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# Waves of Change

*Where No Engineering Generation Has Gone Before*



AIChE Lecture, Feb 11, 2014

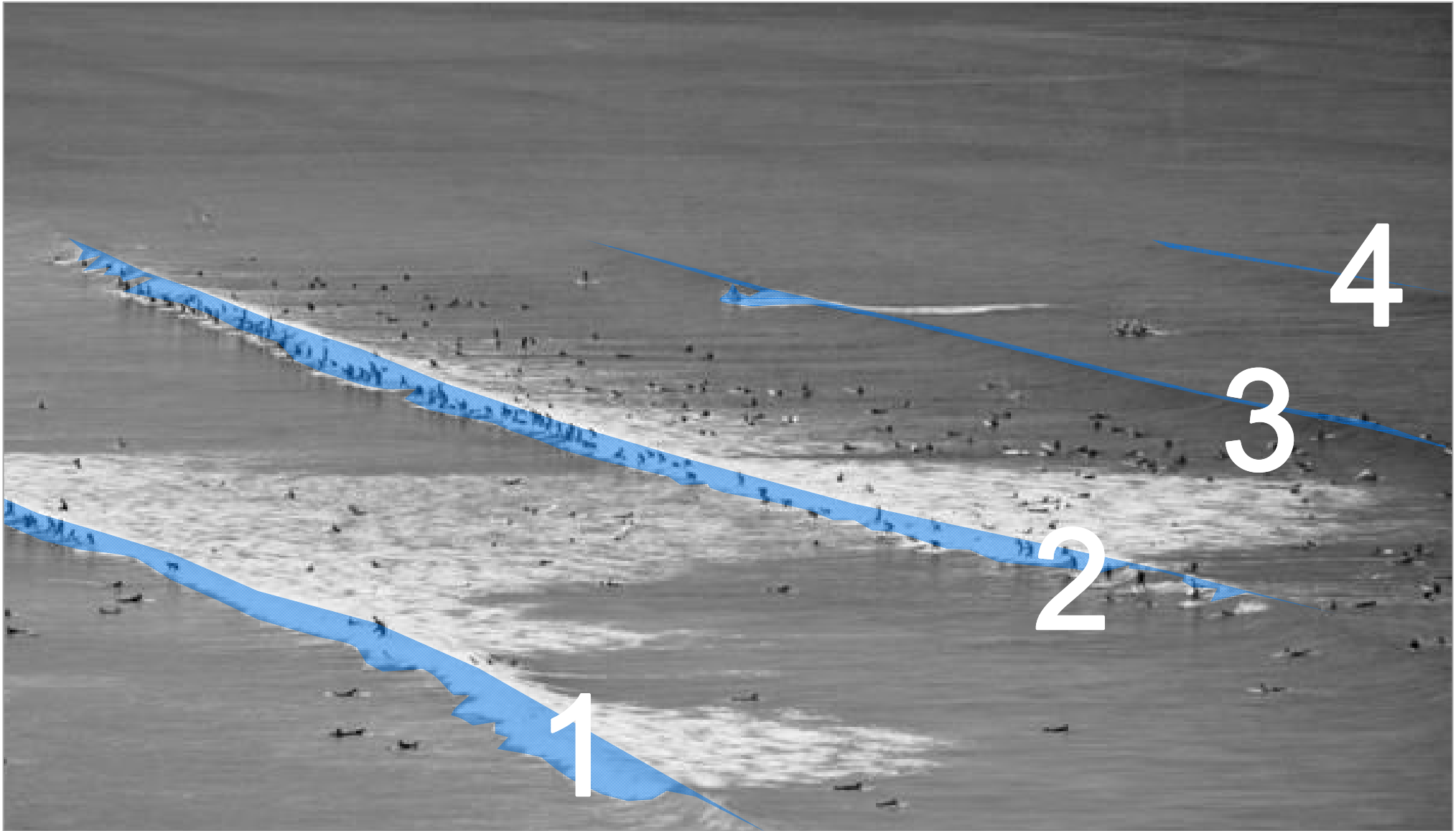
By: Claus-Peter Hälsig  
Martijn Glass

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# Waves of Change



# Claus-Peter Hälsig

The passionate driver of  
technology innovation at Fluor



# Claus-Peter Hälsig

*1<sup>st</sup> wave: young and engaged*



# Claus-Peter Hälsig

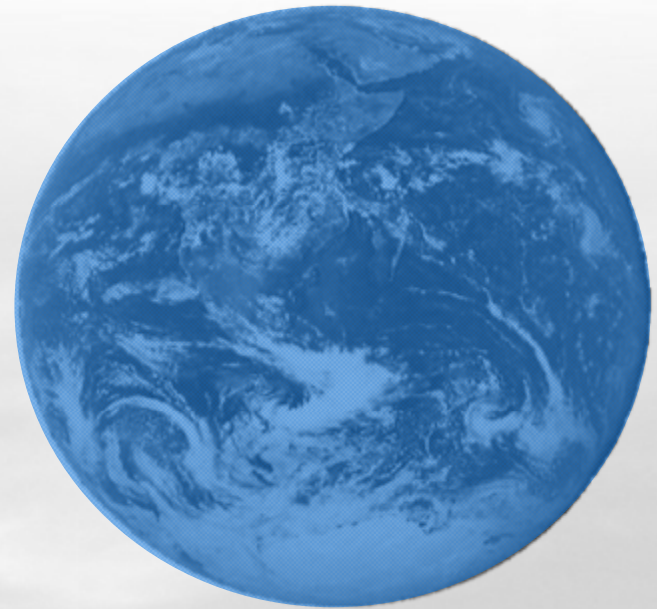
*2<sup>nd</sup> wave: ambitious and engaged*



