AUCKLAND INSTITUTE OF STUDIES NEW ZEALAND

AIS Research Newsletter

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AIS 2015 research awards

The New Zealand Qualifications Authority (NZQA) require staff teaching on Bachelor programmes and higher to be research-engaged. In any case, such staff should be naturally curious about their academic subject area(s). Engagement in research in that area also leads to improved teaching by these staff. The Award recognises those staff who have produced quality outputs over the previous 12 months from July to June.

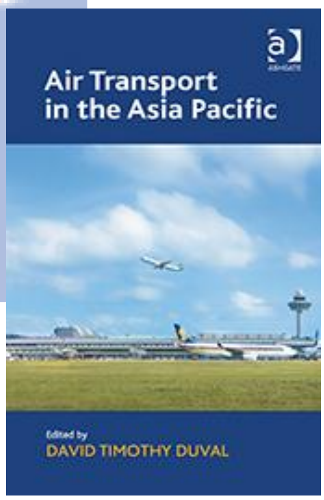
There are three categories:

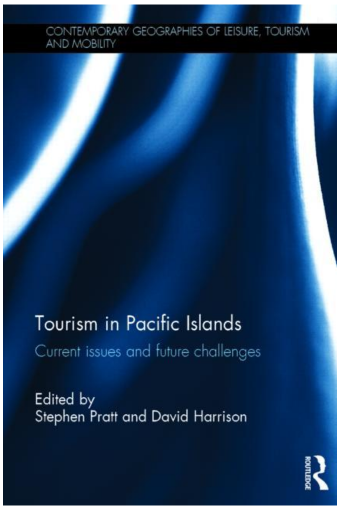
1. The Established Researcher category is for those staff with rankings in the six-yearly PBRF scheme.
2. The Emerging Researcher category is for those without.
3. We also make some “honourable mentions”.

The Awards were presented at the AIS 25th anniversary stakeholders’ evening on 25 September.

The Established Researcher award goes to Dr Semisi Taumoepeau. Semisi is the Director for Pasifika Relations, and former Academic Head of Tourism Management programmes. Among other outputs, Semisi had two book chapters, on “Suitability of the low-cost carrier model for the South Pacific region” (in *Air transport in the Asia Pacific,* published by Ashgate), and “Air transportation and tourism development in the Pacific” (in *Tourism in Pacific Islands*, published by Routledge), as well as three tourism development reports commissioned by the governments of Samoa, Tuvalu, and Nauru.

He has also been awarded an AUT 2015 Excellence Award for over 15 years of Pacific research with Prof Simon Milne and others from AUT University. As Prof Milne was overseas, Semisi, as Associate Director of the New Zealand Tourism Research Institute (NZTRI), received the award at a ceremony at AUT on 18 October.

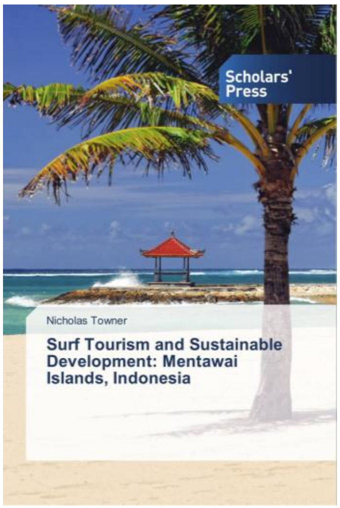




Semisi receives his AUT award at a university-wide ceremony compered by TV newsreader Samantha Hayes (right)

The Emerging Researcher award goes to Dr Nick Towner. Nick only joined AIS in 2014, completing his PhD thesis at AUT on surf tourism and sustainable development in the Mentawai Islands, Indonesia. His thesis has been published as a book. He also contributed to two presentations on "Birdwatching as a potential tourism market on Kiritimati Island", and "Tonga accreditation and quality star rating of accommodation facilities".

