

During the discussions for the Trans-Pacific Partnership (TPP) trade agreement, the US called for strong intellectual property protections for biologic medicines, which are expensive medicines derived from living organisms. The US wanted 12 years of data exclusivity for biologics makers, during which rivals would be blocked from creating 'biosimilars', or cheaper versions of the drug. In the end, a compromise provision was struck by negotiators. However, as President Donald Trump has decided to withdraw the US from the TPP agreement, its provisions have not been brought into effect.

But critics believe that too-stringent protections stifle competition and prevent affordable medicines from entering the market earlier. Australia, for instance, wanted just five years of data protection for biologics makers. The TPP text reveals a compromise that has been struck on the duration of protection.

"In an economically-diverse region such as Asia, which has both high-income countries and least-developed countries, it is not surprising that differences in health priorities and the ability of citizens to pay for medicines can also give rise to divergent trade, intellectual property and health laws and policies," Professor Hsu notes.

Another potential issue in trade treaties is when Asian countries take differing approaches to compulsory licensing, she says. Compulsory licensing refers to when governments allow another company to manufacture a product without the patent owner's consent, but with compensation. For example, a country may need

a potentially life-saving drug as quickly as possible but the patent holder may be unable or unwilling to meet the demand.

In recent years, India, Indonesia, Malaysia and Thailand have used compulsory licensing for patented pharmaceuticals, although not without some legal challenges by the patent holders. Thailand, in particular, has used compulsory licensing even for drugs to treat non-infectious diseases. Singapore, on the other hand, has announced that it will use compulsory licensing only in emergencies or extremely urgent situations.

### BIG TOBACCO AND ASEAN

Aside from making sure the public has access to affordable medicines, governments also have to regulate harmful substances such as tobacco. This, too, can be a source of tension in trade discussions, Professor Hsu comments in a monograph chapter, 'Tobacco Control in ASEAN', published in the book *The Global Tobacco Epidemic and the Law* in 2014.

ASEAN countries use a variety of non-fiscal and fiscal tools such as excise taxes and value-added, or goods and services taxes to control tobacco use among their citizens. While import tariffs have also been imposed, the ASEAN Free Trade Area, its Common Effective Preferential Tariff system, and the Trade in Goods Agreement have led to ASEAN members committing to a reduction or elimination of these import tariffs on tobacco products. Non-fiscal tools include packaging requirements and restrictions on the purchase of such products by minors.

Complicating matters is the fact that some ASEAN countries such as Indonesia, Malaysia, the Philippines and Thailand are also tobacco growers. In fact, the Thailand Tobacco Monopoly (TTM), a state enterprise, operates under the Ministry of Finance. Thai law previously granted TTM a monopoly to produce cigarettes within Thailand, but this changed following pressure from the country's trade partners, including the US.

The tobacco issue was also a point of contention during the TPP negotiations. Some of the negotiating countries, such as the US and

Japan, have strong private interests in tobacco production and export. Other countries such as Malaysia were adamant that the deal should not compromise governments' ability to regulate tobacco use as part of public health protection efforts.

### AN EVOLVING LANDSCAPE

As countries in Asia continue to negotiate new trade partnerships, tensions between healthcare and economic goals will continue to recur, Professor Hsu says. ASEAN countries, for instance, negotiated with six external trade partners to form the Regional Comprehensive Economic Partnership. Members of the Asia-Pacific Economic Cooperation (APEC) also discussed how to create a Free Trade Area of the Asia Pacific.

To smoothen the way for the negotiations, Asian trade partners should identify common interests and health priorities, and carry out health impact assessments for trade treaty provisions, Professor Hsu suggests. Her book, *Trade, Investment, Innovation and their Impact on Access to Medicines: An Asian Perspective*, published in February 2016 by Cambridge University Press, examines the issue in greater detail.

"As ASEAN evolves towards greater integration and development of a common voice on global issues, it will be particularly important to consider what that voice will say when negotiating trade and public health issues," she shares. ■

# China: Rule-taker, rule-shaker or rule-maker?

Despite its ascent on the world stage, Professor Henry Gao's research shows that China may prefer to keep a low profile in global organisations.

To see the world's future, one has to look to China. The country already is the world's second largest economy, and it is projected to overtake the US for pole position by the year 2020.

While its size means that its actions can have outsized effects on the rest of the world's trade, its record in global trade organisations suggests that it may not want to rock the boat too much, says Professor Henry Gao at the SMU School of Law.

Professor Gao specialises in the World Trade Organisation's (WTO) laws and, in particular, China's role in the organisation. His work has been widely cited, including by the US and Chinese governments, the UN and the WTO. He has also served as an advisor to the Ministry of Commerce of China and the WTO.

## TAKING A BACKSEAT

"Judging from China's past record in the WTO, it is unlikely that China will propose any sweeping changes to the governing structure of the institution," he says. "Instead, China will most likely focus on refining the technical rules that fine-tune the system."

While many analysts had predicted that China would seek a leadership role in the WTO in its first decade as a member, Professor Gao notes that it has instead kept a low profile for several reasons, including to digest and implement the unusually heavy requirements attached to its membership, and to familiarise itself with the WTO's procedural rules.

It might also have wanted to avoid drawing

attention to its awkward position on some issues. While China has called itself a developing country for political reasons, some of its interests actually lie closer to those of developed countries. Developing countries want to eliminate export subsidies and reduce domestic support for agricultural products, for instance, to raise the commodities' prices and their income, but such measures would hurt China, which is one of the world's largest importers of wheat, cotton and soya beans.

"Due to the difference between China's political position and economic interests, it would be politically awkward for China to openly deviate from the 'party line' of developing countries. Thus, the best strategy seems to be to keep a low profile," Professor Gao says.

On the other hand, in contrast to its reticence in WTO negotiations, it has transformed from a reluctant player to a forceful litigant in WTO dispute settlement cases, and sought to change rules that it finds discriminatory toward itself. It has also aggressively pursued regional trade agreements with other countries.

Professor Gao has written up his findings in a 2011 paper, 'China's Ascent in Global Trade Governance: From Rule Taker to Rule Shaker, and Maybe Rule Maker?', published in a Cambridge University Press book, *Making Global Trade Governance Work For Development*.

## NOT INVITED TO THE PARTY

In another paper, 'Selected Issues in TPP Negotiations and Implications for China',

published in 2014 as part of the book, *Regional Cooperation and Free Trade Agreements in Asia*, Professor Gao argued that China might have to institute new rules in its existing and new trade agreements to counteract the TPP that excludes it.

In 2013, US President Barack Obama said that China was excluded from the TPP as the US would have a stronger hand in trade negotiations with China if it could ink a trade deal with all the other countries in Asia.

While China could ignore the TPP or seek to join it, both avenues are fraught with perils, Professor Gao explains. If China buries its head in the sand, the US will use the TPP to enhance its economic ties to Asia-Pacific countries, and make rules on key issues such as e-commerce and government procurement without China's involvement. The US could then push for global acceptance of the rules through the WTO, where it would be hard for China to resist.

If China wanted to join the TPP, existing TPP members must reach a consensus to admit a new member, and the US wields considerable clout in the partnership. This means China might have to pay heavy dues for a place at the table, as was the case for its admittance into the WTO. "Or it could also take the middle ground," says Professor Gao, "and the third option is for China to make its own set of rules in its existing and new free trade agreements. This is, in my view, the best option for China as it could enable it to prevent the dominance of the US approach. The difficulty, however, is that China's capacity in rule-making seems to be lacking."

### TOEING THE LINE

Regardless of how China's trade approach evolves, it is in the best interest of other countries, especially small ones such as Singapore, and international organisations to ensure that China plays by existing rules, Professor Gao points out.

While the proliferation of Regional Trade Agreements have threatened the WTO's relevance, it could regain some power by offering its dispute settlement system as a forum to resolve conflicts over the agreements. Professor Gao elaborates on this topic in a paper he co-

authored with Professor Chin Leng Lim from the University of Hong Kong that was published in the *Journal of International Economic Law*.

"How China acts affects smaller countries like Singapore, which relies on international trade organisations," he says. "If China takes a disruptive approach in the WTO, for instance by simply opposing everything the US says, or if it abandons the WTO and creates its own system, it would be disastrous especially for smaller countries like Singapore." ■



# Mergers & acquisitions: The Asian way

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Professor Wan Wai Yee studies the laws that govern mergers and acquisitions in Asia's fast-changing landscape.

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In theory, a merger or an acquisition can be a win-win situation for all parties, but only if the conditions are right. In every such complex corporate dealing, many advisors – from accountants to lawyers – are involved, to protect the interests of both shareholders and investors. But what if their presence adds a stumbling block to the very transaction they are supposed to facilitate?

Drawing on her extensive practical experience in corporate law, Professor Wan Wai Yee, from the SMU School of Law, studies the laws that govern mergers and acquisitions (M&A) in the Asian context. She also examines real-world data to understand whether legal frameworks are effective when transplanted to Asia, where the corporate landscape is markedly different.

## HOW FAIR ARE THE INDEPENDENT FINANCIAL ADVISERS?

Take for example the legal requirement for Independent Financial Advisers (IFA) to be involved in an M&A dealing. “The very purpose of appointing the IFA is to provide advice to the independent directors of the board of the target company as to the merits of the transaction,” Professor Wan explains. The IFA report is also disclosed to shareholders of the target company.

Between 2008 and 2010, she analysed more than 100 IFA opinions issued on takeover offers on the Singapore Stock Exchange. Published in the *Company and Securities Law Journal* in 2012, her analysis highlighted major shortcomings of the IFA opinions.

First, in certain cases, IFA opinions were not based on independently verified information, but on data that was publicly available or provided by the very target company that engaged their services. Second, IFAs were not obliged to justify the methodology or assumptions they use when evaluating a takeover offer, making it easier to shield a biased opinion. Finally, she discovered that inherent biases may potentially arise because IFAs may have an interest in being hired for their advisory services by the parties to the takeover or their major shareholders in the future.

To make IFA opinions more useful to the average shareholder, Professor Wan proposes the following measures: drawing up a code of conduct for IFAs to follow when evaluating whether offers are ‘fair and reasonable’, requiring standardised evaluation methodologies, and making IFAs legally liable for giving false or misleading advice.

## ADAPTING TO ASIAN CONTEXTS

Although her research has shown that the realm of M&A may benefit from more stringent regulations, Professor Wan cautions that it may not be enough simply to enact more laws and regulations.

“People will clamour for more regulations after something bad happens, like a financial meltdown – it is a knee-jerk reaction. But it’s not clear that simply having more regulations is the most appropriate solution. The real challenge is to make the laws that we have useful and effective for their intended purpose,” she suggests.



A case in point: the ‘legal transplantation’ of the Anglo-American model of corporate governance to Asia that occurred after the 1997-98 Asian financial crisis. Unlike the US or the UK, Asian economies are dominated by companies controlled by a small number of shareholders, such as state- and family-owned firms.

In 2015, Professor Wan notes that Asian countries such as Hong Kong and Singapore have transplanted the Western model of corporate governance, in particular, requiring independent directors, as well as making it easier for investors to seek legal recourse in case of breaches of fiduciary duties or market abuse. But there is still limited real-world evidence for whether legal transplantations, modified or otherwise, will actually work as intended.

