SIXTH ARAB-AMERICAN FRONTIERS OF SCIENCE, ENGINEERING, AND MEDICINE SYMPOSIUM

The National Academies of SCIENCES ENGINEERING MEDICINE

DEVELOPMENT, SECURITY, AND COOPERATION
Policy and Global Affairs

NEXT GENERATION BUILDINGS AND INFRASTRUCTURE

Prof. Laila Khodeir
The British University in Egypt

Prof. Hussam Mahmoud
Colorado State University

November 4-6, 2018

BUE The British University in Egypt الجامعة البريطانية في مصر

KFAS مؤسسة الكويت للتقدم العلمي Kuwait Foundation for the Advancement of Sciences

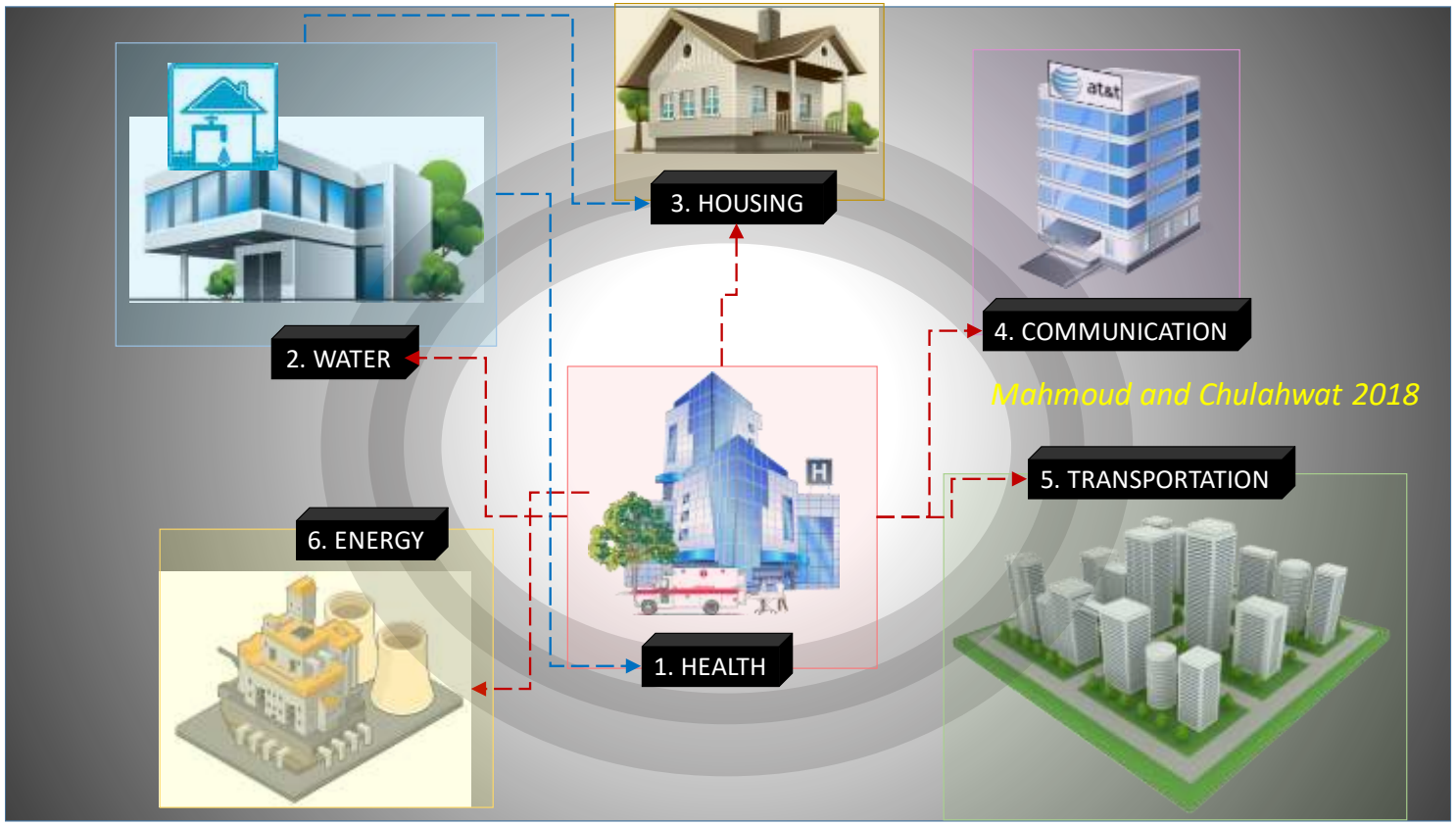
Colorado State University

THE BIG PICTURE

1

THE BIG PICTURE

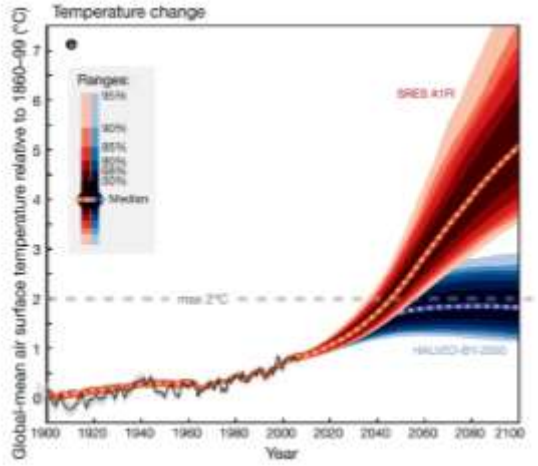
Complex Interdependent Buildings and Infrastructure



Mahmoud, H. and Chulahwat, A. (2018) "Spatial and Temporal Quantification of Community Resilience: Gotham City under Attack", *Computer Aided Civil and Infrastructure Engineering*, Vol. 33, 353–372.

The Big Picture

https://www.worldatlas.com



https://ourchangingclimate.wordpress.com/

https://www.hsdl.org