Semisi Taumoepeau (left) and Nick Towner



Honourable mentions go to:

- Dr Ershad Ali, who published the jointly authored *Bangladesh studies* (Global Research Publication), jointly edited *Managing development in developing countries: Challenges for good governance* (Regal Publications), in addition to three book chapters and five refereed journal articles.
- Dr Manisha Karia, who completed her PhD, with a thesis entitled "The influence of entrepreneur personality and self-efficacy on behavioural activities in the presence of information overload", in addition to a book chapter and conference presentation.

Measurement theory

Just because something is expressed as a number, doesn't mean you can do arithmetic with it. Let's say I give you three numbers: 1, 2, 3. What's the mean of these numbers? (1+2+3) ÷ 3 = 2, right? Well, what if I told you that 1 = apple, 2 = pear and 3 = banana? What's the mean of an apple, a pear and a banana? Plainly, the question is ridiculous. Yet there are still a substantial number of people in research who fall into this trap, especially when presenting data to data analysis software packages.

Software isn't magic. It just follows rigid rules and procedures to turn one number into another. It doesn't know what the numbers mean. So if the numbers you are submitting to them represent classes, rather than measurements, what is the software really telling you?

Measurement is the most fundamental part of data collection, as all natural data originates as measurements of properties of events. Measurements should represent reality and relationships between measurements should reflect the relationships between attributes. Data represents reality; as the source of data, measurements must yield an adequate representation of reality.

Measurement theory, as originated by Stevens (1946), helps us achieve this. By specifying and formalising what exactly measurement is, we can better use measurement to gather data. By understanding exactly what the numbers mean, we can better analyse and transform the data into information and knowledge, while avoiding such traps as making meaningless statements about the numbers or performing a meaningless transformation on the data. A crucial point to bear to in mind is that numbers *represent* reality but *are not the same* as reality. It is even more important to remember that numbers do not *create* reality, something many economists might do well to remember.

Measurement scales

At the heart of Steven's measurement theory is the concept of measurement scales. Five such scales are defined where each scale is distinguished according to four characteristics:

- Distinctiveness: individuals are assigned different values if the property being measured is different.
- Ordering in magnitude: larger numbers represent greater quantities of the property being measured.
- Equal intervals: a difference in measurement represents the same difference in the property.
- Absolute zero: a measurement of zero represents an absence of the property being measured.

Distinctiveness
Ordering in magnitude
Equal intervals
Absolute zero

These four characteristics define the "strength" of the measurement scale. The scales, from "weakest" to "strongest" are:

- Nominal
- Ordinal
- Interval
- Ratio
- Absolute

Nominal
Ordinal
Interval
Ratio
Absolute

Also associated with each of the measurement scales are specific, permissible statistics and transformations. The term *permissible* is slightly misleading: if a statistic is not permissible for a certain scale, it is not forbidden. Rather, the results of that statistic or transformation are not reliable, with the unreliability of the result determined by the way in which the measurements were made. Permissible statistics and transformations are simply those statistics and transformations that yield reliable results. A permissible statistic tells us something meaningful about the data, while a permissible transformation maintains the properties of the data as appropriate for the particular scale. A statistic may still be applied to data from a scale, for which that statistic is impermissible, and it may yield useful results, but these results need to be treated with caution, and interpreted within the context of the original measurements. Note also that permissible statistics and transformations are cumulative across scales, that is, all statistics and transformations permissible for a lower scale are permissible for a higher scale.

"… all statistics and transformations permissible for a lower scale are permissible for a higher scale."

"If you convert the numbers from Celsius to Fahrenheit, adjust for inflation, score on a curve, and factor dog years into the equation, my sales are up 850 percent this quarter!"

Nominal scale

The nominal scale is the weakest of the measurement scales. It possesses only the characteristic of distinctiveness. In other words, if the same attribute of two individuals are assigned the same number, then the attributes are identical. No other conclusions may be drawn from those numbers, as they are simply arbitrary numeric labels.