Professor Wan has secured a grant under the Singapore Ministry of Education Academic Research Fund Tier 2 for a study that she is working on with colleagues from SMU and Hong Kong. The study examines cross-sectional and longitudinal data on firms in Singapore and Hong Kong over a 15-year period (2000-14), with the aim of assessing the effectiveness of transplantation of the Anglo-American model of corporate governance on Hong Kong and Singapore through a variety of measures.

### A GUIDE TO M&A IN ASIA

Professor Wan’s extensive practical experience in the area of M&A law in Singapore led her to the task of writing a practice-oriented book on the subject. Written in collaboration with Professor Umakanth Varottil from the National University of Singapore, the 2014 book *Mergers and Acquisitions: Law and Practice* guides the reader through M&A in Singapore, discussing practical issues, pitfalls and tactics.

She describes the writing of this book as a necessary but challenging task. “We wanted to address the needs of the professional and academic communities and much of the valuable information on this important area was available only within law firms, and not readily accessible to public,” she explains.

With many Asian economies maturing and opening up, as well as ASEAN economic integration

on the way, the need for contextualisation of the law in Asia will be even greater, Professor Wan observes. Such empirical and comparative analyses of Asian ‘experiments’, she believes, will shed light on how best to adapt Western-derived corporate governance frameworks for Asia, and assist regulators as well as users of financial services in making informed decisions. ■

# The blame game

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When parties outsource duties to independent contractors who then carry out the work negligently, is the hiring party also responsible? Professor Low Kee Yang believes so.

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Picture this: you receive a panicked call while at work because your daughter had injured herself at the pool. You find out later that the swimming lesson she had attended, which is deemed mandatory by the school, wasn't carried out by the school's employees. Instead, the school had hired an independent contractor to conduct these lessons. When faced with these facts, you would undoubtedly ask: who is responsible for ensuring your daughter's safety? The school, the independent contractor, or both?

Professor Low Kee Yang, at the SMU School of Law, attempted to answer this question in a paper that he presented at the Protecting Business and Economy Interests: Contemporary Issues in Tort Law conference held at the Supreme Court of Singapore on 18-19 August 2016.

The paper, titled "Non-delegable Duty of Care: *Woodland v Swimming Teachers Association* and Beyond", had previously received a commendation during the Singapore Law Gazette Awards 2015.

## HIRING A THIRD PARTY CONTRACTOR

In this paper, Professor Low focused on a tort law case in the UK where the Supreme Court addressed the thorny issue of non-delegable duty, which refers to an obligation that cannot be outsourced to a third party.

"In the past, even though you had hired independent contractors, the general principle then was that you would not be liable if you had acted with care when selecting these contractors," he explains.

The situation changes if extra-hazardous activity is involved, but Professor Low noted that Lord Sumption, the Supreme Court judge who passed the ruling in the decision of *Woodland v Swimming Teachers Association* and others case, did not consider swimming as extra-hazardous.

Nevertheless, Lord Sumption identified this case as a special one, where the defendant was in breach of his personal duty towards ensuring the safety of the claimant, since the independent contractor representing him was acting without due care.

## FIVE DEFINING FEATURES OF NON-DELEGABLE DUTY

Drawing from this case and others in Australia, Lord Sumption came up with a landmark framework consisting of five defining features to determine whether the duty of care in a certain situation would be non-delegable.

"If you can satisfy these five elements, then there is non-delegable duty," Professor Low explains. "Previously, there was no such unifying framework of principles or criteria."

Of the five, three are particularly important. Firstly, there must be an existing relationship between the claimant and defendant, placing her in the defendant's custody or care. In the *Woodland* case, this was obvious - the student studied at the school. Secondly, the claimant must have no control over whether the defendant delegates his duties to third parties - of which in that case, students have no say in who teaches their lessons. Thirdly, the defendant must have

delegated a function that is integral to his positive duty. For the claimant, swimming was part of the school curriculum.

Considering the facts of the Woodland case, Lord Sumption had decided that all those elements were satisfied and that this was a case of non-delegable duty, relates Professor Low.

“Therefore, the school was found to be liable for the victim’s injuries as the swimming instruction was carelessly carried out by the independent contractor. Effectively, the instructor was representing the school and could be seen as an employee or agent,” he says, pointing out that this is a particularly controversial area of tort law.

### **MAKING DUTY OF CARE NON-DELEGABLE BY DEFAULT**

Using the Woodland case as a starting point, Professor Low proposed an interesting new principle in his paper: that duty of care is non-delegable, and that the principal can be held liable for his representative’s negligence.

“What I’m trying to say is that if there are so many situations in which duty is non-delegable, why don’t we flip it around and say that duty is non-delegable as a default?” he asks. “If you ask someone to do for you, you are responsible. If he doesn’t do it well, you are liable.”

Professor Low’s reasoning behind this is a practical one. The Sumption framework is not one-size-fits-all, he says, citing a tort case in Singapore, MCST Plan No 3322 v Tiong Aik Construction Pte Ltd. Here, the management company of a condominium represented the property owners to sue the developer, main contractor, architect and various parties for some defects.

“The pool landscaping was not well done, and leaves would often fall into the pool and clog up the system. There was also a foul smell coming out of the sewage system,” describes Professor Low.

However, the Singapore Court of Appeal had endorsed the Woodland decision and, referencing the Sumption framework, said that the five requirements were not satisfied. For

that reason, the judge ruled that there was no non-delegable duty on the part of the main contractor and the architect.

Regarding the fairness of the Tiong Aik decision, Professor Low confesses that he had his doubts. “I think that in general property buyers do not contemplate at all who the sub-contractors of their units are,” he says. “They bought the house from the developer; when something goes wrong, they would expect the developer to take care of it.”

Professor Low saw the need to draw up an alternative: one where the principal has non-delegable duty and will be held liable, subject to appropriate exceptions. Noting in his paper that the adoption of such a principle would be a “radical move”, he also pointed out the lack of any comprehensive and coherent legal framework still troubles judges and jurists alike. “This area of law is tricky, and needs to be cleared up.” ■

# Who's wrong, whose liability

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Determining who is legally answerable for a wrong in the civil context can be complicated, but research being done by Professor Lee Pey Woan is helping to clear the air.

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It seemed like a straightforward request: Your friend, whom you know to be a little short on cash, asked to borrow your car over the weekend. There was just one hitch – he used it to rob a bank, and you find yourself next to him in the dock.

Under criminal law, the verdict is clear: If you lent your car knowing that he intended to rob a bank you have become an accessory to a crime, even though you might not have robbed the bank yourself. But do you then also owe the bank compensation under civil law even though you did not directly cause them harm?

These are just some of the issues that Professor Lee Pey Woan wrestles with in the course of research at the intersection of civil and corporate law. A faculty member at the SMU School of Law, Professor Lee co-authored a textbook of corporate law in 2015 and also contributed chapters to textbooks in tort and contract law.

In a 2015 piece, titled 'Accessory Liability in Tort and Equity' and published in the *Singapore Academy of Law Journal*, she examines the general principles for making accessories liable and argues that we should not simply transfer what works for criminal law into the civil context.

"My conclusion is that the principles used should be narrow in nature. It should not be too easy for us to say that somebody is responsible for helping another commit a civil wrong because, unlike in criminal law, wrongdoing in civil law are more wide-ranging and may often be less serious," Professor Lee explains.

## **DISTINGUISHING BETWEEN CRIMES AND TORTS**

Crimes are serious wrongdoing that attract the punishment of the State. A tort, on the other hand, is typically understood as a wrong done by one person to another that necessitates compensation; for example, injuring a pedestrian while driving under the speed limit. Certain actions – injuring a pedestrian while speeding, for one – can qualify as both a crime and a tort.

This distinction is important when it comes to determining accessory liability, Professor Lee stresses. She gives the example of how the owner of a paint shop should not be considered liable if he or she sells paint to someone who subsequently vandalises a wall, as the seller should not have the burden of monitoring what all his or her customers do.

One particularly interesting application of Professor Lee's research on accessory liability in the civil context lies in the field of intellectual property rights infringement, specifically websites which make it easier for users to download movies illegally.

While the end users who download such movies have clearly infringed the copyright, movie companies find it hard to trace and pursue the large number of individuals involved. Instead, the copyright owners have found it easier to go after the service providers, who also have greater financial resources to compensate them.

"The question raised is whether such websites are liable as an accessory for helping others to

contravene the copyright of the movie companies,” she notes.

“In a case heard at the English High Court, the judges ruled that the highly customised service and very detailed instructions – including advice on discussion forums encouraging users to upload infringing materials to share with others – that were provided by a website called Newzbin showed that there was a clear intention to commit illegal activities.”

### **CAN A COMPANY BE AN ACCESSORY?**

As an extension of her interest in the intersection between corporate and civil law, Professor Lee has also investigated the legal implications of accessory liability in cases where the accessory is a company rather than an individual.

“In such cases, we have to ask questions like who is the company. Whose knowledge is relevant for making the company liable? It is not a straightforward application of the normal two human agent situation. When you transpose the principles to a company, you face a different set of problems,” she remarks.

The situation is further complicated by the fact that a company is not always a monolithic entity with one set of unified interests but is in fact a composite entity made up of stakeholders with diverse interests, she adds.

“Thus, if a director uses the company to defraud others, it may not always be fair to impose liability on the company as a conspirator because the liability is ultimately borne by the shareholders or creditors of the company who are entirely innocent. That is why the law generally guards the company’s separate status as a distinct legal entity jealously, and is very reluctant to equate a company with the people who own and manage it.”

These aspects of Professor Lee’s research have been published in the *Singapore Academy of Law Journal* and the *International Company and Commercial Law Review* as articles titled ‘The Company and its Directors as Co-Conspirators’ (in 2009) and ‘The Enigma of Veil-Piercing’ (in 2015), respectively.

### **SEEKING COLLABORATORS**

In the near future, Professor Lee intends to further her research by examining whether the company act should be decriminalised and if civil penalties could be used as a more effective deterrent instead.

“This in an area with potential for collaborating with people from the other schools at SMU, as we are looking at the optimal balance of penalties, which is not a purely legal question,” she elaborates.

By collaborating with colleagues from diverse research backgrounds, such as researchers at the School of Social Sciences and the Lee Kong Chian School of Business, she is looking to better understand from both psychological and business perspectives how users would respond to different penalty systems. ■

# Asia's legal tiger

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The growing globalisation of Singapore's legal profession presents both opportunities and challenges, says Professor Goh Yihan.

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How did Singapore transform from a legal backwater to a hub for international commercial dispute resolution and other law specialties, and where will it go from there? A look at the country's legal history over the past 200 years, and especially in the past 50 years, suggests how it might find its footing in an evolving legal landscape.

Professor Goh Yihan, Dean at the SMU School of Law, is an expert on contract and tort law and has also written about the development of Singapore's legal system.

In 2015, he co-edited *Singapore Law: 50 Years in the Making*, published by Academy Publishing, and authored *Singapore Chronicles: Law*, published by the Straits Times Press. The books track the birth and growth of Singapore's legal system, and were timed to commemorate the 50th anniversary of Singapore's independence.