**Claus-Peter Hälsig**  
*3<sup>rd</sup> wave: leader and engaged*

**There is only one  
system earth...and we  
must keep it in balance  
for future generations!**

**This does not have to  
be at odds with sound  
business drivers.**



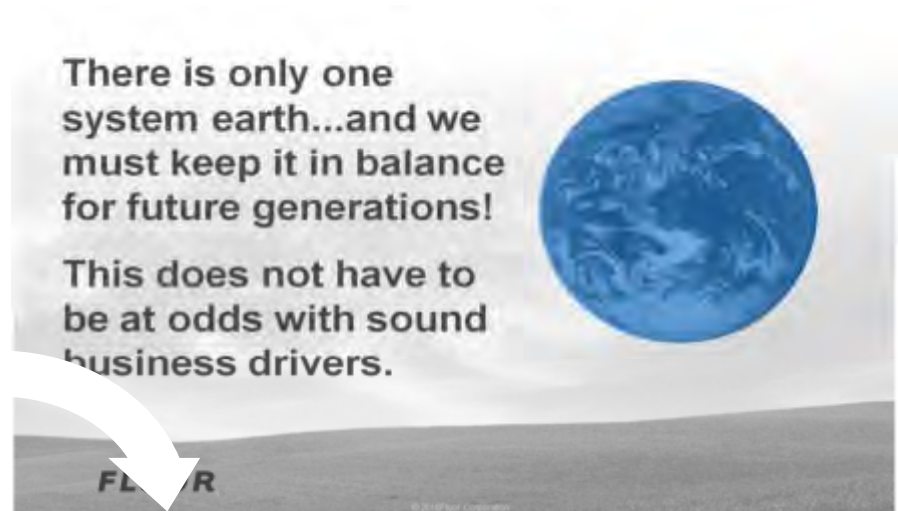
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# Claus-Peter Hälsig