For example, the colours red, green, and blue can be placed on the nominal scale with the measurements red = 1, green = 2, blue = 3. However, two reds do not make a green. They could just as easily be labelled green = 1, blue = 2, red = 3, or any other permutation, without altering their distinctiveness.

The only permissible statistics for nominal scale measurements are the number of cases and the mode. Permissible transformations are permutations and one-to-one substitutions.

Ordinal scale

Measurements on the ordinal scale have the properties of distinctiveness and ordering in magnitude. In other words, objects are ordered in the scale according to some pair-wise comparison. Measurements on this scale can be compared to one another with the *equality*, *greater than* or *less than* operators. However, while we can say that one measurement is greater than or less than another, we cannot say how different they are. Numbers in this scale are categories; they do not have the arithmetic properties of numbers.

An example of an ordinal scale measurement is teaching evaluations: a teacher's performance is evaluated by students over several variables, with the performance being rated from one to five, with one being "Poor" and five being "Excellent". While it is meaningful to draw the conclusion that a score of four is better than a score of two, it is not meaningful to draw the conclusion that a score of four is twice as good as a score of two, nor is it meaningful to say that a score of five is the same "distance" from a score of three, as a score of three is from one.

Permissible statistics introduced at the ordinal scale are medians and percentiles. Permissible transformations introduced are monotonic increasing functions, that is, any transformation that will maintain the order of the individuals.

Interval scale

Measurements on the interval scale have the characteristics of distinctiveness, ordering in magnitude and equal intervals. In this scale, objects are placed in order on a number line with an arbitrary zero point and an arbitrary, equally-sized, interval between objects. While the numerical values have no significance other than as labels, differences between the values do have meaning.

An example of an interval scale is the date in years. The Common Era (CE) scale has an arbitrary zero point (year 1) and equally sized intervals (the length of a year does not vary, excepting leap years, which actually make up for errors caused by the slight mismatch between the arbitrary length of the year set at 365 days and the actual length of the Earth's orbit of 365 ¼ days). It is meaningful to say that 1973 is later than 1928, and that the difference between 1999 and 1973 is twice the difference between 1986 and 1973. It is not meaningful, however, to say that 2004 is twice the year that 1002 was.

Permissible statistics introduced at the interval scale are the mean, standard deviation, rank-order correlation and product-moment correlation. Permissible transformations introduced at this scale are linear transformations of the format $y=ax+b$, where x is the measurement, and the constant a cannot be zero. In other words, permissible transformations are those transformations that preserve the order of the objects, and the relative intervals between them.

Ratio scale

Measurements on the ratio scale have the characteristics of distinctiveness, ordering in magnitude, equal intervals and absolute zero. In this scale, objects are placed in order on a number line with equally sized intervals and a true zero point. A measurement of zero on the ratio scale indicates the absence of the property being measured. A ratio scale can also be defined as the differences between two interval measures: a difference of zero between two interval measurements indicates an absence of difference. In the ratio scale, the values themselves have significance, as do the differences and ratios of those values.

Many properties in physics are ratio scale measurements. An example of this is speed. An object with a speed of zero isn't moving, that is, it has no speed, while an object moving at 50 metres per second is twice as fast as an object moving at 25 metres per second.

Permissible statistics introduced at the ratio scale are the coefficient of variation, and permissible transformations are affine transformations, that is, $y=ax$.