With the rising stars and veterans of the legal profession contributing to the chapters in *Singapore Law: 50 Years in the Making*, the book is subject-intensive and more suitable for those in the profession who want to know more about specific fields of law. In comparison, *Singapore Chronicles: Law* offers a simpler overview for people not familiar with Singapore's legal system.

"They weren't intended as companion books, but they do serve different audiences," says Professor Goh. "By looking back at Singapore's legal history, you get a better sense of what its future might look like."

## BLAZING ITS OWN PATH

Among the highlights of *Singapore Law: 50 Years in the Making* is a chapter penned by former

Chief Justice (CJ) Chan Sek Keong, who was also the architect of the landmark Application of English Law Act (AELA) passed in Singapore in 1993.

Singapore once followed the English common law that was introduced into the country in 1826, but the 1993 AELA made Singapore's legal system truly independent of the English common law.

As former CJ, Chan recounted in his chapter, he had written about some problematic aspects of the English common law in 1961, but 30 years would pass before he convinced the Singapore government to introduce the AELA, and against "strong resistance from an influential lawyer in the Attorney-General's Chambers".

Professor Goh cites the chapter as one of his favourites in the book. "The Application of English Law Act allowed Singapore to start on a clean slate and provided that, while English law can apply in Singapore, Singapore could develop its own law. Former CJ Chan's account is the untold story behind that seminal piece of legislation," he shares.

A 2015 paper he co-wrote with Judge of Appeal Justice Andrew Phang - in which Professor Goh was the secondary author - outlines how Singapore has since taken a novel approach to general and specific issues related to the breach of contract. The paper, 'Encounters with History, Theory and Doctrine-Some Reflections on Discharge by Breach of Contract', was presented in a conference held in Sydney in December 2015.

Under English contract law, a party cannot terminate for breach of contract as long as the breached clause is stipulated to be a 'warranty', or a non-essential term of the contract.

Under Singapore contract law, however, a party may have the right to terminate the contract, even if the term is listed as a “warranty”, if the consequences of the breach were sufficiently serious.

#### A CASE STUDY FOR OTHER LEGAL SYSTEMS

Other countries have also increasingly looked to Singapore for legal guidance. For example, Hong Kong referred to a 2001 anti-harassment case tried in the Singapore High Court when it adopted common law protections against harassment.

“There are increasing references to Singapore law in other countries, despite the smaller number of cases that come out of our courts. This exportation of Singapore law is part of the globalisation of the legal profession,” says Professor Goh.

While Singapore’s courts strive to develop laws in various fields, there are nevertheless clear benefits to having homogenous laws, for example in commerce, to facilitate cross-border trade, he says.

“If Singapore’s courts think there is a better way of doing things, they will not hesitate to do so, but this must be balanced against being an outlier especially in areas related to commercial law.”

#### THE SHIFTING LEGAL LANDSCAPE

While it seeks to develop its own identity, Singapore’s legal system has at the same time become more global in outlook. In 2013, Singapore’s courts considered more than 1,500 foreign cases in their judgments, five times as many as the number 20 years ago, and from countries such as Australia, Malaysia, Canada, India, Hong Kong, New Zealand, the US and even South Africa.

In 2015, Singapore also launched the Singapore International Commercial Court, which aims to be the Asian centre for resolving international commercial disputes. The new court joins other international legal institutions in the country such as the Singapore International Arbitration Centre and the Singapore International Mediation Centre.

“In this evolving legal landscape, even as we strive to build our own jurisprudence – itself an important endeavour – Singapore’s lawyers and law students will need to know what’s happening in other countries. They can’t just say that only local law is relevant, because that will be the equivalent of burying their heads in the sand,” he says. ■

# When punches fly in cyberspace

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Professor Gary Chan examines how legal practice has changed in response to the Internet and technology.

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Can a businessman sue a US-based publication for loss of reputation in Australia in respect of an online article? The landmark case of *Dow Jones v. Gutnick* suggests that it's possible, with the Australian High Court deciding in the plaintiff's favour on the grounds that he was suing only for the damage to his reputation in Victoria, Australia, where the online publication was accessed and downloaded by Victorians, and where the plaintiff resided and conducted some of his business dealings.

The article in question is titled 'Unholy Gains', a 7,000-word piece questioning the business practices of Joseph Gutnick, an ordained rabbi widely known as 'Diamond Joe' for his business interests in the mining industry. In their defence as owners of *Barron's* magazine where the article appeared, Dow Jones Corporation argued that the trial should be held in the US since their servers were based there.

"The practical difference is that it is much harder to succeed in a lawsuit based on the defamation law in the US. They have stricter requirements than those in Australia, where the defamation law is more similar to English common law at that time," explains tort law expert Professor Gary Chan from SMU's School of Law, whose interest in defamation law was piqued by this highly controversial case.

## THE IMPACT OF THE INTERNET

*Dow Jones v. Gutnick* is just one of the many cases that highlight the impact that moving communications onto the Internet has had on defamation law. Defamation suits can trace their origins to English common law that tends to develop incrementally. These legal principles have also been modified through statutes

passed by Parliament in the common law countries, Professor Chan says.

"What the plaintiff has to do is prove defamatory meaning, that there was publication to at least one third party, and that the statement referred to the plaintiff," he adds. "However, the advent of the Internet has made it more complicated to apply the rules consistently."

One key issue that Professor Chan has discussed at length in an article published in the *Singapore Academy of Law Journal* is what constitutes defamatory meaning in online media. In the article, he highlighted a local case where the judge had to decide whether the different comments and threads in response to a Facebook post could be regarded collectively as a single publication. Professor Chan also commented on the case in a post on the *Singapore Law Blog*.

"This legal point has implications for defamatory meaning. How do you determine whether a comment is defamatory? For example, the last comment on the fifth thread may not be defamatory on its own, but if you combine it with the fourth, third, second and first thread, looking at it as a whole, it may become defamatory from the reasonable man's point of view," Professor Chan elaborates.

And in the 2015 book *The Law of Torts* in Singapore, written with SMU colleague, Professor Lee Pey Woan, he authored two chapters that track the development of defamation law including Internet defamation both in Singapore and beyond. The book is now in its second edition.

## SUING THE SEARCH ENGINE

Apart from social media channels, one area that Professor Chan predicts that the Singaporean courts may have to deal with is defamation



lawsuits against search engines. He notes that a number of such cases have already arisen in the UK, Australia and New Zealand.

“For instance, if the plaintiff complains that something defamatory shows up when users type in certain search terms concerning the plaintiff, one way is to sue the person who actually wrote the original defamatory materials. But another route is to sue the search engine,” Professor Chan says.

Whether search engines can be liable for defamation seems to vary depending on which country the case is trialled in though the legal position in each country can change over time. Pointing to a case in the UK that decided a few years ago that search engines are not liable, Professor Chan explains that the search engines were deemed not to have control over the results that were obtained by the web crawlers.

“On the other hand, I see a slight shift to the position that search engines do have some control because they can put in algorithms to program the search. There’s also the argument that they benefit commercially from the way they programme the algorithms,” he says, making reference to cases decided in Australia and New Zealand.

#### WHAT COUNTS AS CORPORATE REPUTATION?

In this area of defamation law, Professor Chan sees great potential for interdisciplinary research and collaboration.

“Just take the example of corporate defamation; it raises the question of what the concept of corporate reputation is in the first place. To what extent should it be treated as a commercial asset when we assess a corporation’s loss of reputation? How should it be defined? Should corporate reputation be based on the views of society generally, or should it be based more on those of stakeholders?”

“Investigating these issues involves fields relating to business, management and organisations. And of course, when it comes to Internet defamation there’s social media analytics as well,” he adds.

As the technology continues to evolve, Professor Chan believes that the intersection of

the Internet, reputation and defamation law will continue to be a fruitful area of research for many years to come.

“I expect that it can take us well into the next decade and perhaps beyond. Due to differing public policy stances in different countries, it’s very possible that each country will adopt its own approach to particular aspects of defamation law,” he says. “The lack of standardisation makes this area very interesting.”

Professor Chan, whose other research interests include the Singapore legal system and ethics, has edited two other books with School of Law colleagues: *The Legal System of Singapore—Institutions, Principles and Practices* (in 2015), co-edited with Professor Jack Tsen-Ta Lee, and *Ethics and Social Responsibility: Asian and Western perspectives* (third edition, forthcoming), co-edited with Professor George Shenoy. ■

# Making sense of virtual assets

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Professor Kelvin Low's research shows that the legal rights of people who own some intangible assets are sometimes remarkably ill-defined and poorly studied.

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When the word 'property' comes to mind, most people will relate it to land and real estate, which for the most part have clear laws related to their use and sale. The rights of people who deal in assets such as digital currency bitcoins, carbon credits and even virtual assets in massively multiplayer online games, however, are often much less well-defined.

The research of Kelvin Low, Professor at the SMU School of Law, focuses on trust law and the law of property, specifically on how the law protects people's property. He won an Honourable Mention in the *Journal of Environmental Law's* 2015 Richard Macrory Prize competition for a research paper that examined how legal ambiguities in the European Union (EU) carbon credit trading system are detrimental to its purpose.

## **CARBON CREDITS AS EU LIKES THEM: A BAD PRECEDENT**

Professor Low's paper, titled 'Carbon Credits as EU Like It: Property, Immunity, TragiCO<sub>2</sub>medy?', was co-written with Professor Jolene Lin of the University of Hong Kong Faculty of Law. In it, they explained that the EU had decided not to define the legal nature of its carbon credit, which allows the owner to emit one tonne of carbon dioxide equivalent during a specified period. Instead, the EU allowed each member state in the trading system to create its own definition.

This decision left participants of the scheme in a state of legal limbo as it was difficult to predict how their rights would be protected in any particular member state, particularly because

the designers of the scheme failed to distinguish between a right and a register of the same. It also sowed confusion for the credits' owners as the credits are meant to be traded across borders, and yet would change in nature upon crossing a border.

In the paper, Professor Low analysed how this paucity of guidance had worsened the misfortunes of both parties in the Armstrong DLW GmbH v Winnington Networks Ltd lawsuit in England in 2011. Winnington, a trader of carbon credits registered with the UK registry, had bought 21,000 credits from Zen Holdings, a Dubai-based firm. Winnington, however, was unaware at the time that the credits had been 'stolen' from German company Armstrong.

While the trial judge determined that the carbon credit constituted a property right of some sort, he struggled to determine what private-law rights were conferred by this sort of property. Professor Low found that concessions made by both parties during the trial, certain possibly mistaken assumptions and a number of unexplored claims suggest that the judge's decision in favour of Armstrong is unlikely to be the final word on the subject. He believes that similar lawsuits will become more common in future as intangible property, often poorly defined as a matter of law, increasingly represents a larger proportion of global wealth.

## **FROM CREDITS TO CURRENCY**

Professor Low believes that intangible property such as carbon credits and digital currency bitcoins are remarkably poorly understood from

the perspective of property law because the law has no stable definition of 'property' and some property lawyers reject intangible property as property altogether.