## 4<sup>th</sup> wave?



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# Claus-Peter Hälsig

*4<sup>th</sup> wave: retired but still engaged*

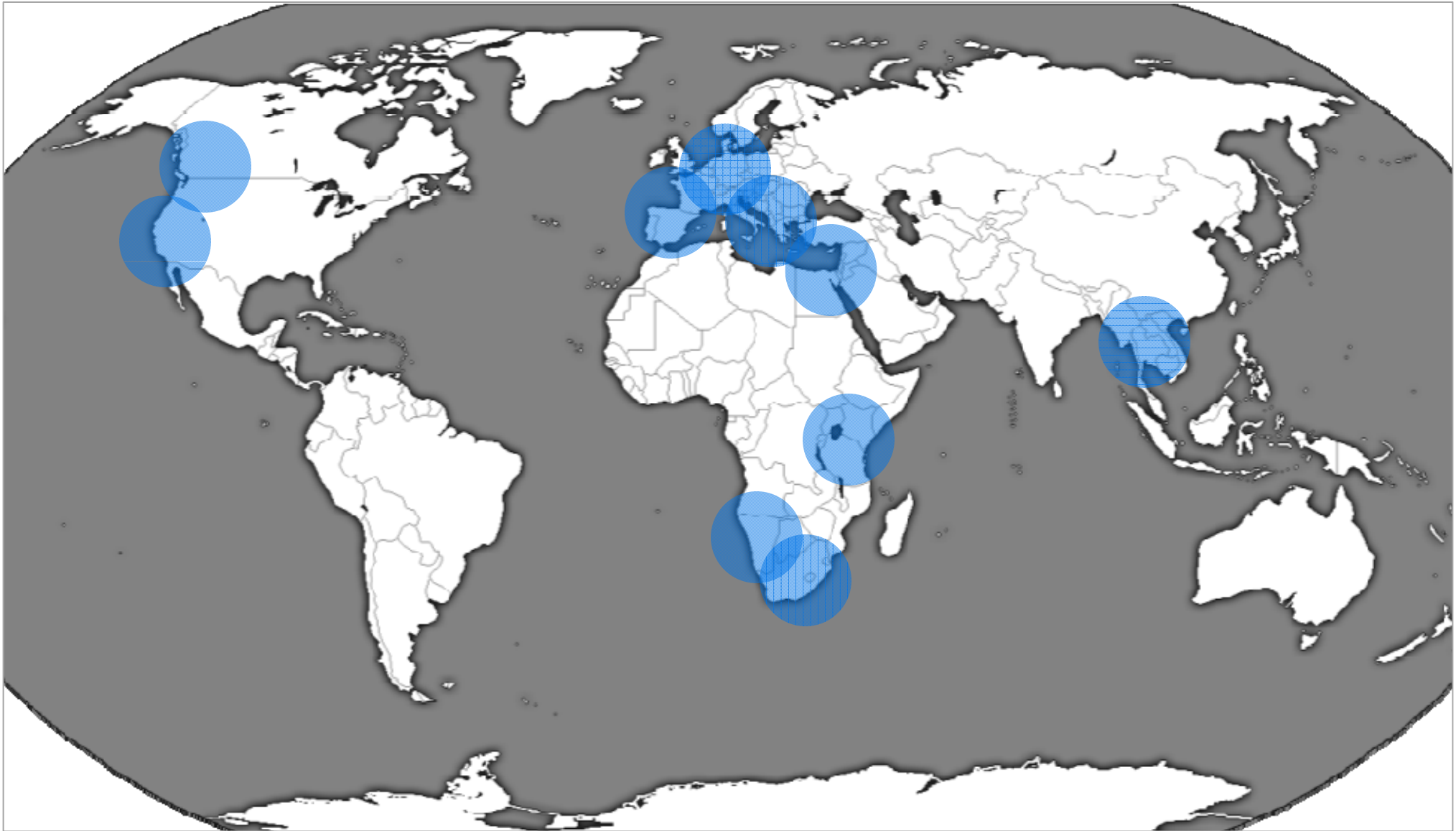


# Martijn Glass

The passionate driver of  
innovation at Fluor

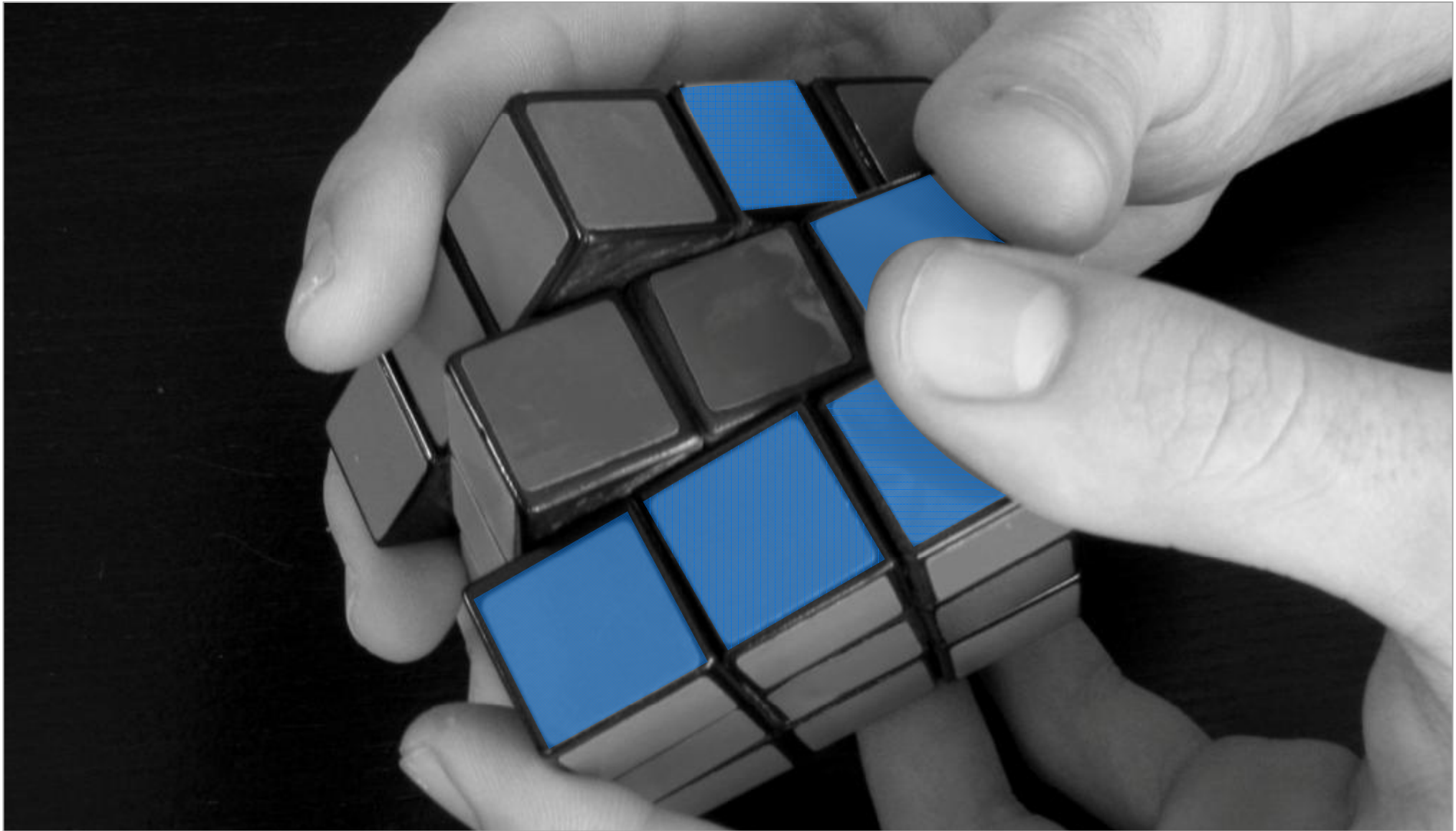
# Martijn Glass

*1<sup>st</sup> wave: exposed to different cultures*



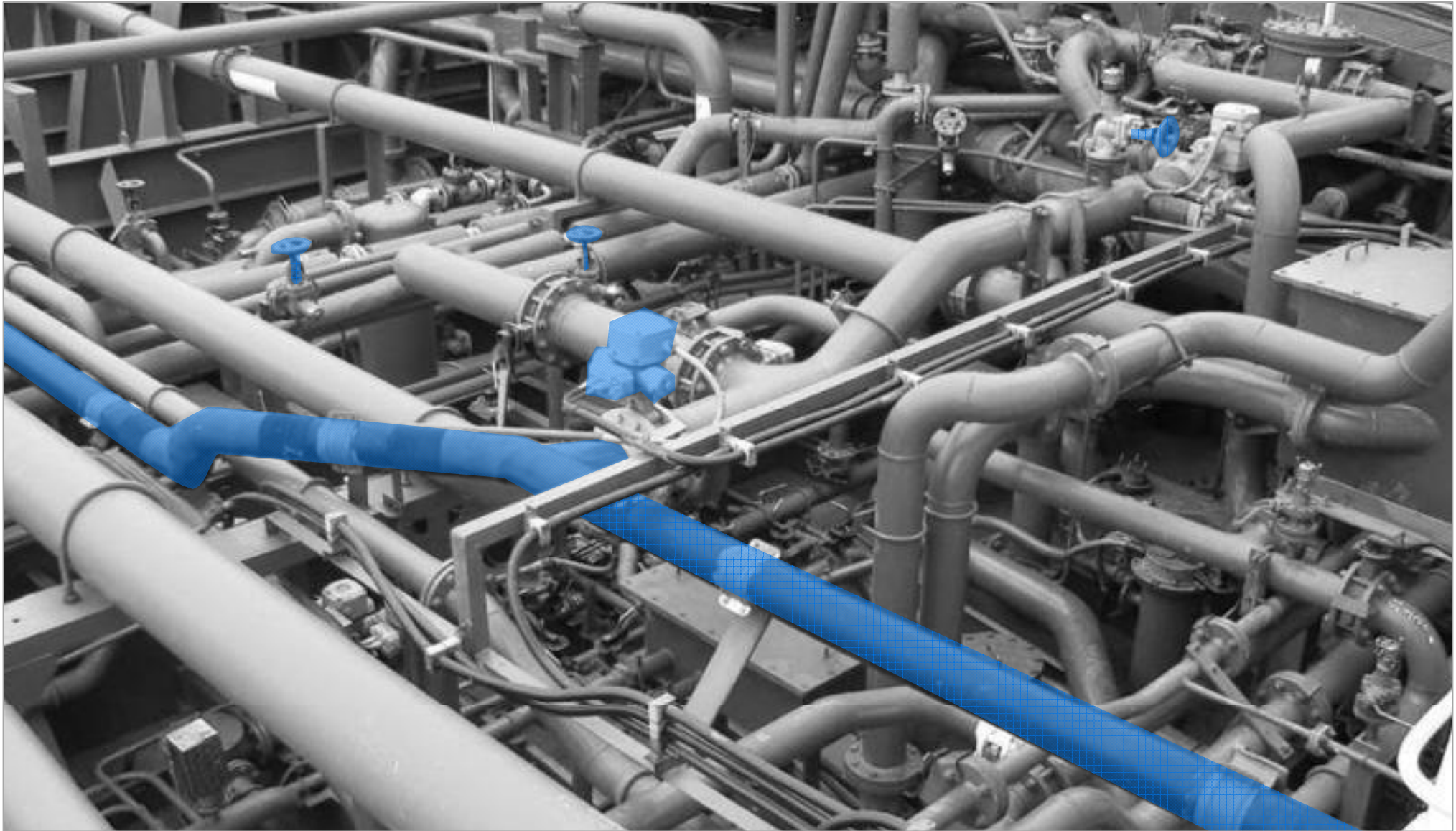
# Martijn Glass

*2<sup>nd</sup> wave: exposed to different engineering disciplines*



# Martijn Glass

*3<sup>rd</sup> wave: enhancing the flow of ideas*



# Martijn Glass

*4<sup>th</sup> wave?*



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# Martijn Glass

*4<sup>th</sup> wave: bending ideas and creating the future*



# Collaboration

To work together toward a  
common goal

# Collaboration

*1<sup>st</sup> wave: discipline silos*



