

ARCOM Meaning of Numbers Doctoral Workshop 2: The Impacts of Quantitative Research in the Built Environment

The Meaning of Numbers Doctoral Workshop 2 follows on from the first workshop held in The University of Manchester in December 2017. While the first workshop was designed to get participants to think about appropriate ways of framing research questions and for selecting methods of quantitative data collection and analysis to address these questions, the second workshop was intended to stimulate a reflection on what we do with quantitative research in the built environment and the impacts of numbers on policy, practice and research. The workshop opened with a reflection on how the field of construction management research is still dominated by quantitative research and that numbers are often (re-)produced uncritically as the basis of policy formulations. Therefore, the second workshop held in UCL, London was designed to reflect on the following questions:

- What kinds of 'numbers' are we producing in quantitative research in the built environment?
- What problems and challenges do researchers face when producing these numbers?
- How do researchers intend for these numbers to be used – by researchers, policy-makers and practitioners?
- What do these numbers do in practice? How are these actually used (or mis-used) by policy-makers and practitioners?
- What kinds of impacts are we producing?

Seven doctoral students presented at this workshop, summarised as follows:

- Danstan Chiponde (Northumbria University) presented his study on understanding failure. He argued that knowledge about failures in projects is still patchy and at best anecdotal. He questioned the validity of generalising from previous studies often based on perceptions rather than actual practices, and identified a number of key challenges and directions for future research, including tackling the challenge of getting people to be honest about failure, defining and quantifying failure over time, the need to find a balance between finer-grained analysis of actual practices and developing broad generalisations, and awareness of institutional contexts.
- Cara Mulholland (The University of Manchester) presented her study on social value in nuclear decommissioning and site remediation. Despite growing awareness of the importance and need to produce social value in construction projects, early scholarship has tended to focus on defining what social value is and developing quantitative measurement frameworks. Cara sees parallels between contemporary discourse on social value and the Sustainable Development Goals (SDGs) framework, and argued for a need to compare between different frameworks to ask what use and how useful these frameworks are. She also raised the question as to whether frameworks actually help generate actions, and if not, to question the value of and move beyond frameworking.
- Kejun Meng (The University of Manchester) compared various performance measurement frameworks and argued for a need to build a more general hierarchical performance measurement framework that can be used as a framework to compare performance more meaningfully between different

projects, especially from a contractor's viewpoint. She also explained the challenges of measuring the less tangible, more qualitative aspects of performance such as quality.

- Yan Liu (TU Delft) presented his study on co-creation practices to examine the interrelationships between exploitative and explorative learning through a structural equation model.
- Ruoheng Zhang (Imperial College) presented a synopsis of early research that aims to develop method for integrating system activities across upstream supply-chain in modular construction. She mapped out key activities and developed a series of mathematical models to analyse cost, logistics and manufacturing sequence, so that these can help create 'what-if' scenarios to simulate real-world supply chains in the use case of bathroom pods.
- Orsolya Bokor (Northumbria University) presented her study on modelling labour productivity in masonry construction using system dynamics and discrete event simulation. She also discussed how these models can be used by masonry contractors to produce more realistic productivity rates.
- Amalka Ranathunge (Northumbria University) presented her multiple linear regression modelling used to predict embodied carbon. She argued that estimations can provide a first useful step towards driving demand reduction.

The presentations provoked some key reflections around:

- What is the purpose of model creation? Is it to represent the operations of how things are done? What are the tradeoffs that researchers go through in balancing between contextualisation and generalisation?
- What are the assumptions that underpin the models researchers create? Is transparency always valued as a good thing by policy-makers, practitioners and researchers? Without academic researchers, how do practitioners model their world(s) at present?
- The word 'system' is often used, but what/where are the system boundaries? How do we define what the system is, and how do we extrapolate from our boundary conditions to say something meaningful about the industry at large?

A panel discussion formed the second part of the workshop. This discussion brought together perspectives of how construction statistics are produced and used in practice. Stephen Gruneberg (Honorary Professor, UCL) kicked off the discussion with a presentation entitled "The inexact science of construction statistics and impediments to accurate measurement in the real world". He began by stating that while there are several statistical agencies that collect data about the industry (e.g. US Bureau, ONS and Eurostat), he emphasised that the industry is not a laboratory and that researchers need to ask about significance of what is being measuring. More importantly, we need to ask the 'so-what' question. Stephen then turned to a discussion on the users of the numbers produced about the industry, and noted how collecting data is not necessarily a high priority for politicians and practitioners. Therefore, it is important to also ask who verifies and checks the data for accuracy if politicians and practitioners are not necessarily interested in these numbers. Finally, there is a need to move beyond descriptive statistics to examine if differences observed are statistically significant, and that those working on construction statistics should seek to raise the impact by publishing in non-construction journals. Stephen added that there is a need to take time series analysis and statistical analysis to a higher level if we were to compete in research on a global level. The Far East and

the US are both developing their techniques of construction analysis to a far greater extent than what is going on in the UK.

Brian Green (Brickonomics) offered some reflections on Stephen's presentation by emphasising the need to understand what context lies behind the numbers produced. Taking examples on gross value added, employment and output data, he argued for an understanding of nuance and to not take figures at face value. He noted how where people live, where projects happen and where output is generated are not necessarily the same thing. Therefore, as researchers, we must always question and be curious about the quirks in the data, and be sensitive to the porosity in the boundaries.

Noble Francis (Construction Products Association) added a rejoinder to stress the point that how we communicate figures can lead to different interpretations across different stakeholders (e.g. politicians, media...). Construction is not a homogeneous sector, but made up of different sectors. There is a need to consider definitional discontinuities in measuring activity and output. Quantitative researchers must understand the nuances of these definitional discontinuities.

Summary by Paul W Chan, TU Delft