http://www.hortica.com/tag/healthy-living/

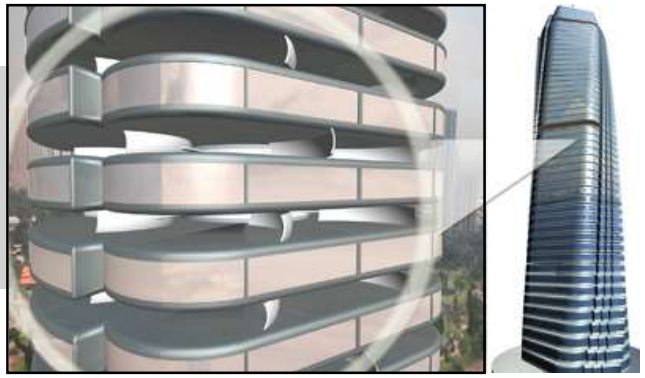
*How might these critical networks be made more efficient under carbon constraints, be **less environmentally damaging, more resilient, while promote healthy living***

INNOVATIVE BUILDING IDEAS 2

INNOVATIVE BUILDING IDEAS

Rotating Skyscraper

Copyright Dynamic Architecture



Copyright Dynamic Architecture

- Use of excessive winds experienced by skyscraper by installation of wind Power turbines between floors, combined with solar panels on roof
- Natural lighting from expansive glass design and rotation mechanism
- Structure designed around a central core with independent rotating floors could provide natural resistance to earthquakes

INNOVATIVE BUILDING IDEAS

The name Aqua is a reference to the wave-like design of the balconies of the tower, and perfectly fits the setting of the Lake Michigan shores

INNOVATIVE BUILDING IDEAS

Copyright :REUTERS/Ben Job

Al Bahar Towers in Abu Dhabi, UAE. The 145 meter-tall twin towers are encased in solar panels.