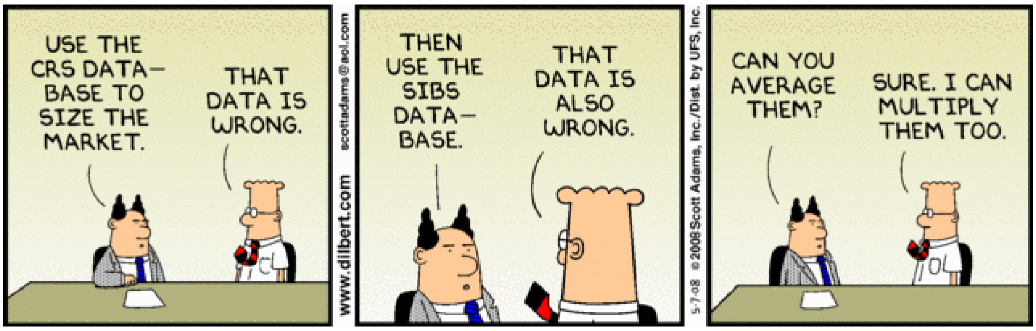
Absolute scale

Whereas measurements on the ratio scale have an absolute zero point, measurements on the absolute scale have an absolute zero and an absolute upper bound.

The classical example of this is probabilities: the probability of an event can range from 0 (the event will never happen) to 1 (the event will always happen). A probability of less than 0 or greater than 1 is meaningless.

Only affine transformations are permissible for measurements on the absolute scale.

"An object with a speed of zero isn't moving"



Transforming between scales

It is possible to transform a measurement made on a particular measurement scale to a weaker scale only. This transformation will involve a loss of information, and cannot be reversed. In other words, it is not possible to transform to a higher measurement scale. For example, consider the heights, in metres, of a group of three people. One person is 1.4 metres tall, the second is 1.8 m tall, and the third is 2 m tall. If we say that a person's height is 1 if they are short, 2 if they are average and 3 if they are tall, then it is possible to transform these ratio scale measurements into the ordinal scale, by assigning the first person's height a value of 1, the second a value of 2 and the third a value of 3. However, if we know only that a person's height is 2 on this scale, we cannot determine exactly what their true height in metres is. In other words, transforming to a weaker scale is a one-way transformation that destroys information.

Summary

The major implication of this is that data must be collected and transformed with great care. Once a measurement is made on a particular measurement scale, it cannot be transformed into a higher scale. Once the measurement is made, no further information can be associated with it. You cannot create information.

You must know which scale the measurements belong to, as they will determine what you can meaningfully do with the data. They will also inform as to how you represent the data for presentation to your models. A working knowledge of measurement theory, therefore, is essential for any researcher.

Stevens, J. (1946) On the theory of scales of measurement, *Science, 103*, 677-680.

Conferences

1 - 4 December 2015
26th ISANA (International Student Advisers' Network of Australasia) International Education Association Conference
Collaborations in providing services to international students
Pullman on the Park, Melbourne
www.isanaconference.com

30 December 2015
THEIIER-28th International Conference on Advances in Business Management and Information Technology (ICABMIT)
Rendezvous Hotel, Melbourne
theiier.org/Conference/Australia/2/ICABMIT/index.php

31 December 2015
IASTEM-6th International Conference on Economics and Business Management (ICEBM)
Rendezvous Hotel, Melbourne
Website: http://iastem.org/Conference/Australia/ICEBM/

18 - 20 January 2016
Centre for Research in International Education (CRIE) conference
Trends and issues in international education
Auckland Institute of Studies
crie.org.nz/conferences.htm

25 - 27 January 2016
13th Finance, Business & Banking symposium
Sofitel on Collins, Melbourne
fbb-symposium.review-gjsg.com

8 - 11 February 2016
CAUTHE (Council for Australasian Tourism and Hospitality Education) conference
'The changing landscape: The impact of emerging markets and destination'
Blue Mountains International Hotel Management School, Sydney
cauthe.org/services/conferences/

24 - 25 February 2016
World Business and Economics Research Conference
Rendezvous Hotel, Auckland
www.newzealandconfo.com/

3 - 4 March 2016
2nd International Conference on Information Technology - ICIT
Hotel Grand Chancellor, Melbourne
http://www.icit.org/

1 - 4 July 2016
International Conference on Information Technology and Applications (ICITA 2016)
Hilton Hotel, Sydney
www.icita.org/2016/

14-17 July 2016
CLESOL (Community Languages and ESOL)
University of Waikato
www.clesol.org.nz

Research outputs by AIS staff

Albakry, K. & **Hookings, A.** (2015). Capstone project course framework and individual grading formula. Presentation at CITRENZ (Computing and Information Technology Research and Education New Zealand) conference "Inspirational computing education', Queenstown, 6-9 October.