With tangible property such as a car, the legal rights to the asset and the asset itself are two distinct things. With intangible property such as carbon credits, on the other hand, the legal rights are the property itself, since there is no physical product. As such, most intangible property, such as intellectual property, do not cross national borders. Failure to understand this distinction could lead to odd situations, as in the case of the EU carbon credits, where the carbon credits change upon crossing borders depending on domestic laws.

"The way in which my rights to my car are protected may change when I drive across the Causeway to the extent that Malaysian law differs from Singapore law, but the car remains physically the same. It does not transform. However, intangible property is whatever the particular legal system chooses to protect," he explains.

Professor Low plans to work with colleagues from the SMU Sim Kee Boon Institute for Financial Economics to study whether digital currency bitcoins, another intangible product, can and will be treated as property in the law and if so, how rights to bitcoins should be protected. He notes that the common law generally classifies property in two ways: tangible things that are owned through physical possession of them, and intangible things that are owned through the legal rights to them.

"Bitcoins are clearly not the former since they cannot be possessed, but until courts or the legislature recognise 'owners' as having any legal rights to them, they are not obviously the latter either. So bitcoins are extremely interesting from the perspective of a property lawyer because they represent something quite unique," he says.

He adds that bitcoin owners' rights will only be clarified when there is a dispute before the courts. If bitcoin owners are granted property rights over their digital money, this will also be a

remarkably rare occurrence in modern times of new property being recognised by the courts rather than by the legislature.

#### **HOLISTIC VIEW ON PROPERTY NEEDED**

After his bitcoin project, Professor Low intends to start work on a textbook on the law of property. He says that while Singapore has textbooks on land law and personal property law, there is no overarching text on the holistic law of property. This will become increasingly important as many interesting new questions are being raised even in the field of tangible property.

He says, "Most of our law of tangible property is concerned with protecting possession and preventing physical interferences, but with our property becoming increasingly 'smart', it will increasingly become possible to interfere with them without actual direct physical contact."

"Once upon a time, I probably shared the view that intangible property is not really property, but the more I explored the periphery of the law of property, the more I came to believe that this view is, while not without its merits, entirely too simplistic." ■



SECTION 4

# INFORMATION TECHNOLOGY & SMART CITIES TRANSFORMATION

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# FOREWORD

## Information Technology & Smart Cities Transformation

The proliferation of data is a by-product of recent developments in IT and recent smart city transformation efforts. The proliferation of data also presents tremendous opportunities for computing and IT research, for new smart city initiatives, and for new lifestyle and management applications.

The security of data is a paramount concern. The first two articles in this section highlight SMU's capabilities in cybersecurity research. SMU School of Information Systems (SIS) targeted cybersecurity as a priority R&D area in 2003 right at the outset of the establishment of the school. In the ensuing 15 years, the SMU cybersecurity research group has built up a very strong international research reputation for its work in data security, mobile systems security, Internet-of-Things (IoT) and RFID security, as well as computer and software systems security. The two articles elaborate on recent cybersecurity R&D work related to mobile device security.

Data leads to analytics. Since 2010, SMU has steadily built capability at the intersection of analytics and smart city enablement through the following three areas of excellence: Analytics for Business, Consumer & Social Insights, Urban Management & Sustainability, and Ageing & Healthcare Management. Four of the articles in this section highlight analytics-focused research projects associated with these university-wide areas of excellence.

The LiveLabs Urban Lifestyle Innovation Platform brings together mobile sensing, mobile application development and behavioural, consumer and social analytics in Singapore's urban environment. This is an example of SMU's work in the area of Analytics for Business, Consumer & Social Insights. In a project on 'Market Mechanisms for Multi-Party Coordination of Urban Logistics Operations', a faculty from SIS teams up with a LKCSB faculty to develop better algorithms and intelligent software systems for managing last-mile deliveries in dense urban settings. This type of project, combining data analytics with optimisation and resource management decision analytics, is an example of work in the area of Urban Management & Sustainability. The Green Transformation Lab brings together SMU's ongoing collaboration with DHL, the enablement of green supply chains and data analytics. This is another example of SMU's work in the area of Urban Management & Sustainability.

The SHINESeniors Project is a major initiative under the SMU-TCS iCity Lab. This effort brings together SMU's ongoing collaboration with Tata Consulting Services, the use of IoT in the home for the sensing of daily living activities, analytics for identifying changes in living patterns for elderly seniors living alone, and coordination with community care providers to make use of this information. This project is an example of SMU's work in the area of Ageing & Healthcare Management. At the same time this project deeply links to SMU's ongoing work in Urban Management & Sustainability as well as Analytics for Business, Consumer & Social Insights.

More complex and intelligent smart city efforts and more complex IT systems for data management and analytics require more complex software that is highly reliable. Given competitive and commercial requirements, the cost and time of producing such software must be carefully managed and kept within strict limits. To do this, new types of tools to support software development and maintenance are required. The seventh article in this section highlights SMU's efforts in developing these types

of tools for software engineering support. These tools treat software as data and deploy new types of methods for software analytics to support software development and maintenance tasks.

A summary of each essay in this section is given below.



In **Strengthening Cybersecurity Through Research**, Robert Deng and Li Yingjiu discuss ways to tackle the cybersecurity risks associated with mobile computing. The article discusses two projects – the first focuses on developing practical and secure solutions for sharing encrypted data in the cloud, while the second looks at designing secure and usable authentication systems for users of mobile devices. Both projects are done through SMU’s Secure Mobile Centre. To bridge research outcomes with practical needs, the Secure Mobile Centre also collaborates with various government agencies, including the Defence Science and Technology Agency, the Monetary Authority of Singapore, and private sector companies, such as ST Electronics and Huawei Technologies.

In **Keeping Data Safe From Prying Eyes**, Robert Deng provides updates on the recent R&D work of SMU’s highly accomplished cybersecurity R&D team. Deng has been focusing on cybersecurity research for over 20 years, and he brings that depth and sense of perspective to his recent work and to his observations on cybersecurity trends. Through its research fund, the global insurance company AXA recognised Deng’s achievements and ongoing efforts in cybersecurity by conferring him the AXA Chair Professorship of Cybersecurity in 2017. Deng comments on current projects related to the security of mobile phone operating systems and applications, and RFID security. He also gave observations on current cybersecurity trends.

In **Pushing Boundaries in Software Analytics**, David Lo says new innovations are needed to design tools and techniques that can help keep software development and maintenance costs low, while keeping the quality of software systems high. Lo and his colleagues developed a technique called AutoQuery, which allowed programmers to search through codes using dependency queries made out of small snippets of code. They also developed an automated debugging approach, called the Adaptive Multimodal Bug Localisation. These two tools and techniques help to increase efficiency and reduce time and effort needed by programmers in the development and maintenance of software.

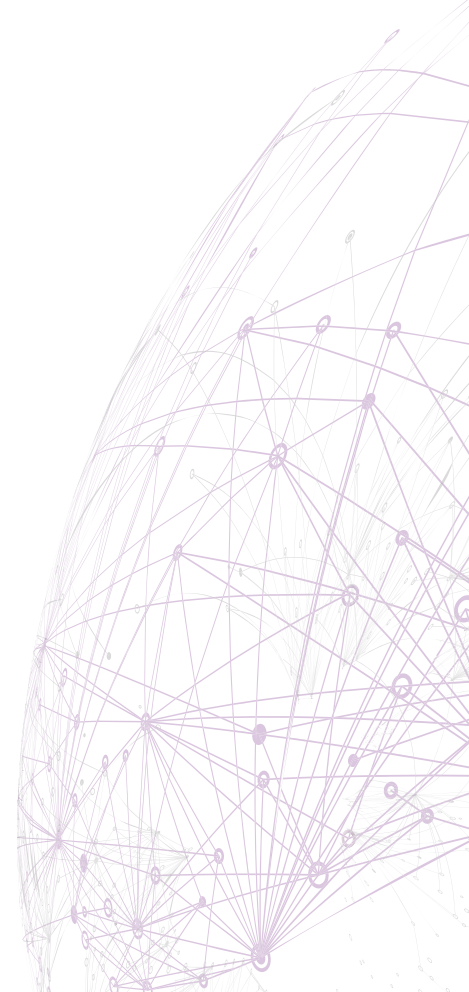
“Is it possible for the ubiquitous smartphone to improve our quality of life and make cities run more efficiently?” queries Rajesh Balan in **Using Smartphones to Turn Cities Into Innovation Engines**. Balan is the co-director of the SMU LiveLabs Urban Lifestyle Innovation Platform, a major centre for mobile technology development and a unique test bed for mobile application deployment. LiveLabs is an in situ, real-time, mobile-based behavioural test bed, that has enabled Balan and his research colleagues to do unique types of work with the SMU community as well as with Singapore-based industry and government partners. Livelabs meshes very well with the government’s plan to develop Singapore into a smart city, he adds.

Lau Hoong Chuin and Lim Yun Fong combine their mathematical, computational and business know-how in **Managing Cities with Urban Computing** to address challenges facing the inner-city deliveries of orders and shipments. The current urban logistics industry in Singapore is fragmented and unregulated, they say, making it both operationally and environmentally inefficient. Other challenges related to urban logistics include the rise of e-commerce, as well as last-mile deliveries, which exert tremendous pressures on the economic, environmental and social well-being of cities. Together, the two professors worked on a project to develop methods and technologies that would enable multiple parties in the last-mile supply chain to collaborate on a win-win basis. Lau is building on this urban logistic work by participating in a Singapore Smart Nation effort to reduce urban congestion and delays associated with deliveries to shopping malls.