# Collaboration

*2<sup>nd</sup> wave: open work spaces / taskforces*



# Collaboration

*3<sup>rd</sup> wave: multi-location execution*



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# Collaboration

*4<sup>th</sup> wave: ?*



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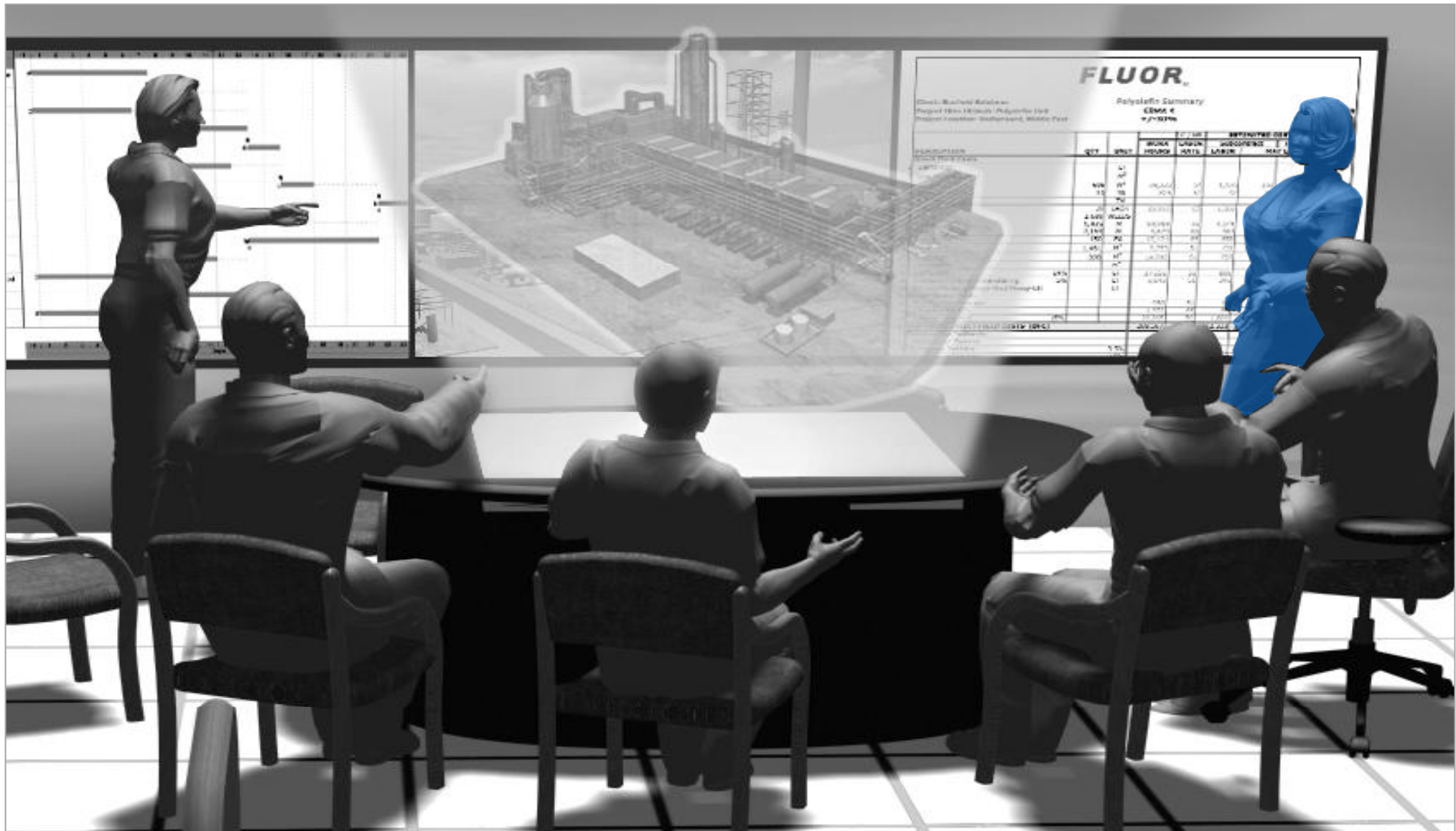
# Collaboration

*4<sup>th</sup> wave: dispersed execution / metanomics?*



# Collaboration

*4<sup>th</sup> wave: dispersed execution / metanomics?*



# Knowledge Transfer

Means by which expertise, skills and capabilities are passed on from one person to another

# Knowledge Transfer

*1<sup>st</sup> wave: master - apprentice approach*



# Knowledge Transfer

## *2<sup>nd</sup> wave: instructor-led*



# Knowledge Transfer

## 3<sup>rd</sup> wave: MOOCs

- ☒ All Languages
  - ☐ English
  - ☐ Chinese
  - ☐ French
