Design Thinking For Winners In Construction Industry

Case Study of Design for Manufacturing & Assembly

by Practice Professor K C Chan
We cannot change the world
but we can change how people design

Dr KC Chan
Design Thinking Experience

### Achievements
- Developed 10,000 senior executives in organization project management, agile leadership, accelerated learning for faster, better and smarter performance

### Practice Professor K C Chan
**DLitt DPhil DPS PhD MBA MSc BSc(Hons) CEng**

### Management Certification
- SCPM *(Stanford)* PMP *(PMI)*
- FCMC PMC *(SPRING)*
- ACTA *(WDA)*

### Awards
- Best article on “Whole Brain Manager”
- Chief Judge for Asia Furniture Leadership Award
- Most Outstanding Performer – Husky (Canada)
- Excellence in Execution Capability – Okuma (Japan)

### Sinar Mas Group - Corporate Director
- Plan corporate global strategies (US$14b)
- Execute strategies via Office of Strategy Management

### NagaCorp Integrated Resorts & Casino - COO
- Lead turnkey business development
- Managed 6 mega projects (US$3.6b)

### Husky Asia - Regional VP
- Setup R&D centers and offshore business development centers
- Lead, managed, developed regional teams and turnkey programs & projects in Asia (US$ 500m)

### Okuma Corporation - Regional GM
- Lead, managed turnkey programs/projects and business developments in ASEAN
- Build execution capability of Okuma’s partners in ASEAN countries (US$ 400m)
Six Perspectives of Design Thinking

- Blue: The Big Picture
- White: Facts & Information
- Green: Alternatives & Learning
- Red: Feelings & Emotions
- Yellow: Positive Judgment
- Black: Critical Judgment

De Bono (1985)
What is Design Thinking in the Construction Industry?

DT should permeate the whole organization as our core competence is to attain faster, better, and smarter product, service, solution.

DT must result in improving productivity of the 5 Ms.

DT may be a fad; we must implement one step at a time.

We must justify the costs vs benefits of DT using NPV/IRR method.

Just do it, so that we are the pioneer in DT.

DT will help to position our company as technology-driven with best business value innovation.
6As of Design Thinking

Embrace Awareness
What is Design Thinking (DT)?

Ensure Alignment
Why Design Thinking is vital?

Engage Action
How to Cultivate Design Thinking?

Encourage Adoption
Who are the Authentic DT Winners?

Enable Assurance
When to Multiply Design Thinking?

Envisage Risk
Where does Design Thinking Works Best?
Design thinking focuses on human activities to ensure that complex and expensive products/services/solutions are transformed into simple and affordable ones.
## Alignment: Why Design Thinking is Vital?

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White</strong> (Info)</td>
<td>Reduce cost - to stay relevant and sustain competitive advantage</td>
</tr>
<tr>
<td><strong>Red</strong> (Passion)</td>
<td>Improve aesthetic value through common sense – touch, taste, smell, sight, sound of customers/end-users</td>
</tr>
<tr>
<td><strong>Black</strong> (Caution)</td>
<td>Reduce accidents is top priority – minimize risk of tarnishing corporate image and losing tender</td>
</tr>
<tr>
<td><strong>Yellow</strong> (Opportunity)</td>
<td>Increase sales revenue, improve profit margin are key objectives of design thinking</td>
</tr>
<tr>
<td><strong>Green</strong> (Innovation)</td>
<td>Enhance contribution to sustain the green environment and eco-system as part of corporate social responsibility</td>
</tr>
<tr>
<td><strong>Blue</strong> (Visionary)</td>
<td>Improve total productivity of resources for cost advantage – money, manpower, materials, machines, methods</td>
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</tbody>
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### Action: How to Cultivate Design Thinking?