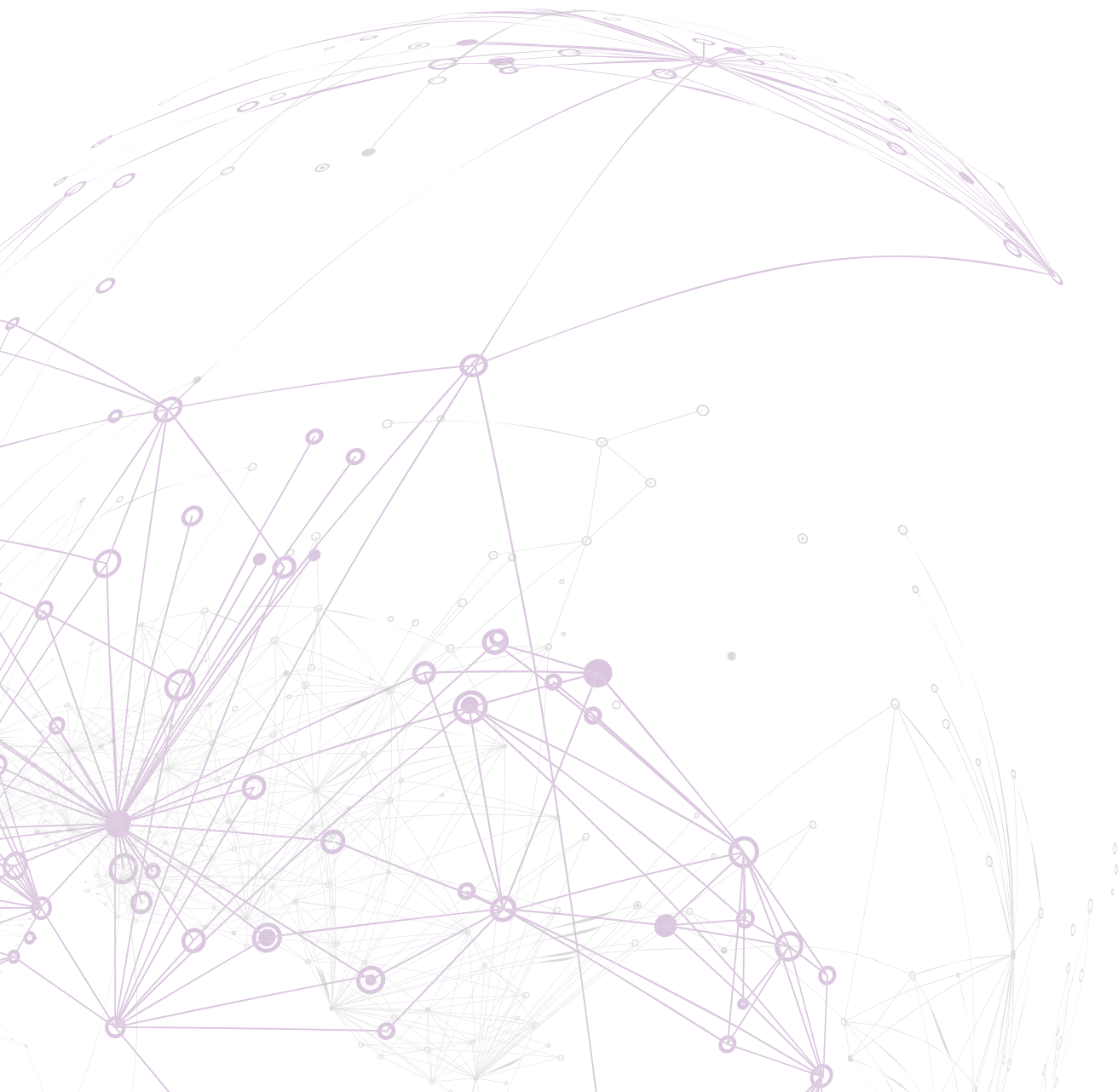


In **SMU's Green Transformation Lab Transforms the Future of Logistics**, the global logistics company DHL and SMU celebrate three years of collaboration and innovation in improving the efficiency and sustainability of shipping goods in Asia-Pacific. Transport provides a significant contribution to a product's environmental footprint and the Green Transformation Lab has been creating solutions that have been helping organisations to make their supply chains greener, more resource-efficient and sustainable. The lab has been an excellent example of combining academic standards with commercial pragmatism to bring completely new approaches to light.

In **Smart Homes Enhance Seniors' Safety**, Tan Hwee Pink and his research team at SMU's iCity Lab explain how they are using IoT and other technological tools to enhance the efforts of community caregivers to manage how they provide the crucial, person-to-person contact needed for older people living alone. Under the SHINESeniors project co-funded by Singapore's Land & Liveability National Innovation Challenge (L2NIC) and Tata Consultancy Services, they equipped an initial set of 50 one-bedroom apartments with passive motion sensors, and developed the analytics to detect unusual periods of inactivity. The analytics results are transmitted to community care organisations responsible for overseeing the elderly living alone in their catchment area. The SHINESeniors' effort has brought together technology enablement with the real needs of community care organisations, their field workers and the real behaviours of elderly seniors living alone. This deep integration of the IoT and analytics technology with the social and behavioural aspects is what has been making this pilot effort so interesting, as it continues to expand and scale up. ■







# Strengthening cybersecurity through research

## Tackling cybersecurity risks in mobile computing by Professors Robert Deng and Li Yingjiu.

Mobile computing has become a fundamental feature in modern day life as people develop an unprecedented reliance on smart phones and tablets. However, along with their ubiquity comes a host of risks that can affect personal privacy, sensitive corporate information and even national security.

Professor Robert Deng from the SMU School of Information Systems (SIS) believes that current approaches to mobile computing security have been ineffective because they fail to consider differences between platforms and applications.

“Mobile devices are power- and resource-limited compared to desktop computers due to their smaller sizes. They are open to more channels such as mobile networks, Bluetooth, Wi-Fi and storage cards. They also have increased functionality due to their ability to download applications. The mobility, connectivity and extensibility of mobile devices mean they require targeted and efficient security solutions,” says Professor Deng, who is also the director of SMU’s Secure Mobile Centre (SMC).

This calls for a new approach to security research in mobile computing, one that he and his colleagues at the SMC aim to develop.

### SECURING PLATFORMS AND DATA

Launched in February 2015, the SMC is funded by Singapore’s National Research Foundation under the National Cybersecurity Research and Development Programme. The centre conducts research under three inter-related programmes, each led by professors from SIS.

Helmed by Professor Ding Xuhua, the Mobile Platform Security Programme aims to design a hardware-protected, secure environment for mobile devices to safeguard the code, data and execution integrity of critical mobile apps under a compromised operating system.

Professor Gao Debin heads the Mobile Application Security Programme, which studies how mobile malware spreads and how to effectively detect and contain it to minimise damage.

The Mobile Internet Service Security Programme comprises two projects. Led by Professors Robert Deng and Pang Hwee Hwa, the first project focuses on developing practical and secure solutions for sharing encrypted data in the cloud.

“Cloud data storage is becoming increasingly popular. However, since software systems are not guaranteed to be bug-free and hardware platforms are not under the direct control of data owners in the cloud, security risks are abundant. A common solution to mitigate users’ privacy concerns is to encrypt their data before it reaches the cloud. This keeps the data private even if service provider systems are compromised or untrusted,” says Professor Deng.

However, he notes that it is extremely challenging to share large amounts of encrypted data using traditional techniques because of the difficulty in distributing decryption keys and managing decryption key revocations. For example, when people leave an organisation, their decryption keys must be revoked so they are no longer able to access the organisation’s data.

The SMC has filed a patent on a new technique that will allow individuals and organisations to share their encrypted data in the cloud in a scalable and efficient manner. This new technique allows efficient decryption on mobile devices and supports user revocation in real-time.

The second project that is headed by Professor Li Yingjiu focuses on designing secure and usable authentication systems for mobile users.

Mobile platforms that authenticate the face of a legitimate user are not new. They are an attractive alternative to passwords, which are often difficult to remember. However, most face-authentication systems currently in use are intrinsically vulnerable to forgery by means of photos or videos of the legitimate user.

To overcome this problem, researchers at the SMC have developed FaceLive, a system that can differentiate between a photograph or video of a user and a 'live' one. FaceLive corroborates facial video information with live motion data from the mobile device to verify an actual live feed from the user. It uses a front-facing camera, an accelerometer and a gyroscope to detect three-dimensional characteristics of a live user's face by measuring the consistency between head movements captured in a video and those captured through sensors in the mobile device.

FaceLive simply requires users to hold and move their mobile device in front of their face while the front-facing camera captures a video of their face and the sensors simultaneously record motion data about their device. A live user is authenticated if changes in head movement in the video are consistent with movements captured by the device. According to Professor Deng, FaceLive can operate under complex lighting conditions and compensate for a range of cumulative errors that can happen while detecting head movements during face authentication.

Like most systems, FaceLive could be vulnerable to sophisticated attacks, but the system is an improvement on current face-detection software. "Our technique significantly raises the bar for adversaries to perform attacks," says Professor Li.

## SUPPORTING SINGAPORE'S TECHNOLOGY AIMS

Singapore aims to establish itself as a Smart Nation by tapping into the vast potential of technology. "Mobile computing security is an important aspect, for it is essential to ensuring service continuity, integrity and privacy. The application of SMC's work will also be relevant for a wide range of services ranging from emergency response to critical infrastructure monitoring, e-commerce to e-government services, and strengthening social networks to care for an ageing population," notes Professor Deng.

He adds that cybersecurity research is inherently multi-disciplinary for it involves cryptography, software, hardware, multimedia processing, human-computer interaction, computational cognitive modelling and security policies.

In view of this, the SMC is working closely with key industry players, including ST Electronics (a subsidiary of ST Engineering); international digital security company Gemalto, which produces SIM cards; telecommunications company StarHub; and computer security firm, McAfee Singapore, which is now part of the Intel Security Group.

To bridge research outcomes with practical needs, SMC also collaborates with various government agencies, including the Defence Science and Technology Agency, and the Monetary Authority of Singapore.

SMC's principal investigators have held in-depth discussions with these government agencies to align their research with Singapore's technological needs. "The team works very closely with industrial partners and end-user organisations to ensure that the project research and development deliverables not only have excellent academic value but can also be integrated into products and operational systems to create practical value of considerable impact," says Professor Deng. ■

# Keeping data safe from prying eyes

An expert in information security research, Professor Robert Deng is constantly trying to beat hackers at their own game.

In 2011, Rupert Murdoch's *News International* sparked a heated controversy for spying on celebrities and public figures to obtain tabloid fodder. Revealing the dangers of data leaks, this incident remains a stark reminder of how crucial information security is, even today.

In this day and age where the economy is powered by huge swathes of data, information systems are highly valued yet susceptible to great risks. "Risk and value are positively related, i.e., if value increases, so does risk. Twenty years ago, information security research and education were unheard of. But information systems today have become so valuable that hackers are paying a lot of attention to them. This has led to a tremendous increase in risk," explains Robert Deng, Professor at the SMU School of Information Systems (SIS).

Since his entry into the-then nascent field, Professor Deng has actively pursued his research interest in keeping information safe and secure. Information systems consist of processed data that is either stored in repositories (e.g., CD-ROMs or hard drives), or flowing within networks (e.g., SMS text messages). Such systems are not fail-safe, and thus, have loopholes. For example, a confidential document may be accessible to the public due to poor encryption schemes, despite the owner's efforts at protecting its privacy. Even smartphones, which are perceived by some to be the greatest industrial innovation of the 21<sup>st</sup> century, are vulnerable to unauthorised access by third parties or hackers.

This underscores the significance of one of his latest research projects that has given him

immense satisfaction: exposing the security flaws of Apple's iPhone Operating System (iOS). Together with his team from the SIS (including Professors Li Yingjiu and Gao Debin, as well as their PhD students), and collaborators from the Agency of Science, Technology and Research, they identified a generic method in which third party applications such as mobile games could be used to launch attacks on iOS devices. The team demonstrated that the method could be used to perform hacking functions, such as cracking personal identification numbers and taking screenshots, without the owner's knowledge.

Having noticed this potential vulnerability that could be exploited by hackers, the team, with Professor Deng's guidance, devised mitigation strategies to allow Apple's engineers to vet third party applications. The team then contacted Apple's Product Security team, which incorporated these strategies into the iOS7 system update. When iOS7 was released in September 2013, the team's contribution was acknowledged by Apple.

## FROM IOS TO LOGISTICS AND LAW

In reality, the application of information security is much more diverse. Besides smartphone operating systems, radio-frequency identification (RFID), a ubiquitous technology that enables non-contact identification of objects via electromagnetic waves, is commonly used in logistics and accounting.

For example, in the context of supply chain management, containers of goods are tagged with unique RFID chips for more efficient

processing and logistics operations. But third parties can eavesdrop into specific radio-frequency channels and monitor the RFID chips embedded within containers. This is where Professors Deng and Li, together with their team extended their research focus to examine potential loopholes in RFID technology, and devise countermeasures to strengthen existing security protocols.