  - ☐ Spanish
  - ☐ German
  - ☐ Arabic
  - ☐ Italian
- ☒ All Subtitles Available
  - ☐ English
  - ☐ Chinese
  - ☐ French
  - ☐ Spanish
  - ☐ Portuguese
  - ☐ Turkish
  - ☐ German
  - ☐ Russian
  - ☐ Ukrainian
  - ☐ Arabic
  - ☐ Italian
  - ☐ Japanese
- ☒ All Categories
  - ☐ Arts
  - ☐ Biology & Life Sciences
  - ☐ Business & Management
  - ☐ Chemistry
  - ☐ CS: Artificial Intelligence
  - ☐ CS: Software Engineering
  - ☐ CS: Systems & Security
  - ☐ CS: Theory
  - ☐ Economics & Finance
  - ☐ Education
  - ☐ Energy & Earth Sciences
  - ☐ Engineering
  - ☐ Food and Nutrition
  - ☐ Health & Society
  - ☐ Humanities
  - ☐ Information, Tech & Design
  - ☐ Law
  - ☐ Mathematics
  - ☐ Medicine
  - ☐ Music, Film, and Audio
  - ☐ Physical & Earth Sciences
  - ☐ Physics
  - ☐ Social Sciences
  - ☐ Statistics and Data Analysis
  - ☐ Teacher Professional Development