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<tr>
<td><strong>White</strong> (Information-Driven)</td>
<td>Implement lean six sigma – standardize, straighten, sort, shine, sustain, simplify</td>
</tr>
<tr>
<td><strong>Red</strong> (Passion-Driven)</td>
<td>Implement transformational leadership for change</td>
</tr>
<tr>
<td><strong>Black</strong> (Caution-Driven)</td>
<td>Implement risk response strategy with workaround plan for know-unknown and unknown-unknown risks</td>
</tr>
<tr>
<td><strong>Yellow</strong> (Opportunity-Driven)</td>
<td>Implement incentive and remuneration plan to foster and motivate staff to exceed their performance targets</td>
</tr>
<tr>
<td><strong>Green</strong> (Innovation-Driven)</td>
<td>Implement breakthrough technology to gain experience and expertise to run more complex and bigger projects</td>
</tr>
<tr>
<td><strong>Blue</strong> (Visionary-Driven)</td>
<td>Implement in domestic market; next tender for projects in overseas market for scalability and employability</td>
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Adoption: Who are the Authentic DT Winners?

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<tr>
<td>White (Information-Driven)</td>
<td>Determine the budget for training and developing of design thinking capabilities for the whole organization</td>
</tr>
<tr>
<td>Red (Passion-Driven)</td>
<td>Top management must be committed for consistency, compassion and congruence to give assurance</td>
</tr>
<tr>
<td>Black (Caution-Driven)</td>
<td>Develop more authentic design thinking talents because not everyone will remain forever with the company</td>
</tr>
<tr>
<td>Yellow (Opportunity-Driven)</td>
<td>Develop staff who has the right attitude and ability - offer them partnerships with the company</td>
</tr>
<tr>
<td>Green (Innovation-Driven)</td>
<td>Develop, train and nurture the right staff to ensure that their competence level remain as industry best</td>
</tr>
<tr>
<td>Blue (Visionary-Driven)</td>
<td>Develop and nurture authentic DT winners; it must pass through 5 stages of maturity which takes time to attain</td>
</tr>
</tbody>
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## Assurance: When to Multiply Design Thinking?

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<tr>
<td>White (Information-Driven)</td>
<td>Develop the right KPIs (key performance indicators) to benchmark against competitors and industry - SQA</td>
</tr>
<tr>
<td>Red (Passion-Driven)</td>
<td>Develop the right organizational culture to become a high performance company through design thinking</td>
</tr>
<tr>
<td>Black (Caution-Driven)</td>
<td>The initiative will not last – unless it is 100% driven by senior management with top management commitment</td>
</tr>
<tr>
<td>Yellow (Opportunity-Driven)</td>
<td>The initiative will increase our productivity and create a stress-free environment – everyone benefits</td>
</tr>
<tr>
<td>Green (Innovation-Driven)</td>
<td>This is the best practice to keep the company abreast with technology where action learning ≥ rate of change</td>
</tr>
<tr>
<td>Blue (Visionary-Driven)</td>
<td>Implement transition management process to overcome resistance to change – where employability is assured</td>
</tr>
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Anticipation: Where Design Thinking Works Best?

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<tbody>
<tr>
<td><strong>White</strong> (Information-Driven)</td>
<td>Focus on the areas where cost reduction brings the highest return-on-investments</td>
</tr>
<tr>
<td><strong>Red</strong> (Passion-Driven)</td>
<td>Everyone must reduce cost to achieve a “nuclear effect”; inculcate sense of ownership &amp; spirit of an entrepreneur</td>
</tr>
<tr>
<td><strong>Black</strong> (Caution-Driven)</td>
<td>Designing thinking could be another fad like the six sigma, process reengineering, etc. It will not last</td>
</tr>
<tr>
<td><strong>Yellow</strong> (Opportunity-Driven)</td>
<td>Nothing venture, nothing gain; try, try, try…. until proven to be of no business value adding</td>
</tr>
<tr>
<td><strong>Green</strong> (Innovation-Driven)</td>
<td>Design thinking for innovation – to be faster, better and smarter than the competition is no longer a choice</td>
</tr>
<tr>
<td><strong>Blue</strong> (Visionary-Driven)</td>
<td>Designing thinking must permeate the whole enterprise; the concept and process can be integrated with TQM – DT is everyone’s business value-add for client happiness</td>
</tr>
</tbody>
</table>
Six Senses of Design for Manufacturing & Assembly

- Sight
- Smell
- Touch
- Sound
- Taste
- Common Sense
### Six Senses of DfMA: Holistic Approach