Professor Deng says information security also has an impact on law. “In the real world, we have handwritten signatures. In cyberspace, there are digital signatures that are used to authenticate and identify users. There are (parliamentary) acts that allow digital signatures to be used as evidence in the court of law. In law research, researchers should understand how digital signatures are made secure. Some of the technical implications of the validity of such evidence should also be clarified.”

#### **BIG DATA AND MOBILE COMPUTING SECURITY**

When asked what the future holds for information security, Professor Deng says research directions will align with social, economic and cultural trends. In particular, interest in big data and increasing pervasiveness of mobile technologies will play monumental roles.

“Data mining involves analysing raw data to derive useful information, for example, on understanding consumer behaviour. We could venture further by looking into data mining on encrypted data. There exists some research in this area, but so far, its practicality has not been proven. This domain is worth exploring, as information security grows into a more robust field, and more information gets encrypted by the day,” shares Professor Deng.

Equally interesting is the rise of mobile computing security, as people develop stronger reliance on their smartphones and tablets. Professor Deng notes that the novelty of mobile technology means the field is still amorphous, with much room for exploration by both hackers and security experts. The recent contribution of his team to iOS7 is but the tip of the iceberg.

“Current approaches to mobile computing security have failed to consider key differences

between platforms and applications when adopting traditional technologies from non-mobile environments. This calls for a new approach to security research in mobile computing,” he explains.

But as hacking strategies evolve, so will Professor Deng’s research. He is looking forward to expose more security flaws in the mobile technology space, and to find solutions to beat hackers at their own game. ■

# Pushing boundaries in software analytics

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Professor David Lo is working to push the boundaries of what can be done by analysing huge amounts of software data.

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Software analytics is a relatively new field of research, having developed more formally near the start of the 21<sup>st</sup> century. It involves analysing the large amount of data produced during the software life cycle, including source code, bug reports, and user feedback. By analysing this data, software developers are able to improve software development and performance.

Professor David Lo at the SMU School of Information Systems has published many research papers on the topic in the past six years.

“My work is motivated by the high cost involved in developing and maintaining software systems and the importance of delivering systems of high quality,” says Professor Lo. “New innovations are needed to design tools and techniques that can help keep software development and maintenance costs low, while keeping the quality of software systems high.”

The surge of software data that has become publicly available online provides excellent opportunities to create customised solutions that can be used to automate software engineering tasks, he explains.

“Being able to create new solutions to tackle concrete problems excites me the most,” he says.

Even though software engineering has been a part of information systems for some time, it still faces a wide range of problems that require solutions. The field has been developing rapidly in recent years with the introduction of new platforms, processes and programming tools to create software products. This not only creates new challenges but also new opportunities, Professor Lo explains.

“Being able to understand and work with those challenges and design solutions to address them, not alone but with students and colleagues from academia and industry across the globe, makes my job an interesting and satisfying one,” he says.

In 2014, Professor Lo published a study he conducted with two other SMU colleagues in which they developed an algorithm to create a search engine for source code (commands that are assembled into a software programme). Many code search techniques had been proposed previously, but they depended on searching through text only. However, source code is not mere text, it contains elements that depend on one another in order for the software programme to perform an execution process. Professor Lo and his colleagues developed a technique called AutoQuery, which allowed programmers to search through codes using dependency queries made out of small snippets of code. The technique took into consideration the code structure rather than simply looking at its text.

## BETTER WAYS TO DEBUG

Software programmes often contain defects or bugs that need to be detected and repaired. This manual ‘debugging’ usually requires much valuable time and resources. To help developers debug more efficiently, automated debugging solutions have been proposed. One family of solutions goes through information available in bug reports. Another goes through information collected by running a set of test cases. Professor Lo notes that until now, there has been a ‘missing

link' that prevents these threads of work from being combined together.

Together with colleagues from SMU, Professor Lo has developed an automated debugging approach called Adaptive Multimodal Bug Localisation (AML). It gleans debugging hints from both bug reports and test cases, and it performs a statistical analysis to pinpoint programme elements that are likely to contain bugs. Moreover, AML adapts itself for different kinds of bugs.

"AML can reduce the manual process of finding where a bug resides in a big programme," he explains. "While most past studies only demonstrate the applicability of similar solutions for small programmes and artificial bugs, our approach can automate the debugging process for many real bugs that impact large programmes," he explains.

Professor Lo and his colleagues presented the AML at the 10<sup>th</sup> Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering in Italy. They plan to contact several industry partners to take AML one step closer to being integrated as a software development tool.

### TAKING A MULTI-DISCIPLINARY APPROACH

Professor Lo is enthusiastic about multi-disciplinary work with his SMU colleagues. "Besides colleagues who specialise in similar research areas, I collaborate with many other colleagues across the five research areas at the School of Information Systems," he says. "I have benefited from their diverse expertise to solve challenges that I otherwise could not have solved alone, and to spot opportunities that I otherwise would not have noticed. These collaborations have resulted in many pieces of work that have been published in various international conferences and journals."

Professor Lo is also hoping to be involved in future collaborations with colleagues from other schools at SMU. "I strongly believe a multi-disciplinary approach will result in holistic research works that expand the frontiers of research in new and interesting directions," he says.

For example, he is currently looking at ways

to optimise cooperative workflows in software organisations and in open source teams. A project of this kind would require expertise from diverse fields such as organisational behaviour, psychology and group behaviour, empirical analysis, applied statistics, and game theory. Professor Lo also plans to study the problem-solving and mental task processes that software developers undergo. This project would benefit from the expertise of his colleagues from the School of Social Sciences in psychology, he says.

Aside from his research projects, Professor Lo enjoys teaching a variety of undergraduate and postgraduate software engineering courses at SMU. He supervises undergraduate projects that require teams of students to develop software solutions for real clients, and also works closely with SMU PhD candidates to bring his research ideas to fruition.

"SMU provides a lot of support for faculty members to do research, for instance, travel grants to present papers at conferences; visiting professors; and hardware support are some of the things that SMU provides to facilitate research activities. "Also, the Office of Research & Tech Transfer has provided much support for research grant submissions, and the SMU library has provided much support in securing greater visibility for my work", he says.

One of Professor Lo's research ambitions is to develop an Internet-scale software analytics solution. With Internet-scale software analytics, massive amounts of passive software data buried in myriads of diversified online repositories can be analysed to transform manual, painstaking and error-prone software engineering tasks to automated activities that can be performed efficiently with high quality. This is done by harvesting the wisdom of the masses, accumulated through years of development efforts by thousands of developers that are hidden in these passive, distributed and diversified data sources. "I strongly believe this will be ground-breaking because no existing software analysis technique has come close to making sense of software engineering data at this scale and diversity in a holistic way," says Professor Lo. ■



# Using smartphones to turn cities into innovation engines

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Can smartphones improve our quality of life and make cities run more efficiently? Professor Rajesh Balan is working towards this vision.

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Mobile devices such as smartphones are now so widely and intensely used that they have almost become extensions of the human body. Can we take advantage of this connectivity to save time, improve quality of life, and make cities run more efficiently?

Moving towards this vision is Professor Rajesh Balan at SMU's School of Information Systems, who develops novel mobile computing technologies for diverse applications, including traffic management, digital wallets and social networking. He is also co-director of the SMU LiveLabs Urban Lifestyle Innovation Platform, a unique test-bed for mobile technologies.

"This idea of creating live test-beds is very exciting as it is unique and extremely useful not just for academic researchers, but also for companies that want to understand their customers better," Professor Balan says. "It also meshes very well with the government's plan to develop Singapore into a smart city."

## MOBILE COMPUTING IN PUBLIC TRANSPORT

Professor Balan was drawn to mobile computing because of its unique challenges. Like most other computing disciplines, the field makes use of technology to solve technical problems, such as extending the battery life of a smartphone. At the same time, however, human-centric technologies are also needed so that people will be willing to use the phone. "Whatever I develop has to be both technologically innovative and

impressive, as well as easy to use and engaging," he explains.

One of Professor Balan's earlier projects involved working with a large taxi company in Singapore to build a real-time trip information system. By rapidly searching a huge database of historical data, the system could predict the duration of any taxi trip to within one minute, and the fare to within 50 cents. It also took into account variables such as traffic conditions and Singapore's taxi fare structure, which charges different rates depending on the day of the week and the time of the day.

A paper on the project titled 'Providing Real-Time Feedback for a Large Taxi Fleet' was published in 2011 in *Proceedings of the 9<sup>th</sup> International Conference on Mobile Systems, Applications, and Services*. Besides taxis, the system also has potential to be useful to bus and train operators, as well as to logistics companies looking to improve their operations.

## SOCIETY AS A LIVING LABORATORY

For Professor Balan, solutions to research questions should always be useful to people. In 2012, this focus on the end-user led him and colleague Professor Archan Misra to start LiveLabs, a platform that enables researchers to test lifestyle-related mobile computing technologies on people in real environments. LiveLabs is currently available across the SMU campus, with 3,000 students voluntarily signed



up by 2016. It is also being expanded to other public spaces such as the Suntec Convention & Exhibition Centre and Sentosa.

“This kind of in situ, real-time, mobile-based behavioural test-bed is unavailable anywhere else in the world,” notes Professor Balan. In LiveLabs, a marketing researcher could, for example, send students working in the library two different promotions on their smartphones: a standard discount for 10% off a cup of coffee, or a more social ‘buy one coffee get one free’ promotion. The researcher can then observe which version proves more popular. Using sensors already existing in participants’ smartphones, malls can send out personalised, location-specific shopping recommendations and discounts. To safeguard individual privacy, participation would be opt-in, and sensitive information would be removed from all the collected data.

Trials of many different mobile technologies are now underway at LiveLabs, including detecting the location of unoccupied tables and chairs in the library, automatic tracking of food consumption using a smart watch, and peer-to-peer mobile gaming that allows train commuters to play games with one another without using data networks.

### **THE FUTURE: A NATION OF SMART CITIZENS**

Professor Balan believes that in the near future, mobile connectivity can be leveraged to create the concept of a ‘smart citizen’, where “each individual will play a much stronger role in the welfare and upkeep of their environment”.

For example, trash cans are now emptied only when cleaning staff physically make their rounds. With the smart citizen concept, anyone who sees a full trash can immediately report it – through a mobile app or a web form, for instance – and alert the cleaning staff. Customers in the supermarket can report how many people are ahead of them at the checkout counter, and commuters can provide feedback on the status of subway lines.

By providing the right incentives, an advanced version of this concept could even get people to perform micro-tasks on behalf of others. For example, an elderly person who needs a

carton of milk would simply state this request into an app. The app would then find someone whose route would take him past the grocery store as well as the elderly person’s home; he could then be asked to buy and deliver the milk at only a small inconvenience to himself. In return, he would be rewarded – with vouchers sponsored by a company, for instance.

“This would open up completely new and innovative ways for people to help each other, while receiving something in return for their help,” he says. “I see a future where everyone is connected with everyone else, and where those connections can be used to improve society as a whole.” ■

# Managing cities with urban computing

SMU Professors Lau Hoong Chuin and Lim Yun Fong are combining their mathematical, computational and business know-how to address challenges facing the inner-city deliveries of orders and shipments.