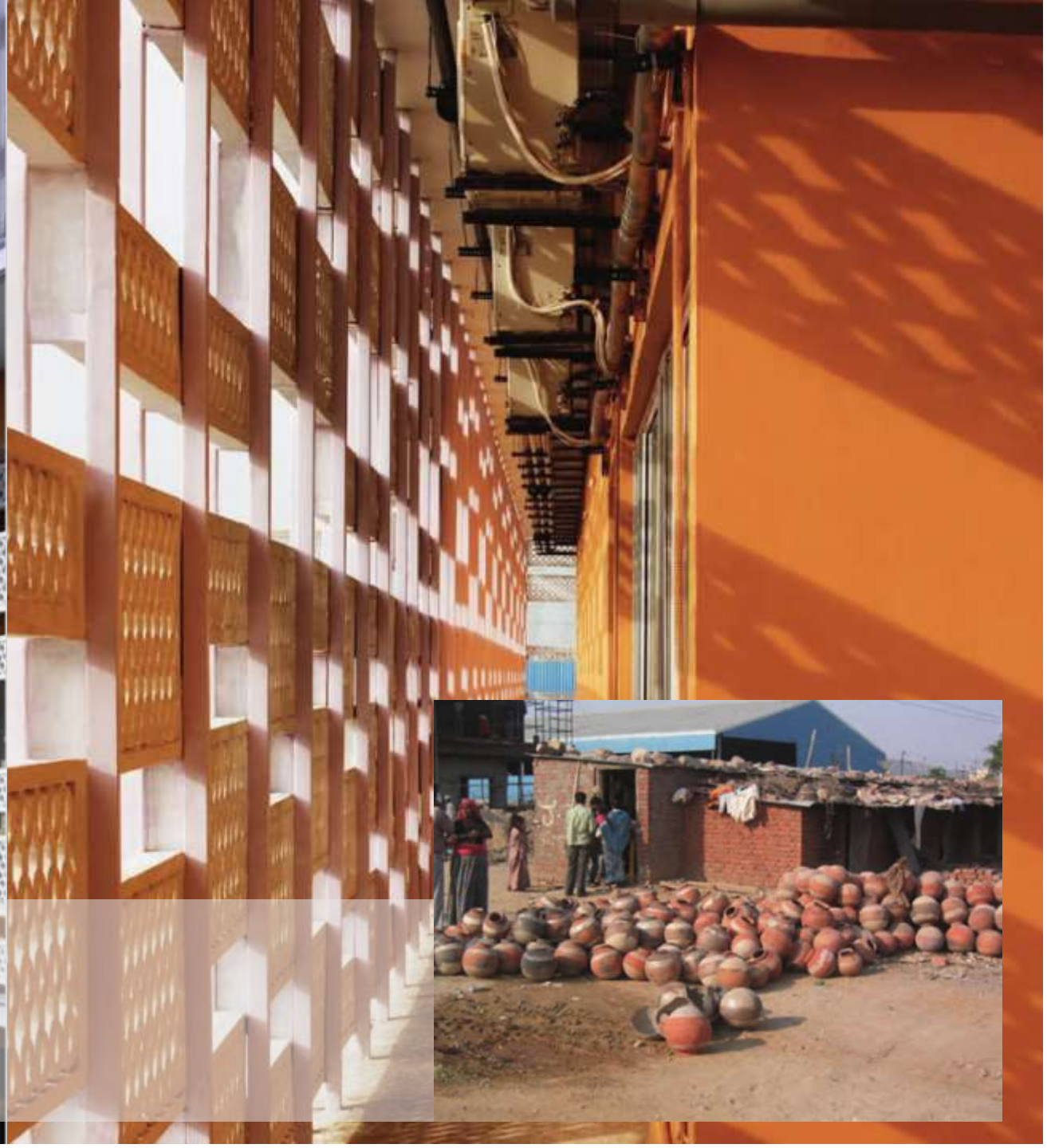
Copyright :Adam Jan/AFP/Getty Images

Bahrain World Trade Center, Manama,. One of the first of the new generation of skyscrapers in the Middle East.