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 Brown University  
 California Institute of Technology  
 California Institute of the Arts  
 Case Western Reserve University  
 Columbia University  
 Commonwealth Education Trust  
 Curtis Institute of Music  
 Duke University  
 École Polytechnique  
 École Polytechnique Fédérale d...  
 Emory University  
 Exploratorium  
 Georgia Institute of Technology  
 Hebrew University of Jerusalem  
 IE Business School  
 Icahn School of Medicine at Mo...  
 Johns Hopkins University  
 Ludwig-Maximilians-Universität...  
 Match Teacher Residency  
 Nanyang Technological Universi...  
 National Taiwan University  
 National University of Singapore  
 New Teacher Center  
 Northwestern University

Peking University  
 Pennsylvania State University  
 Princeton University  
 Relay Graduate School of Educ...  
 Rice University  
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 University of Pittsburgh  
 University of Rochester  
 University of Toronto  
 University of Virginia  
 University of Washington  
 University of Wisconsin-Madison  
 University of Zurich  
 Vanderbilt University  
 Wesleyan University  
 Yale University

# Knowledge Transfer

## 4<sup>th</sup> wave: ?



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# Knowledge Transfer

## *4<sup>th</sup> wave: (serious) gaming?*



# Decision criteria

A standard, philosophy, rule, or test on which a judgment can be based

# Decision Criteria

*1<sup>st</sup> wave: does it work?*



# Decision Criteria

*2<sup>nd</sup> wave: money!*



# Decision Criteria

*3<sup>rd</sup> wave: environment*



# Decision Criteria

*4<sup>th</sup> wave: ?*



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# Decision Criteria

*4<sup>th</sup> wave: the human element*



# Visualization

To form an image

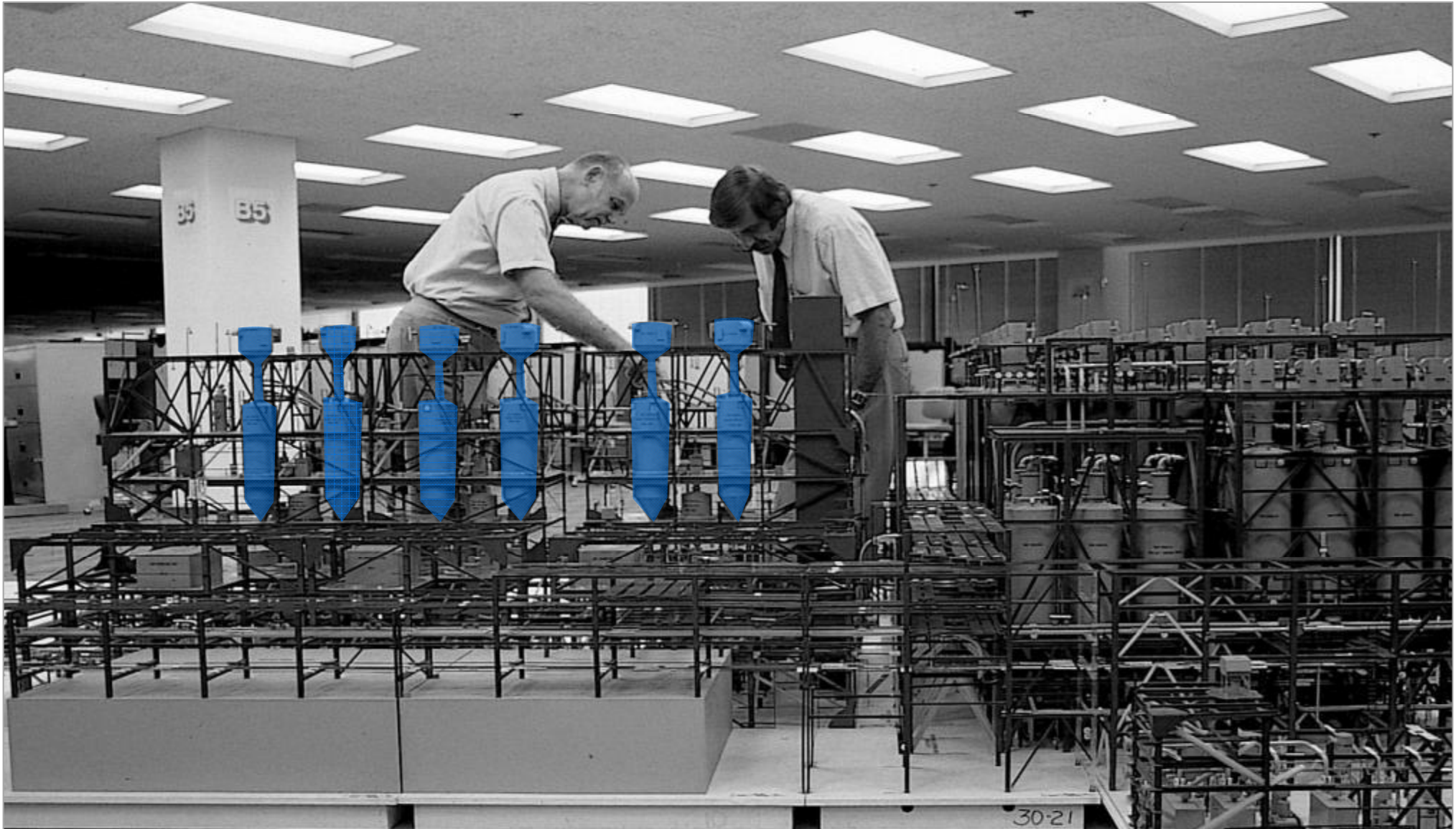
# Visualization

## *1<sup>st</sup> wave: drawing board*



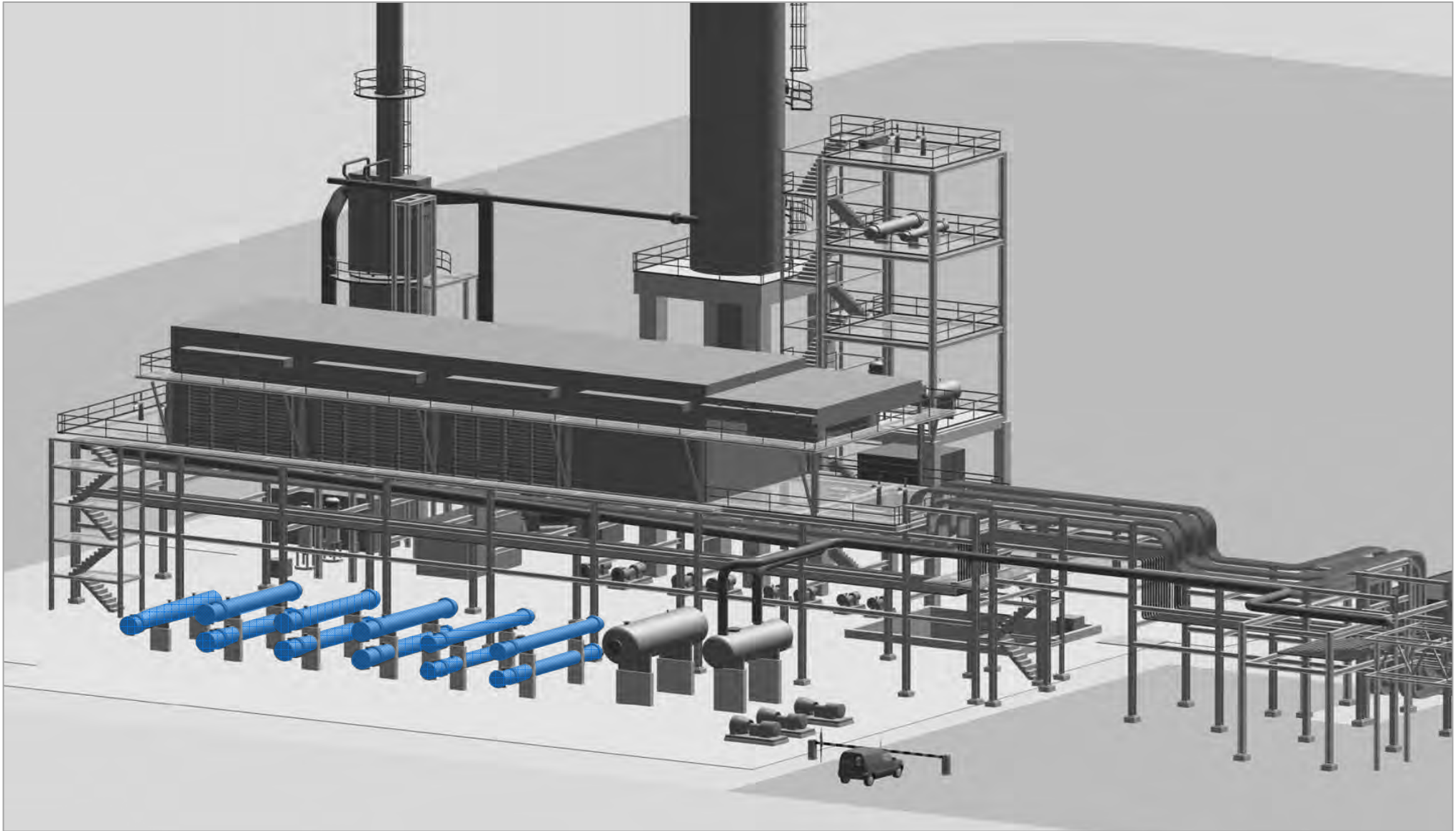
# Visualization

*2<sup>nd</sup> wave: plastic models*



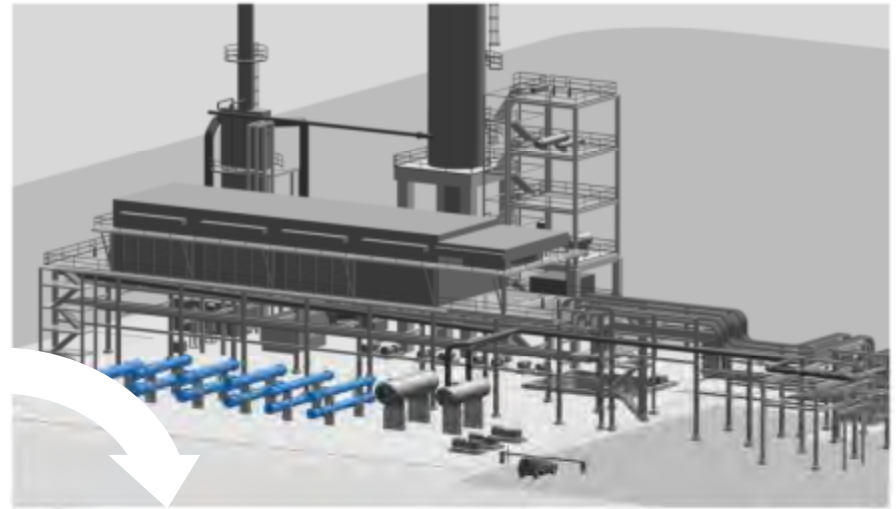
# Visualization

*3<sup>rd</sup> wave: 3D modeling*



# Visualization

*4<sup>th</sup> wave: ?*



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## 4<sup>th</sup> wave: multi-dimensional?

