CLC Lecture

A Tale of Two Cities

Alvin Chua

Sustainable buildings are fundamentally about people-centric design, says Professor Lam Khee Poh.

Using cases studies of his work on the National Library in Singapore and the Phipps Conservatory in Pittsburgh, United States, the head of the School of Design and Environment at the National University of Singapore demonstrated the need for architects, engineers and all in the building industry to heed the human dimension, regardless of the different climatic, social and cultural conditions they are working in.

“Technologies will continue to emerge and evolve, but the fundamental principles—why we’re doing what we’re doing—should not change. What we should be all about is meeting the physiological, psychological, sociological and economic needs,” said Professor Lam at his “A Tale of Two Cities” lecture at CLC on 17 August. “This concept is more than 35 years old, but we have barely touched (these areas) in terms of serious R&D.”

Early in his career as an architecture researcher and educator at Carnegie Mellon University, Professor Lam pushed the frontier of advanced systems and energy-efficient design by researching and developing building performance and diagnostics models. He and his team made a major breakthrough when the National Science Foundation in the United States awarded them a grant for their work.

National Library Board. Image credit: Flickr Creative Commons, Ellen Forsyth

Image credit: Phipps Conservatory and Botanical Gardens.

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"That showed architecture does not only mean the arts and the humanities. It can, and must necessarily, embrace science and technology," he said.

This is an approach Professor Lam brought to the design of the National Library, a building that he worked on with architect Ken Yeang. The design was shaped by several building performance simulations, including models that looked at airflow, computational fluid dynamics and energy use of the entire building.

"It was a holistic approach, and we spent a lot of time in particular on the energy aspect of the building," said Professor Lam. The models helped the different building and construction teams come together to develop an optimal solution. "Whether you're an architect or an engineer, this is the place where you meet and talk and understand the functionalities if you want your building to operate and function according to design. You need to discuss, debate and work with the client as well."

Building upon the National Library project, Professor Lam and his team added adaptive and learning elements to their models and simulations when they worked on the Phipps Conservatory. This enabled the team to calibrate their models after the building began operation to ensure it performed as planned.

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"We were able to collect data over the first, second year, and calibrate the model because the building was owner-occupied," he said. The team focused particularly on the dynamic element of building occupancy. As the way people use and control facilities such as lighting cannot be easily predicted, the team engaged the users and monitored how the building was used. With a better understanding of how people consumed energy instead of making assumptions, they could adapt their models too.

The process of monitoring and model calibration also raised new questions about energy use in buildings. "What we discovered was that even as our buildings become much more energy-efficient, the plug loads are going up sky-high," said Professor Lam. "We've got to pay very close attention to this. We're charging our iPhones, iPads, Fitbits, multiple computer monitors. It's going to be very hard to predict (energy use levels) and we need to do more research."

Beyond just an issue of energy consumption, the future of sustainable buildings also had an impact on human behaviour and wellness. Professor Lam highlighted how The Well Living Lab in the United States has spent $50 million over the last seven years doing research with the Mayo Clinic on the health of occupants in buildings.

"The next thing is really about wellness and green (building). We've got to couple the two. For too long, we have neglected the human dimension, being so enamoured with the economic side," he said. "The benefits of healthy and green buildings has been a hard sell, but now we have scientific evidence."

About the Speakers

SPEAKER

Prof Lam Khee Poh

Provost's Chair Professor Dean, School of Design and Environment
National University of Singapore

Professor Lam is an educator, researcher, architect and consultant who specialises in life-cycle building information modelling and computational design support systems for total building performance analysis and building diagnostics. Widely published, he is also a building performance consultant for several major award winning and green certified projects.

MODERATOR

Jeffery Neng

Deputy Group Director, Environmental Sustainability Group,
Building and Construction Authority of Singapore (BCA)

Jeffery holds several posts in BCA. His responsibilities include leading the development of Research and Innovation solutions for green buildings, construction productivity and workmanship quality, formulating strategic policies in areas of green buildings and sustainable construction and coordinating support to develop the green building.

About CLC

The Centre for Liveable Cities was set up in 2008 by the Ministry of National Development and the Ministry of the Environment and Water Resources, based on a strategic blueprint developed by Singapore's Inter-Ministerial Committee on Sustainable Development. Guided by its mission to distil, create and share knowledge on liveable and sustainable cities, the Centre's work spans four main areas - Research, Capability Development, Knowledge Platforms and Advisory. The CLC Lecture Series is a platform for urban experts to share their knowledge with other practitioners. For more information, please visit us at http://www.clc.gov.sg