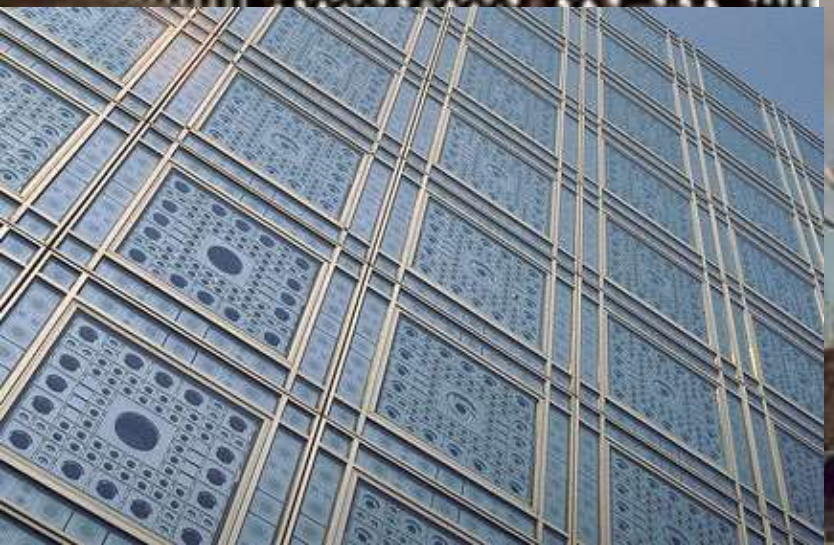
INSPIRATIONS FROM The PAST

3

Pearl Academy



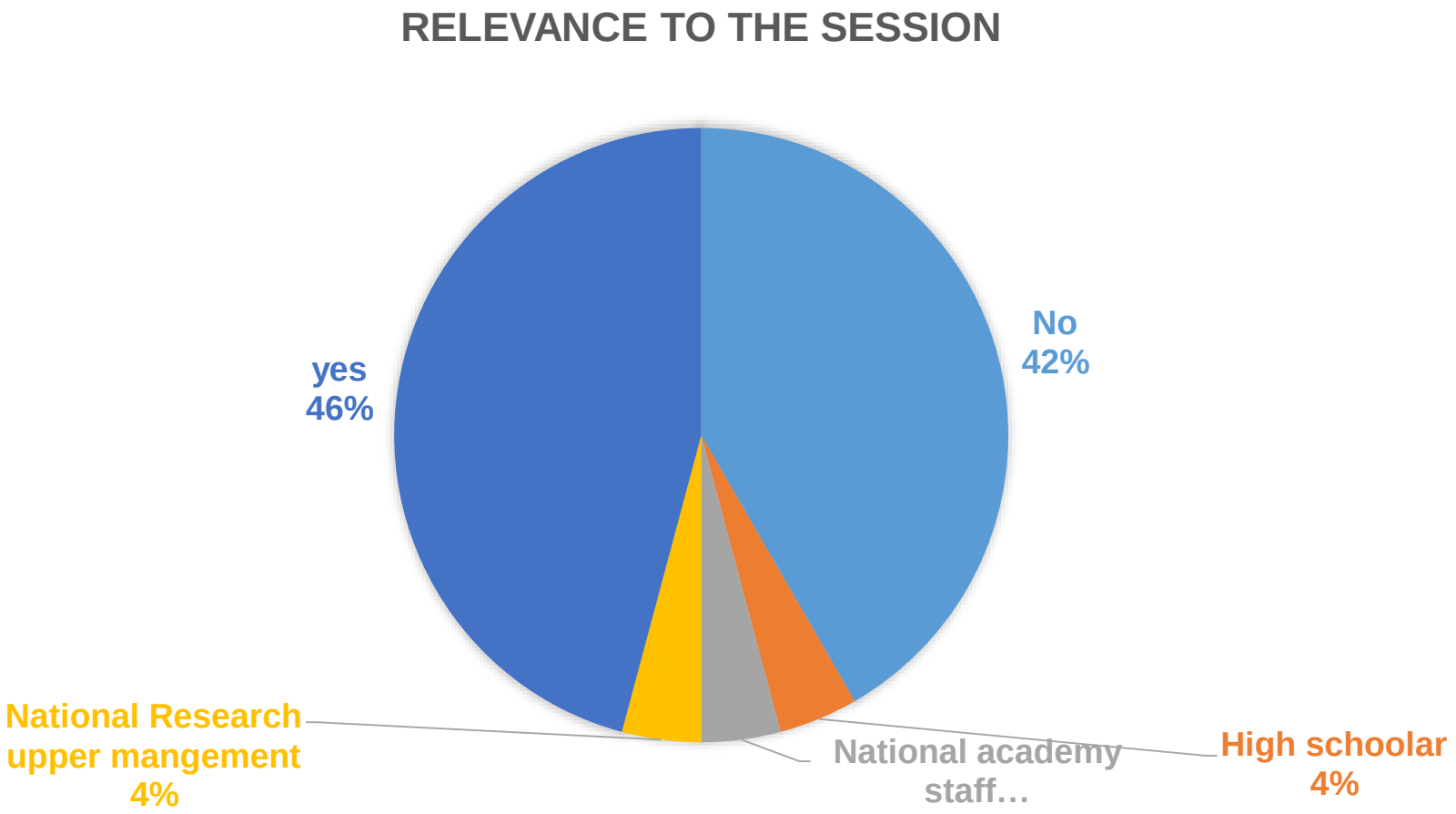
The Institute of the Arab World



SESSION 4

OVERVIEW

1. How relevant is your work to the session?



How relevant is your work to the session?

51% OF Interviewees are Relevant

49% OF Interviewees Irrelevant

Challengeable!

Smart cities , Urban development, Water Systems, Building science and technology, Digital mobility Smart Environment, Environmental engineering and Sustainability

2. Are you interested in attending the session?

97% Yes

3% No

OH, This should be quite valuable, yet Fun !

3. Why are you interested in attending?