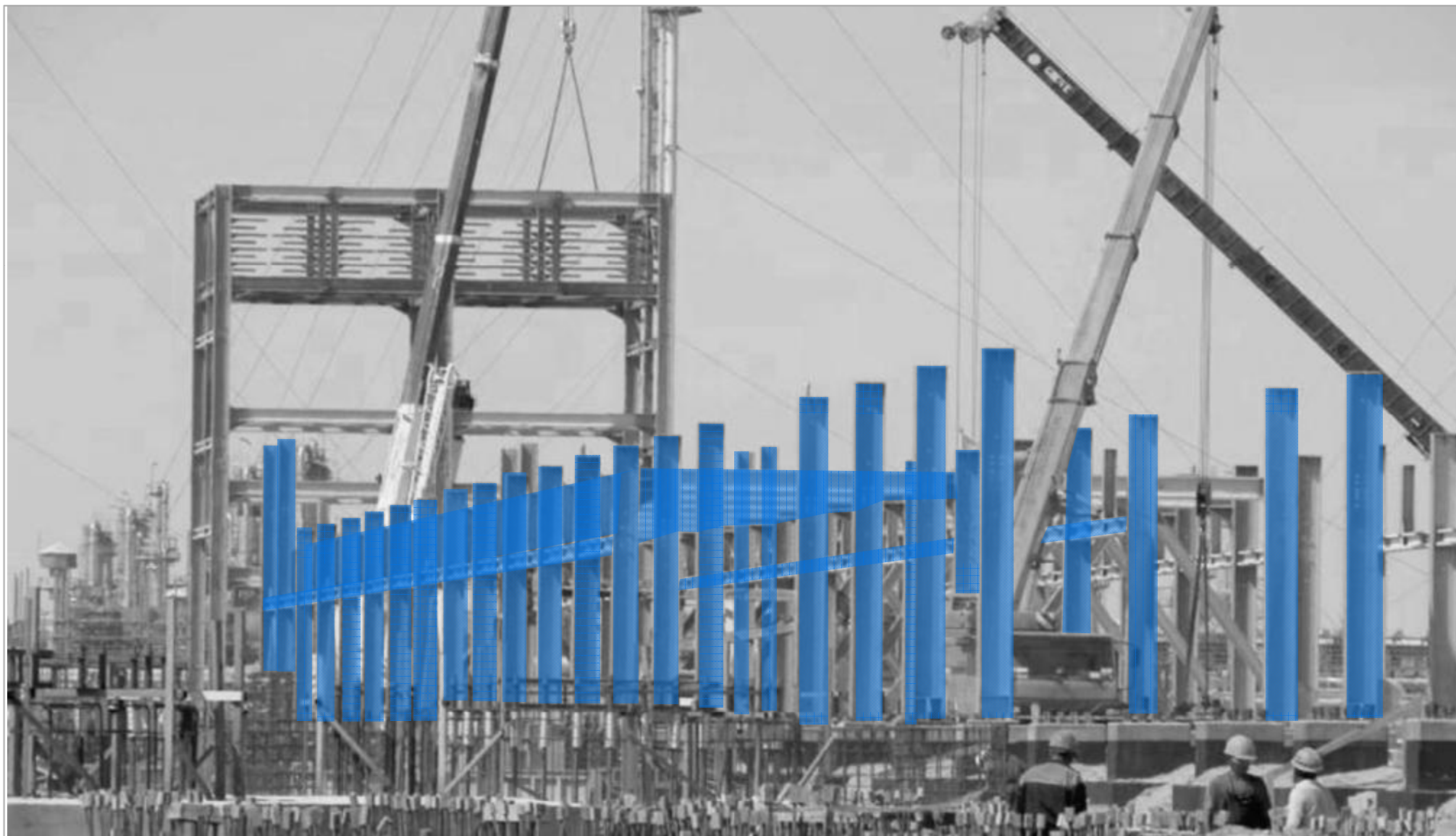


# Construction

The way in which something is  
built or put together

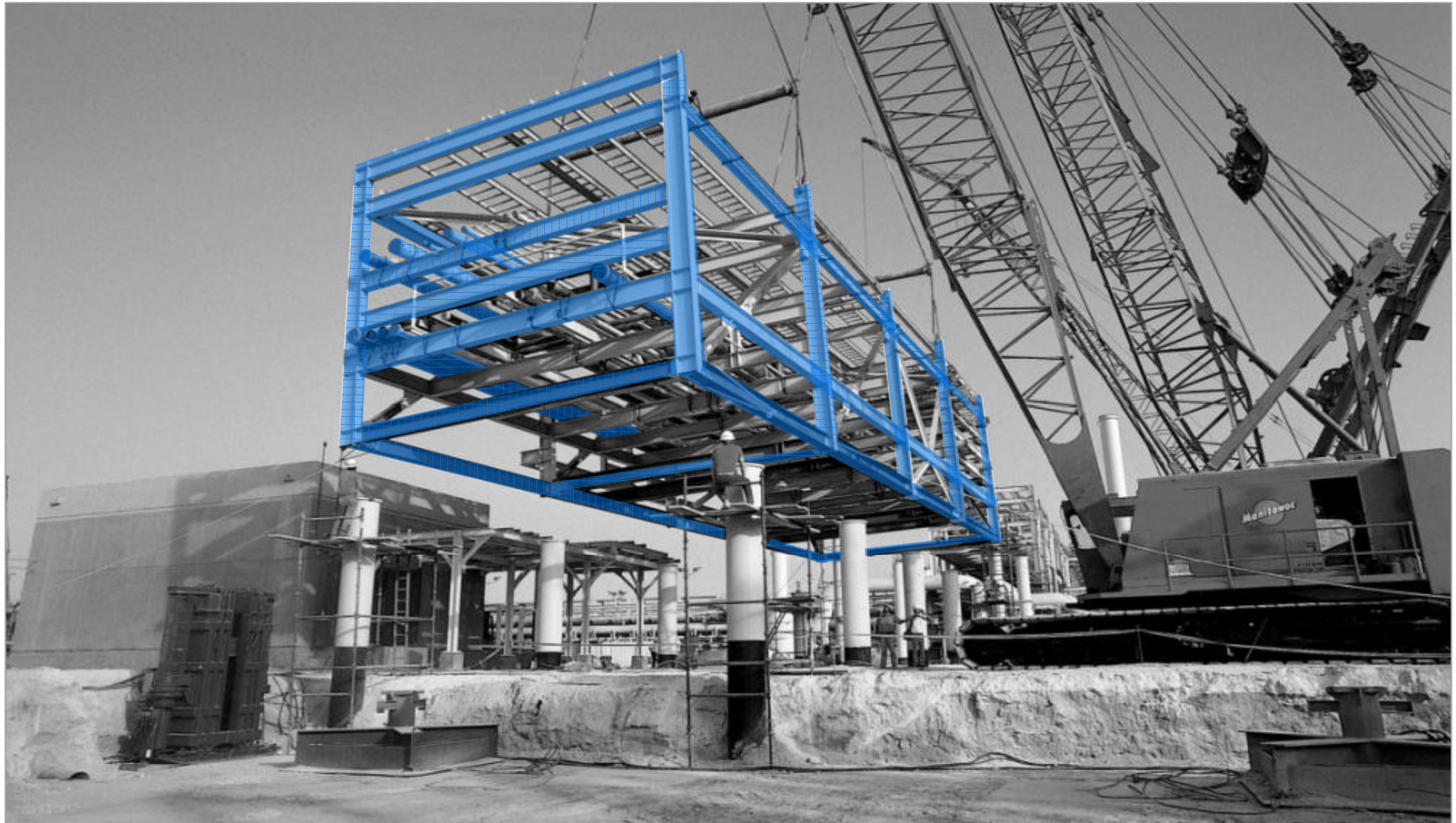
# Construction

*1<sup>st</sup> wave: stick-build*



# Construction

*2<sup>nd</sup> wave: pre-assembled rack (PARs)*



# Construction

*3<sup>rd</sup> wave: process modules*



# Construction

*4<sup>th</sup> wave: ?*



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# Construction

*4<sup>th</sup> wave: standardized plug & play modules?*

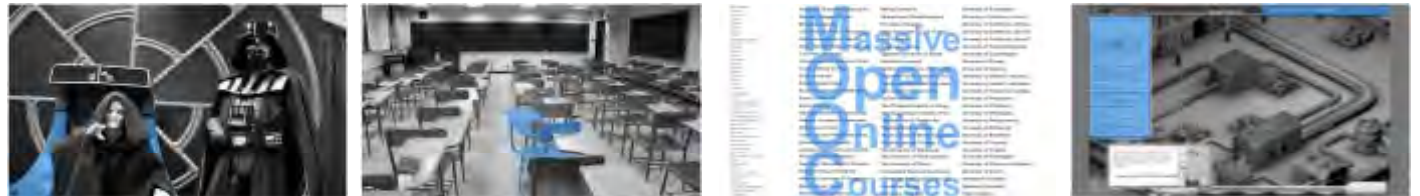


