Impact of National Culture on Innovation: A PIPE model for Engineering education

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WEF) 3 Economic development models

Basic Requirements
- Institutions
- Infrastructure
- Macroeconomy
- Health and Primary Education

Key for factor-driven economies

Efficiency Enhancers
- Higher Education and Training
- Market Efficiency (goods, labor, financial)
- Technological Readiness

Key for efficiency-driven economies

Innovation and Sophistication Factors
- Business Sophistication
- Innovation

Key for innovation-driven economies
Economic growth

Innovation

Culture
Culture 文化？

- Fine arts and literatures, constructions, religions, philosophy, education, wine, tea, politics, cuisine, etc. etc.
- Spiritual, physical, Language, norm/behavior.
Chinese culture

- Buddhism? Taoism? Confucianism?
- Part of each not all
- What is the exact culture in China now?
Edward B Taylor: complex whole which includes knowledge, belief, art, law, morals, custom, and any other capabilities and habits acquired by man as a member of society.

在一个社会里，社会成员普遍具有：
- 价值观念，信念态度，行为规范，相处之道

民族文化（传统）是影响人类行为的根本因素。

表现在政治，经济，军事，衣食住行，科技
- 酒文化，茶文化，官场文化，方方面面
An empirical research

National culture and innovation
Hofstede (97), Hall(76)

Culture context
H6: -ve

Innovation Capability
H7: -ve

(NICI (Porter & Stern))

(Hofstede 1997)

Power Distance
H1 - ve

Individualism
H2 + ve

Masculinity
H3 + ve

Uncertainty Avoidance
H4 - ve

Long-Term Orientation
H5 + ve

(X)

(Hall 1976)
## Correlation test (n=49)

### Pearson Correlation

<table>
<thead>
<tr>
<th></th>
<th>NICI</th>
<th>PDI</th>
<th>IDV</th>
<th>MAS</th>
<th>UAI</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>NICI</td>
<td>1</td>
<td>-.549**</td>
<td>.752**</td>
<td>-.054</td>
<td>-.357**</td>
<td>-.620**</td>
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<tr>
<td>PDI</td>
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<td>.172</td>
<td>.579**</td>
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<tr>
<td>IDV</td>
<td>.752**</td>
<td>-.675**</td>
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<td>.100</td>
<td>-.239*</td>
<td>-.689**</td>
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<td>MAS</td>
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<td>.089</td>
<td>.100</td>
<td>1</td>
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<td>.026</td>
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<tr>
<td>UAI</td>
<td>-.357**</td>
<td>.172</td>
<td>-.239*</td>
<td>.019</td>
<td>1</td>
<td>.435**</td>
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<tr>
<td>Context</td>
<td>-.620**</td>
<td>.579**</td>
<td>-.689**</td>
<td>.026</td>
<td>.435**</td>
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<tr>
<td>Chronic</td>
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<td>.620**</td>
<td>-.768**</td>
<td>-.047</td>
<td>.344**</td>
<td>.842**</td>
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<tr>
<td>LTO</td>
<td>-.144</td>
<td>.372*</td>
<td>.408*</td>
<td>.209</td>
<td>.010</td>
<td>.451*</td>
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</table>

**. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.05 level (1-tailed).
National culture and innovation
Hofstede (97), Hall(76)

<table>
<thead>
<tr>
<th></th>
<th>Equal</th>
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<tbody>
<tr>
<td>Power distance</td>
<td>Equal</td>
<td>-</td>
</tr>
<tr>
<td>Individualism</td>
<td>Collectivism</td>
<td>+</td>
</tr>
<tr>
<td>Uncertainty Avoidance</td>
<td>Tolerant, acceptable, facing problems</td>
<td>-</td>
</tr>
<tr>
<td>high context</td>
<td>Intuitive, experiences</td>
<td>+</td>
</tr>
<tr>
<td>Chronicity</td>
<td>Flexible, changeable</td>
<td>+</td>
</tr>
</tbody>
</table>
Innovative national culture index (INCI)