The interdisciplinary field of urban computing involves the acquisition and analysis of large amounts of data in order to tackle major issues faced by cities. One of these issues is the logistics of last-mile deliveries, a term used to describe the transportation of goods from hubs outside of the city to their final destinations in homes and businesses.

“With the rise of e-commerce and ageing populations in major cities like Singapore, last-mile deliveries exert tremendous pressures on the economic, environmental and social well-being of cities,” says Professor Lau Hoong Chuin from the SMU School of Information Systems.

“Many trucks deliver goods or parcels to retailers, offices and households in urban areas every day,” adds Professor Lim Yun Fong from the SMU Lee Kong Chian School of Business. Uncoordinated deliveries add to congestion, pollution and noise, he explains.

Professors Lau and Lim wanted to coordinate these last-mile deliveries so that fewer trucks would need to enter the urban area, substantially reducing traffic.

Professor Lau explains that the problem with the urban logistics industry in Singapore is that it is fragmented and unregulated, making it inefficient both operationally and environmentally. This is an issue in many large cities around the world. “I see the challenge and opportunity to create a positive impact by working on this problem,” he says.

Together, the two professors worked on the project titled ‘Market Mechanisms for Multi-Party

Coordination of Urban Logistics Operations’ to develop methods and technologies that would enable multiple parties in the last-mile supply chain to collaborate on a win-win basis.

## DETERMINING THE WINNING BID

The professors first developed a system that allows multiple companies to consolidate their orders for delivery. They did this by employing the concept of Urban Consolidation Centres (UCCs). The UCCs receive goods carried by large trucks owned by multiple shipping companies and are responsible for delivering the goods within the city’s centre. They either have their own fleet of vehicles to deliver the goods or a docking facility for goods to be transferred to other vehicles – vehicles belonging to other companies which are compliant with inner-city transportation laws. Cities such as Nijmegen in the Netherlands, Paris in France, and Fukuoka in Japan have operating UCCs that are located in the outskirts.

Professors Lau and Lim considered the case of a UCC that operates its own delivery vehicles. They designed an automated auction mechanism that allows shippers to specify their delivery requirements through a bidding process that allows shippers and the UCC to minimise their costs and, at the same time, maximise the UCC’s total profit.

However, as this auction protocol did not consider companies’ need to plan deliveries weeks ahead of time, Professors Lau and Lim refined the model to allow for a ‘rolling horizon auction’. In this scenario, shippers can bid over successive

auctions up to four weeks in advance for spaces in carrier delivery vehicles. The capacity of the same truck is also up for bid in each auction. Announcements of the results of each bid throughout the four-week period are made to give losing bidders a chance to arrange for alternative means of delivery or to alter their bid prices and resubmit them in subsequent auctions. The auction mechanism still exists, but it is modified to consider a more complex set of factors.

The team's computational experiments showed that the rolling horizon model improves companies' revenues by 28% when compared to a single period auction. This method is able to generate more revenue as it reserves a truck's capacity for more profitable bids that may come along as the final auction week nears.

Taking the model a step further, the team developed a 'double auction' platform that allows shipping companies to indicate the amount they are willing to pay a carrier to deliver their goods from the UCC into the city. Likewise, delivery carriers indicate the amount they are willing to accept as a fee. Both types of companies will then specify the areas they need or are willing to deliver to, and an optimisation model will determine the winning bid based on all the information submitted. The team conducted a computational study using the model, and was successful in demonstrating the platform's effectiveness in saving costs for both shipping companies and delivery carriers.

### PROGRAMMING INNER-CITY LOGISTICS

As an extension of this project, Professor Lau worked with a team of researchers from the National University of Singapore and Nanyang Technological University to consider a real-life case study of an urban zone in Singapore that includes five shopping malls. They identified a busy Singaporean precinct and conducted field studies in the area. Besides engaging with the stakeholders, such as the suppliers, carriers, shopping malls, retail shops and in-mall carriers, observations, questionnaires and semi-structured interviews were also carried out to map the situation in the region. After surveying the area, they found three main challenges: retail shops

ordered their goods separately from one another; traffic density to and from the malls varied throughout the day and week; and the distribution of goods to and within malls was inefficient.

To encourage the stakeholders to collaborate in consolidating their orders and deliveries, the team developed the concept of Retail Precinct Management, which optimises the use of delivery routes and loading docks at malls, improving waiting and final delivery times.

The model integrates real-time and static data on moving traffic and shopping mall car parks to determine the best routes and time to load and unload delivery vehicles. The model is also capable of handling trucks that unload at a mall and thereafter deliver goods to other malls (either by hand or by using smaller vehicles, to save time at mall docking bays). From their calculations, using the model results in a 40% decrease in the usage of vehicles, and travel distance would be almost halved compared to usual distances travelled. Waiting times and carbon emissions would also be significantly reduced.

With the successful trial runs, the team plans to work with a large local logistics provider to test its platform, says Professor Lau.

Their main challenge during the project was engaging the stakeholders to participate in the initiative, says Professor Lau. It was hard for them to see that this research could, in the long term, lead to cost benefits for them. The team is now working on finding different ways to incentivise the stakeholders. They also plan to expand their studies to other retail clusters in Singapore and other countries, with hopes to play a role in relieving congestion in regional commercial hubs caused by a rapid flow of public, private and freight vehicles in and out of regional centres.

This project builds on years of professional collaboration and friendship between Professors Lau and Lim. "I know his research interests and capabilities well, so he was a natural choice!" says Professor Lau of their collaboration.

"Our backgrounds complement each other for this project. Professor Lau is an expert in using computers to solve complex, real-world problems and I am familiar with the theoretical methods for solving such problems," adds Professor Lim. ■

# SMU's Green Transformation Lab transforms the future of logistics

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The Green Transformation Lab celebrates its third year of innovation.

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The global logistics company DHL and SMU are celebrating three years of collaboration in improving the efficiency and sustainability of shipping goods in Asia-Pacific.

From television sets to t-shirts, paperclips to cars – goods travel vast distances from manufacturing plants to their end consumers. A significant contribution to a product's environmental footprint comes from its transport.

To accelerate the evolution of sustainable logistics, DHL and SMU formed the Green Transformation Lab (GTL) in 2013. Tapping on DHL's standing as the world's leading logistics company to present real-world business scenarios and challenges, SMU's faculty and students come together to work with DHL in developing new ideas and innovative solutions.

"The lab's vision is to be the catalyst for change," says Professor Tan Kar Way, the academic director of GTL. "We aim to create solutions for organisations and supply chains that lead to large-scale adoption so they become greener, more resource-efficient and sustainable."

GTL's performance in the past three years has exceeded expectations.

"We frequently are surprised by the unconventional approaches that students and the faculty choose, as well as how these approaches produce unexpected solutions to the problems," says Stephan Schablinski, Director of Sustainable Supply Chain Solutions at DHL.

For example, GTL developed an application that optimises the choice of ocean container sizes and provides consolidation options at key ports. Many ocean shipping containers have

unutilised space in them, presenting a significant opportunity to reduce carbon emissions and costs. Many manufacturers ship directly from their factories to the consumer markets without much consolidation planning. The application helps manufacturers analyse options for picking the most appropriate shipping container size, and thereafter consolidate the freight at key ports before forwarding the items to their destinations.

Using real data from a manufacturing company, a SMU student determined that selecting optimal shipping container sizes could potentially result in a 13.1% decrease in carbon emissions. Consolidating goods from multiple manufacturing plants at a port can further reduce carbon emissions by 12% for this company.

To help companies better understand the impact of different shipping options on carbon emissions, GTL, together with SMU students, revamped the Carbon Dashboard application to make it more visually appealing and user-friendly. An IT application that estimates carbon emissions for shipping routes and modes, Carbon Dashboard 2.0 allows companies to explore different shipping routes and the corresponding carbon footprint, so that they can consider the greener routes in the future. The application was fully commercialised in 2014 and is now used by DHL's clients regularly.

"This tool enables DHL customers to really see where emissions along the supply chain are highest and try different 'what if' scenarios to see how they can reduce emissions and save money," Schablinski says.

Another useful application to come out of GTL

is the Online Energy Certificate, a web-based platform that DHL customers can use to measure energy efficiencies of warehouses. Developed by a group of undergraduates, the tool allows users to compare their facilities with an idealistic warehouse that adopts the best practices and to see how their warehouses can be modified to become more energy-efficient. To further improve the benchmark methodology, a master's student took the lead on developing an algorithm that enables fair benchmarking for energy consumption based on data from a large number of warehouses.

To date, more than 150 undergraduate and master's students have worked with GTL as part of their coursework, and many have enjoyed the real-world experience presented to them.

"Students learn that the logistics and supply chain industry is actually more exciting than they initially thought, and this is an area where innovation in IT and data analytics can make a big difference," Schablinski said. "We hope that GTL will continue to make our industry more attractive for young talent."

The students have also helped raise awareness amongst local firms on the need for more sustainable packaging and shipping practices, and that environmentally-friendly choices do not have to cost more.

"The best part of the GTL is how closely students have been able to work with the local industry," said Dr. Aparna Mukherjee Rajesh, Group Lead of Management Programmes at the SMU Lee Kong Chian School of Business. "Their research can be directly applied to real situations. I believe other departments can follow GTL's model in making an impact in the industry."

Apart from working with students, GTL also partners with the industry and government agencies. Environmental sustainability at ports has been receiving attention from port operators and regulators, and with the growing interest on building a clean and green port for Singapore, GTL worked with the Maritime Port Authority of Singapore to develop a sustainability framework for port terminals. The framework, which covers transparency measurements, best practices, technologies and policies that allow business

units in terminal operators to be accountable for their energy consumption, will help gear Singapore's maritime operations towards sustainable green growth. The project was awarded the Special Mention Award as the top Policy Research Project in Singapore Maritime Institute Project Showcase April 2016.

In addition, GTL conducted an analytics study for a large IT manufacturing company to locate the most suitable site for its production plants. Through considering factors such as the inbound and outbound flow of raw materials and finished goods, the study provided the company with an economical strategy in the forward planning of its operations.

As more companies reach out to GTL for collaboration on sustainability projects, Dr. Mukherjee Rajesh is thrilled, as the companies can bring in more real-life business challenges for SMU faculty and students to work on.

DHL originally seeded the lab with \$2 million for an initial duration of 2 years. In 2015, DHL extended its commitment for another two years until March 2017. Four DHL full-time employees share office space with students and faculty, providing industry with insight and guidance. The tangible products produced by GTL contributed to DHL's win of the Best Practice Leadership in Energy Management prize at the 2015 Sustainable Business Awards (SBA) Singapore, for the second year in a row.

"What makes the lab different is the unconventional mix of academic standards and commercial pragmatism, which brings completely new approaches to light," Schablinski said.

Going forward, GTL will focus on developing the circular economy - where items once considered waste at the end of their life cycle are recycled, reused or refurbished.