# Summary

Collaboration



Knowledge transfer



Decision criteria



Visualization



Construction



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Are you watching out for the next wave?



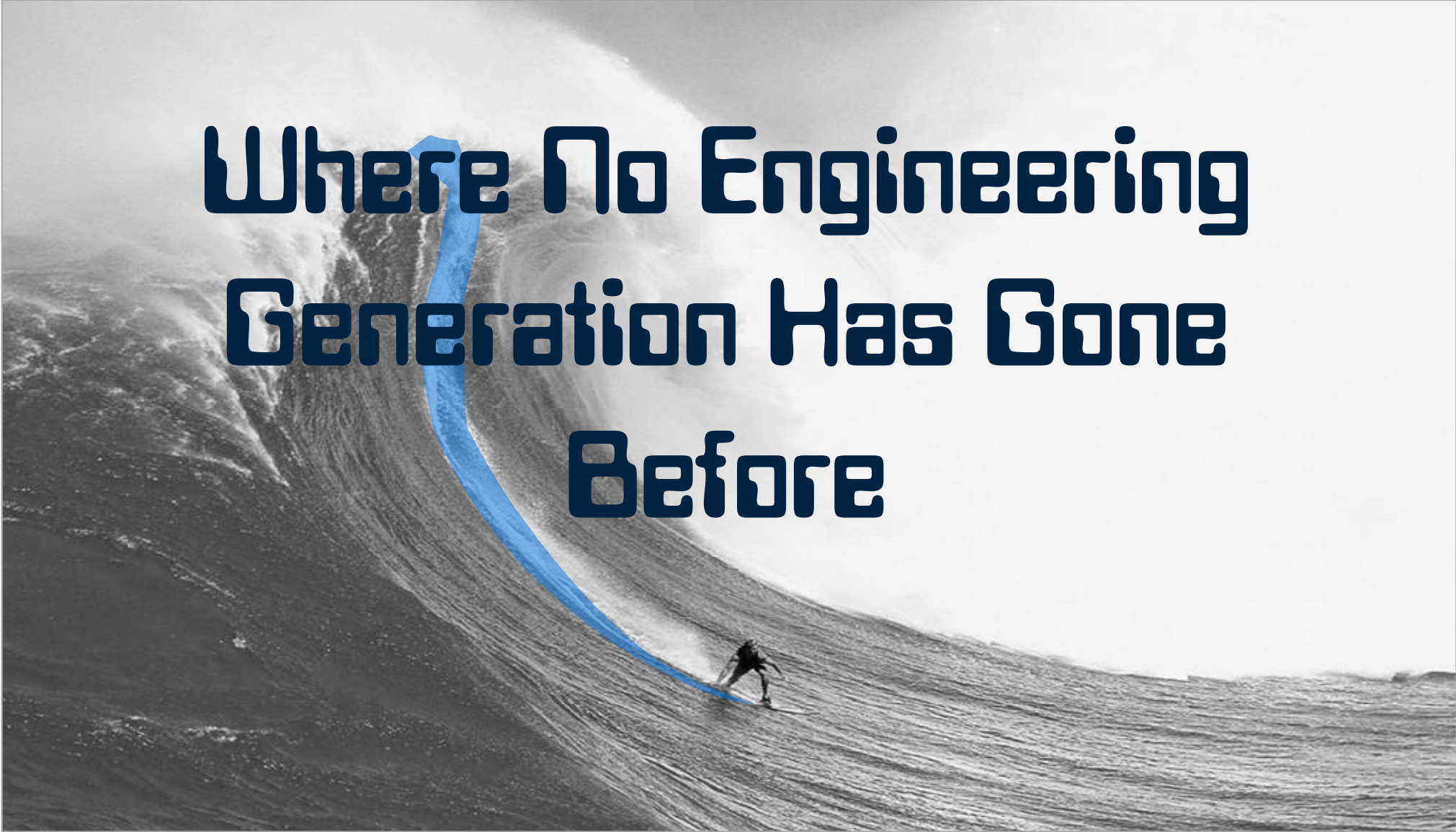
Are you helping make the next wave?



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Are you ready to ride the next wave, independent of who made it?





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Generation Has Gone  
Before**

# Thank you for your attention!

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