1. Shorter power distance
2. More individualistic
3. Lower uncertainty avoidance
4. High Context
5. High Chronicity

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Chronicity</td>
<td>.928</td>
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<tr>
<td>Context</td>
<td>.913</td>
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<tr>
<td>IDV</td>
<td>-.864</td>
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<tr>
<td>PDI</td>
<td>.838</td>
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<tr>
<td>UAI</td>
<td>.465</td>
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<tr>
<td>Initial Eigenvalue</td>
<td>3.36</td>
</tr>
<tr>
<td>% of Variance</td>
<td>67.12</td>
</tr>
<tr>
<td>Cronbach’ Alpha</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Where is China?
## Compare China and USA

<table>
<thead>
<tr>
<th></th>
<th>權利距離</th>
<th>高 0.13</th>
<th>低 0.70</th>
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</thead>
<tbody>
<tr>
<td><strong>Power distance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Individualism</strong></td>
<td>個人主義</td>
<td>低 0.21</td>
<td>高 1.00</td>
</tr>
<tr>
<td><strong>Uncertainty Avoidance</strong></td>
<td>承受不確定性</td>
<td>高 0.91</td>
<td>高 0.80</td>
</tr>
<tr>
<td><strong>Low-high context</strong></td>
<td>透明+科學</td>
<td>低0.02</td>
<td>高 0.92</td>
</tr>
<tr>
<td><strong>Chronicity</strong></td>
<td>精確+準時</td>
<td>中0.57</td>
<td>高 0.95</td>
</tr>
</tbody>
</table>
權力距離 \( \rightarrow \) 領導風格:
Power distance \( \rightarrow \) education style
社交場合/Social gathering
生活方式
个人生活Individual 集体生活collective
Value of individualism
承担风险，面對問題：迴避問題
Risk taking, facing problems
表達問題: Expression straight forward, full of twists and turns
Communication:

相由心生，表裏不一
Sense of time
Measuring and precision
煮饭的诀窍：正确的水量
Cook rice: proper amount of water

1. **洗米**时第一次加入大量的水，快速地搅拌后立刻将水倒掉，用手掌以按压的方式搓洗米，用水重复冲洗至清澈为止。

2. 洗好的米放入内锅并加入**正确的水量**，放置约半小时，让米吸收水分再开始煮饭。**饭煮好后**继续保温约10～15分钟再将锅盖打开，并用饭匙将煮好的饭翻搅均匀，就是香喷喷的白饭了。

3. 如果你不能很有把握地煮出熟度刚好的饭，加入一两滴酒可以让半生不熟的饭变成香喷喷的白饭喔！

4. 在洗好的米中加一小搓盐和色拉油，可以让煮出来的饭亮晶晶。
Two kinds of thinking

Crisp
Yes/No
Black/White
Polar, Dichotomy

Fuzzy
Depends
Shades of Gray
Distributed Membership

Aristotle
OCCIDENTAL

Lao Zi
ORIENTAL
The Process from Creativity, Innovation to Entrepreneurship

Psychology → Creativity → Idea

Technology (invention) → Innovation → Product

Business → Enterprise → Market

$
Creativity or innovation?

- 创新：应用到商业环境里的创造力和想象力：

- 2006："Creativity and imagination applied in a business context is innovation."（Business Week: 100 top innovative companies）
# The PIPE model for teaching creativity, innovation and entrepreneurship

<table>
<thead>
<tr>
<th>Project</th>
<th>Team-based project (Mock company, role play, teamwork, communication)</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Creativity (创造)</td>
<td>Innovation (创新)</td>
</tr>
<tr>
<td>Practice</td>
<td>Ideas (新想法)</td>
<td>Product (新产品)</td>
</tr>
<tr>
<td>Practice</td>
<td>Use brain (动脑)</td>
<td>Hands-on (动手)</td>
</tr>
<tr>
<td>Presentation</td>
<td>报告 1 Report 1</td>
<td>报告 2 Report 2</td>
</tr>
</tbody>
</table>

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