To spark new ideas on circular economy practices amongst industry, GTL co-hosted a symposium on the circular economy, shared value and urban mobility. About 100 industry professionals, academics and researchers gathered to discuss how to move people and goods around cities more efficiently, as well as how to make mega cities more sustainable.

One key project that GTL has embarked on

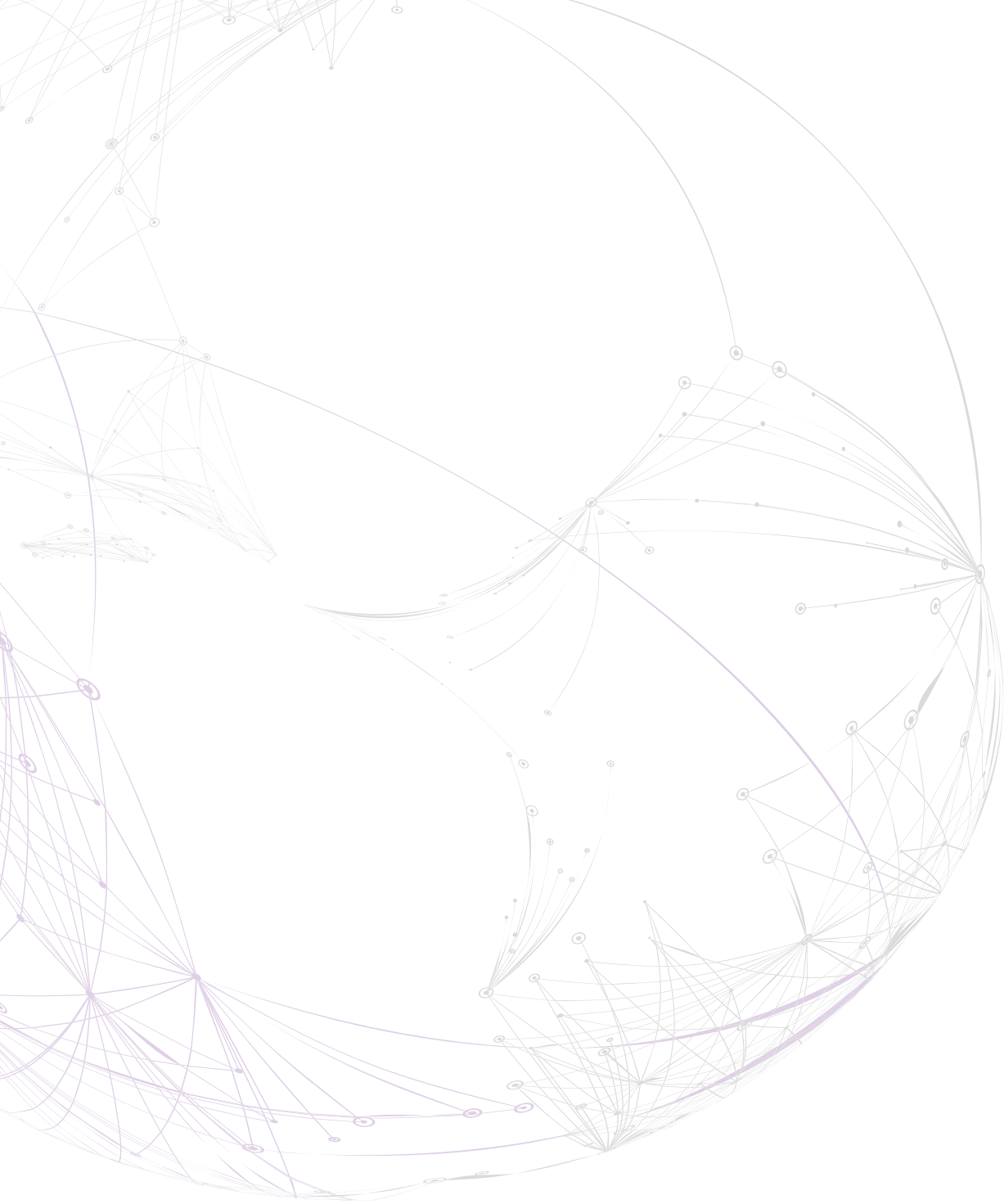
for this endeavour is the Circular Economy Tyre Study, which researches on how to reuse tires instead of piling them up in landfills. Another project, Wheels4Food, aims to help the distribution of excess food to reduce food waste. This project is a partnership with Food from the Heart, a non-profit food bank in Singapore.

“With a greater strain on resources, it is imperative to move away from the model of ‘take, make, dispose,’” said Professor Tan. “Logistics is one of the key catalysts and defining components for value creation towards new business models that incorporate circular practices.”

The lab also wants to help companies create business value by addressing social problems that intersect with their operations, something called “Shared Value”. Dr. Mukherjee Rajesh noted that often companies are viewed negatively as earning profits at the expense of the greater good.

“What if the public could see businesses doing good for their communities and simultaneously creating economic benefits for themselves? What if corporate mind-sets could be changed to view environmental and social problems not as constraints, but as business opportunities?” she said. “Shared Value can help achieve the paradigm shift.” ■







# Smart homes enhance seniors' safety

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Professor Tan Hwee Pink and researchers at iCity Lab are using sensors to increase the safety of seniors who live independently in their own homes.

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In Singapore, as well as many other countries, ensuring a high quality of life for an expanding elderly population demands that community eldercare providers strike a delicate balance between frequently competing factors. For instance, safety is sometimes at odds with privacy; providing comprehensive care may erode an elderly person's cherished sense of independence; and a sense of security may give rise to a sense of being controlled.

Project SHINESeniors, which is focused on resolving these contradictions, does so by creating a "smart home" for older people living alone. Driven by a research team at SMU's iCity Lab (co-founded by SMU and Tata Consultancy Services), the project is funded by the Singapore Ministry of National Development and National Research Foundation under the Land and Liveability National Innovation Challenge (L2NIC) grant.

As part of the three-year project, the team has equipped 50 one-bedroom apartments with motion sensors that can detect unusual periods of inactivity – a possible indication that the tenant has either fallen or suffered a health crisis. This information is then fed to a Voluntary Welfare Organisation (VWO) for its staff and volunteers to react to the potential emergency.

Although other projects in Singapore are testing similar technologies, what makes Project SHINESeniors unique is its focus on how the technological tools can enhance the efforts of community caregivers who provide the crucial, person-to-person contact with elderly tenants.

"What we are providing that's of value is tying the technology to care provisioning," says Professor Tan Hwee Pink, Academic Director of iCity Lab. "We see it as a more complete, holistic, and end-to-end evidence-based approach to ageing. The technology enables community organisations to improve their operations and increase their effectiveness with the limited number of staff and volunteers they have, while still catering to the elderly person's individual needs."

## STAYING IN PLACE IS PREFERABLE

The research proposes that the best approach to deal with a growth in an ageing population is to allow as many people to stay in their homes as possible.

With senior citizens set to account for 20% of Singapore's population by 2030, the concept of "ageing in place" becomes key to dealing with "the fact that healthcare resources and assisted living facilities are becoming more limited," says Professor Tan. "We don't want our population to be over-stressing the hospitals, and we want them to have a good quality of life in the community they are living in. That's why care is being moved away from the hospitals and nursing homes and into the community, with the help of community-based VWOs."

Interviews with participants of the iCity pilot project indicate that "most of the elderly prefer to be living by themselves rather than living in an assisted living facility," he says.

Yet, living alone is not without risk. In fact, the government initiated the current research in response to the tragic realisation that, over a



five-year period, “about 50 elderly residents in Singapore passed away in their homes, and it had taken days, or sometimes up to a few weeks, to find out that they were dead,” according to Professor Tan.

To reduce such incidents, a sensor-enhanced “smart home” is designed. The first line of defence is a ‘panic button’ that a resident can push to alert the community caregivers that he or she has fallen or is facing some kind of problem. And if the elderly person is not carrying the panic button, there is still the sensor system to detect the conditions that point to an emergency, analyse the data, and sound the alarm.

Door contacts at the main door detect the opening and closing of doors, indicating whether the tenant is inside or outside the apartment. If the resident remains inside, motion sensors on the walls of each room will determine whether the person is moving according to normal patterns, or if there is an unexpected absence of movement.

SMU research fellow Dr. Alvin Valera says a common scenario that makes it crucial to have the sensor system is when the resident has encountered trouble after entering the toilet.

“The reason we monitor inactivity,” he explains, “is that there are situations where the person might not have access to the button. If the person is in the toilet and has fallen, he or she has probably left the panic button outside. In this case, the system will detect that the last activity was in the toilet and that there was no motion afterwards. After a certain period of inactivity, an alert will be sent to the caregivers.”

Dr. Valera stresses that the “unobtrusive” nature of this motion-detecting system reassures residents that their privacy is not being violated.

“We don’t use vision-based or camera-based sensors, or even those that record audio precisely because of this concern with privacy,” he says. “The unobtrusiveness of the system means that the elderly are much more likely to accept the technology. And because the sensors are passive – installed on the walls – they don’t have to do anything to change their lifestyles.”

## REFINING THE SYSTEM FOR SCALE-UP

A key objective of the iCity Lab pilot project is to refine the technology to distinguish better between normal and abnormal periods or inactivity, so as to reduce the number of false alarms.

“We want to make sure that alerts are sent in a timely way, so that they don’t swamp the caregivers with false alerts,” Dr. Valera explains. So we looked at the historical data of each resident’s movement patterns to determine a personalised threshold that would give us a better indication of how long it should be before an alert is sent.”

A second technological enhancement is a personalised, sensor-equipped medication box that is being tested in ten apartments. Unlike those off-the-shelf pillboxes, the ‘sensorised’ medication box has been customised to the needs and preferences (e.g., size and colour) of the individual user. Such customisation has been shown to be effective in encouraging elderly to use these technologically-enhanced box.

“Whenever the person opens up the medication box, we can infer that medication has been taken,” says SMU research scientist Dr. Tan Hwee Xian. “We are able to look at the frequency and timing of the medication intake, to determine if the elderly person is adhering to their medication schedule.”

This is an important issue since controlling chronic diseases such as diabetes and high blood pressure requires medication to be taken and at the right times.

The monitoring of pillbox usage has also uncovered helpful information that was not anticipated. Dr. Tan recalls the case of a woman who had been using the pillbox frequently in the middle of the night. “We thought something must be wrong,” Dr. Tan recounts.

The researchers informed caregivers, who then spoke to the tenant. They discovered that the lady was suffering from insomnia and leg pain, and hence was taking painkillers from the pillbox in the middle of the night to relieve the pain. She would also repack her medication in the pillbox when she couldn’t sleep, creating a false response that the

pillbox was used frequently.” With the truth uncovered, caregivers could better help the lady with her conditions.

After its three-year trial, there are hopes that the implementation of the smart home systems will be scaled up throughout Singapore. In the interim, improvements have been made to increase the effectiveness of the technology. For instance, the system’s interface has been redesigned to provide information to caregivers in a more usable form, while VWOs now receive alerts directly, without researchers acting as intermediaries.

Responses from elderly participants have also been encouraging. No one has dropped out of Project SHINESeniors, and many seniors have also urged their friends to sign up for the pilot test.

“What touches me most,” says Dr. Tan, “is to hear from the elderly that the system makes them feel safe.” ■





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