WE ARE..
CONNECTED
24%

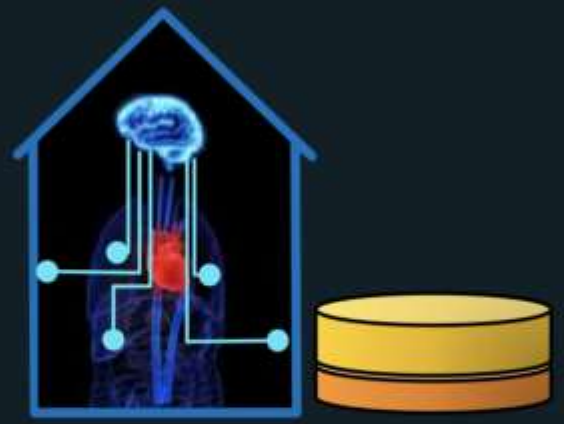
Building Management Evolution

Automated Buildings
(1980 – 2000)

Visualize KPI

- ✚ Good for ratings
- ✚ Allows identifying general issues
- ▬ Bad for identifying energy waste

Smart Buildings
(2000 – 2015)



Analyze Energy Consumers

- ✚ Understand consumption of rooms and central assets
- ▬ Only primary datapoints are analyzed

Cognitive Buildings
(> 2015)

Learn Behaviour

- ✚ Predictive control down to desk level
- ✚ Understand energy flow and building occupancy
- ✚ Consider comfort preferences of users
- ✚ Collect context such as weather and meetings
- ▬ Too data points even for advanced analytics