<table>
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<tbody>
<tr>
<td><strong>Sound</strong> (Information-Driven)</td>
<td>Most of the construction materials are in modular form – precast concrete,</td>
</tr>
<tr>
<td><strong>Touch</strong> (Passion-Driven)</td>
<td>This makes it easier to design, build and operate resulting in less prone to accidents, faster to build</td>
</tr>
<tr>
<td><strong>Smell</strong> (Caution-Driven)</td>
<td>If most of the construction is in modular form, many skilled workers will be replaced because of automation</td>
</tr>
<tr>
<td><strong>Taste</strong> (Opportunity-Driven)</td>
<td>The quality of the modular products are consistent, defective rates are lesser and rework is minimized</td>
</tr>
<tr>
<td><strong>Common Sense</strong> (Innovation-Driven)</td>
<td>Competitors never sleep; it is essential to keep abreast &amp; upgrade our expert power in the construction industry to cater for domestic &amp; overseas projects</td>
</tr>
<tr>
<td><strong>Sight</strong> (Visionary-Driven)</td>
<td>The future shortage of skill workers in the construction industry where artificial intelligence is a viable solution</td>
</tr>
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</table>
6As of DfMA in the VUCA Economy in Industry 4.0

Anticipation of VUCA Economy in Industry 4.0

Impact of Globalisation on Job-shift, Wealth-shift, Economy-shift, Power-shift, Technology-shift
13 Forces of Globalization on VUCA and Industry 4.0

- Variety
- Quality
- Lowest Cost
- Customization
- Speed
- Dilemmas & Paradoxes
- Volatile
- Complex
- Uncertain
- Ambiguous
- Convenience
- Technology
- Infrastructure
- Global Financial Integration
- Free Trade Agreement
- Crude Oil Scarcity
- Gov’t Support for Green Environment

Industry 4.0 & DfMA
Impact of Globalization on VUCA Business Environment

- **Predictable**
- **Unpredictable**

### Complexity
(Multiple key decision factors)

### Volatility
(Rate of change)

### Ambiguity
(Lack of clarity about meaning of an event)

### Uncertainty
(Unclear about the present)

- **Available**
- **Unavailable**

How can you predict the result of the actions?

**Knowledge**
# Design for Manufacturing & Assembly in VUCA World

<table>
<thead>
<tr>
<th>VOLATILITY</th>
<th>UNCERTAINTY</th>
<th>COMPLEXITY</th>
<th>AMBIGUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Translate data into risk information</td>
<td>• Get a fresh perspective</td>
<td>• Develop collaborative leaders</td>
<td>• Listen well</td>
</tr>
<tr>
<td>• Communicate risk early</td>
<td>• Be flexible</td>
<td>• Stop seeking permanent solutions</td>
<td>• Think divergently</td>
</tr>
<tr>
<td>• Update early warning indicators</td>
<td>• Glance back, look ahead</td>
<td>• Train tomorrow’s heroes now</td>
<td>• Setup incremental dividends</td>
</tr>
<tr>
<td>• Perform worst-scenario plan</td>
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### VISIONARY: 80,000 Singaporeans trained in digital technologies for construction industry

### UNDERSTANDING: 10 prefab hub and PPVC productive constructive process

### CLARITY: build IDD progressive and collaborative firms for life cycle savings

### AGILITY: CITM to cope with changes in the VUCA economy, 5D-BIM productivity+innovation
Take-Home Value: Outcome of Lessons Learnt

Design Thinking

Holistic thinking
6 perspectives

Design for Manufacturing & Assembly

Critical thinking
6 senses

Design for Construction Industry Transformation Map

System thinking
6 figures
Design thinking begins with establishing the **precise** pain points of the customer or end-user;

Without ascertaining the **root** of the problem, design thinking will start with the wrong end of the stick and finish in the wrong path; those capable of responding to change and integrating technology will be the **Winners!**

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Dr KC Chan
Thank You

The aim of this book is to energize readers with the insights, enthusiasm, and endeavours to inspire more and better technopreneurs and go beyond disruptive innovation, to what is known as "Olympic Innovation"