Ali, E. & Khan, R.H. (2015). Opportunities and challenges of sustainable energy technology in rural Fiji. In S. Kar, R. H. Khan, E. Ali & G. Subramaniam (Eds.) (2015). *Technology, sustainability and managing development in developing countries* (pp. 58-73). New Delhi: Regal Publications.

Ali, E., Subramaniam, G. & **Khan, R.H.** (2015). Role of returning students in development: A conceptual framework for Chinese phenomenon. In S. Kar, R. H. Khan, E. Ali & G. Subramaniam (Eds.) (2015). *Technology, sustainability and managing development in developing countries* (pp. 74-81). New Delhi: Regal Publications.

Crutzen, J., **Losekoot, E.,** & Staal, A. (2015). FM Kiwi-style: The development of FM professionals in New Zealand. *European Facility Management Conference*. Glasgow, Scotland, UK. 1-3 June.

Kar, S., **Khan, R. H., Ali, E.** & Subramaniam, G. (2015). Concluding remarks: Technology, sustainability and development in developing countries. In S. Kar, R. H. Khan, E. Ali & G. Subramaniam (Eds.) (2015). *Technology, sustainability and managing development in developing countries* (pp. 186-193). New Delhi: Regal Publications.

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Kar, S., **Khan, R. H., Ali, E**. & Subramaniam, G. (Eds.) (2015). Technology, sustainability and managing development in developing countries. New Delhi: Regal Publications.

Kelly, R. (2015). What is the lived experience of hospitality for adults during their hospital stay? Masters thesis, AUT University. Available at: http://hdl.handle.net/10292/8960

Khan, T. & **Ali, E.** (2015). Role of education to mitigate the impact of climate change in Bangladesh: A research framework. In S. Kar, R. H. Khan, E. Ali & G. Subramaniam (Eds.) (2015). *Technology, sustainability and managing development in developing countries* (pp. 174-185). New Delhi: Regal Publications.

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Losekoot, E. (2015). Airports: Places or non-places - Who cares? In M. Lück, G. Lohmann, & D. T. Duval (Eds.), *2nd Symposium of the Transport and Tourism Special Interest Group* (p. 16). Auckland.

Losekoot, E. (2015). *Factors influencing the airport customer experience: A case study of Auckland International Airport's customers.* PhD thesis, AUT University. Available at http://hdl.handle.net/10292/8739

Neill, L. J., Johnston, C., & **Losekoot, E.** (2015). The gaze of hospitality employability. *AIRAANZ 2015 Conference: Pacific Employment Relations*. Auckland.

Taumoepeau, S. & **Towner, N.** (2015). Governance, intervention and outcomes for Pasifika students in New Zealand: A case study. Hospitality Education Providers Forum, Auckland, 28 August.

Towner, N. (2015). Surfing tourism and sustainable tourism development: A case study of the Mentawai Islands. Centre for Surf Research Sustainable Stoke Conference, San Diego, USA, 20-21 September.

Yak X. F. & **Ali, E.** (2015). Applicability of Chinese early childhood education model in New Zealand: A conceptual review. In S. Kar, R. H. Khan, E. Ali & G. Subramaniam (Eds.) (2015). *Technology, sustainability and managing development in developing countries* (pp. 102-112). New Delhi: Regal Publications.

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The AIS research newsletter (ISSN 2357-2426) aims to establish and foster collegial partnerships in common research interests, through high quality research outputs and sharing research ideas and resources. Correspondence about the newsletter should be sent to Christine Edwards at the above address, or email christinee@ais.ac.nz. The editors are Dr Adam Brown (adamb@ais.ac.nz), Dr Ershad Ali (ershada@ais.ac.nz), and Rubaiyet Khan (rubaiyetk@ais.ac.nz).