Cognitive Buildings

Buildings trade with energy providers

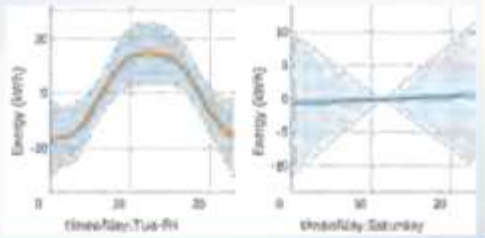
Buildings cooperate in neighbourhoods

Buildings are aware of their energy performance and users' comfort

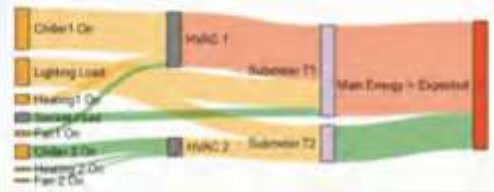
Easy Deployment

Knowledge

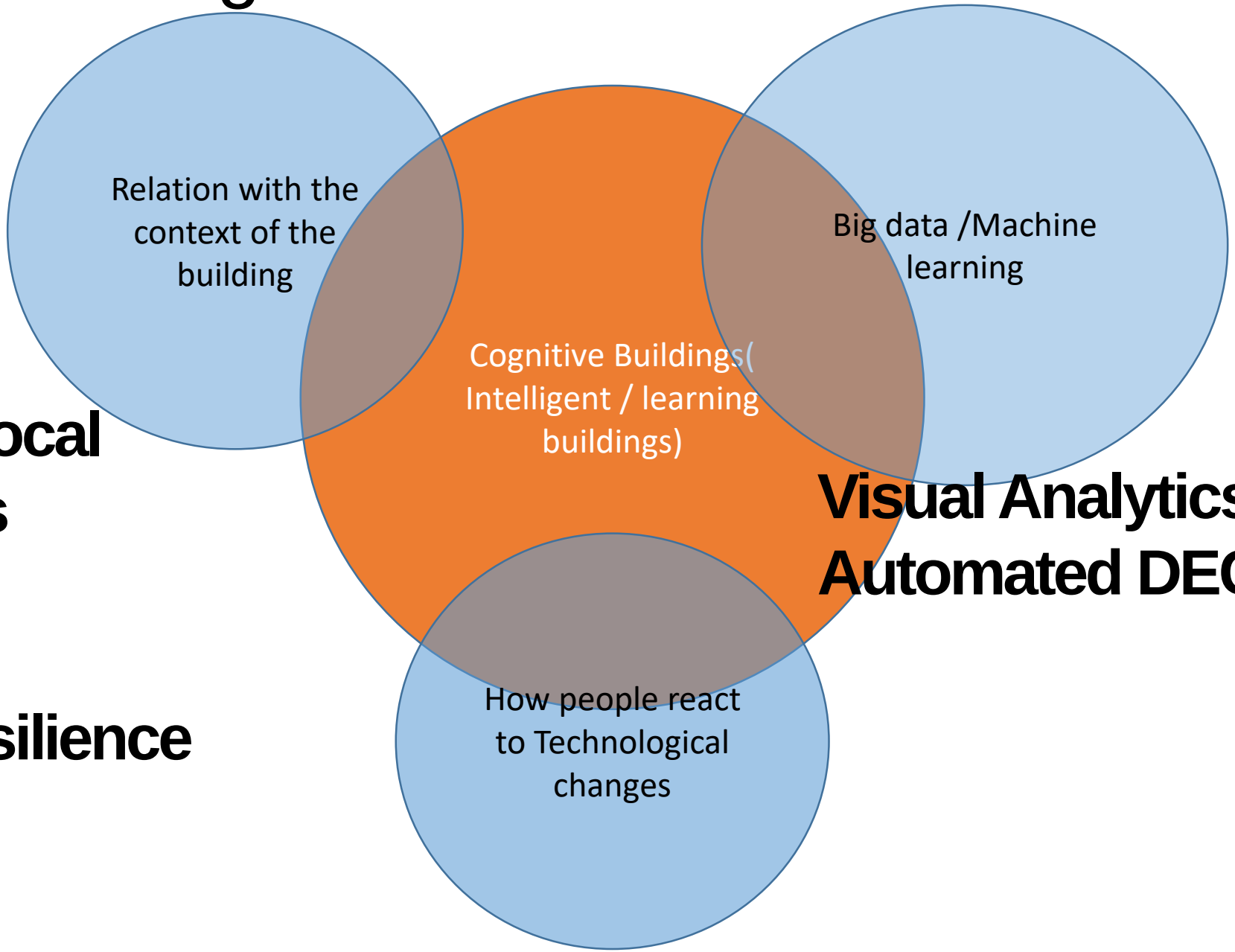
Understand & Learn Behaviour



Providing Insights



Can you Imagine how connected we are ?

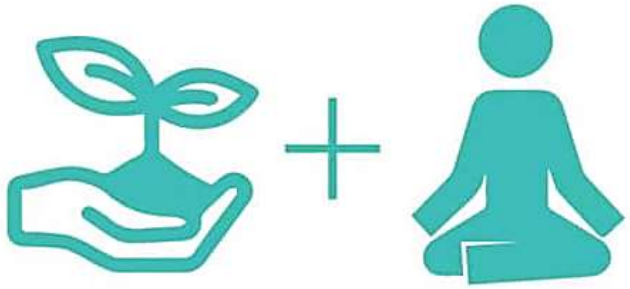


Use of Local Materials

Visual Analytics
Automated DECISIONS

Resilience

4. What are your session expectations ?



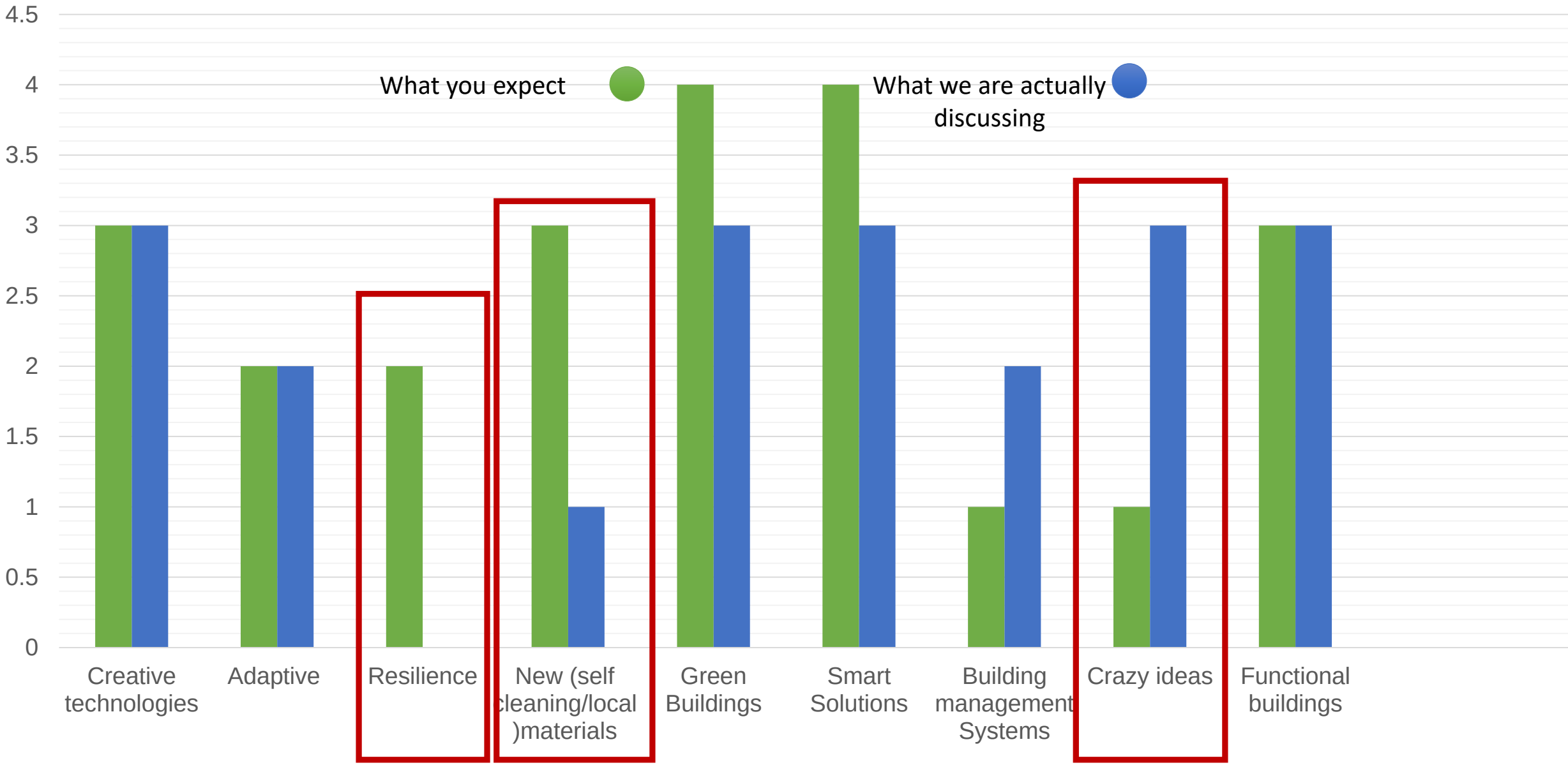
Renewable Energy

Energy Efficiency/ Green Buildings

People

Water Management

Smart/Creative


4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
What you expect
What we are actually discussing
Creative technologies
Adaptive
Resilience
New (self cleaning/local)materials
Green Buildings
Smart Solutions
Building management Systems
Crazy ideas
Functional buildings

OUR SESSION EXPECTATION

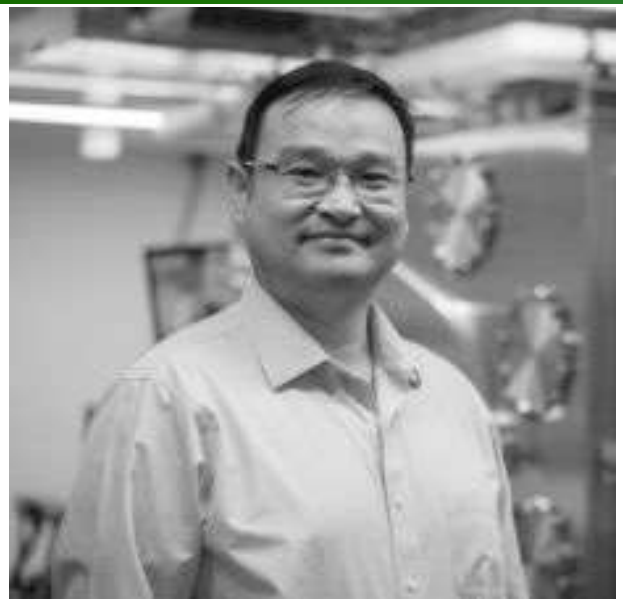
New generation
BUILDINGS &INFRASTRUCTURE

“If we don’t change our direction, We are likely to end up where we are headed”

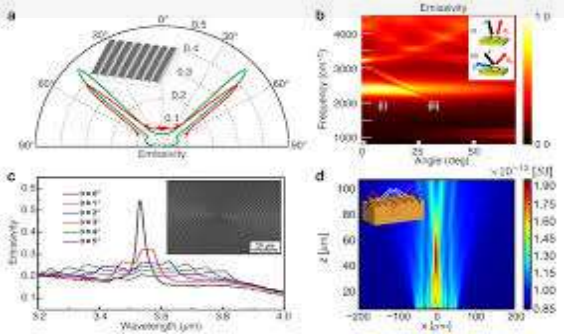
SPEAKERS

Raya Ani
American Institute of Architects-Middle East, United Arab Emirates

Scalable Architectural Visions!



Xiaobo Yin
University of Colorado Boulder
United States



Controlling Thermal Radiation for Large Scale Energy Applications

SPEAKERS

Aziza Chaouni
U. of Toronto and Aziza Chaouini Projects (Fez)
Morocco

Reimagining Heritage and Public Space in Fez, Morocco

Sherif Abdelmohsen
American University of Cairo
Egypt

Programmable Skins: A Hygromorphic Approach for Low-Cost Adaptive Building Façades

Acknowledgment

Dr. Dalal Najib (The National Academy)

Dr. Esra Aleisa (Kuwait University)

Dr. Joy Ward (the University of Kansas)