# Outline

1. Introduction

2. Latest INCOSE IS & IW Cultural Related Topics

3. SE from an Islamic Perspective

(1/3)

# Introduction
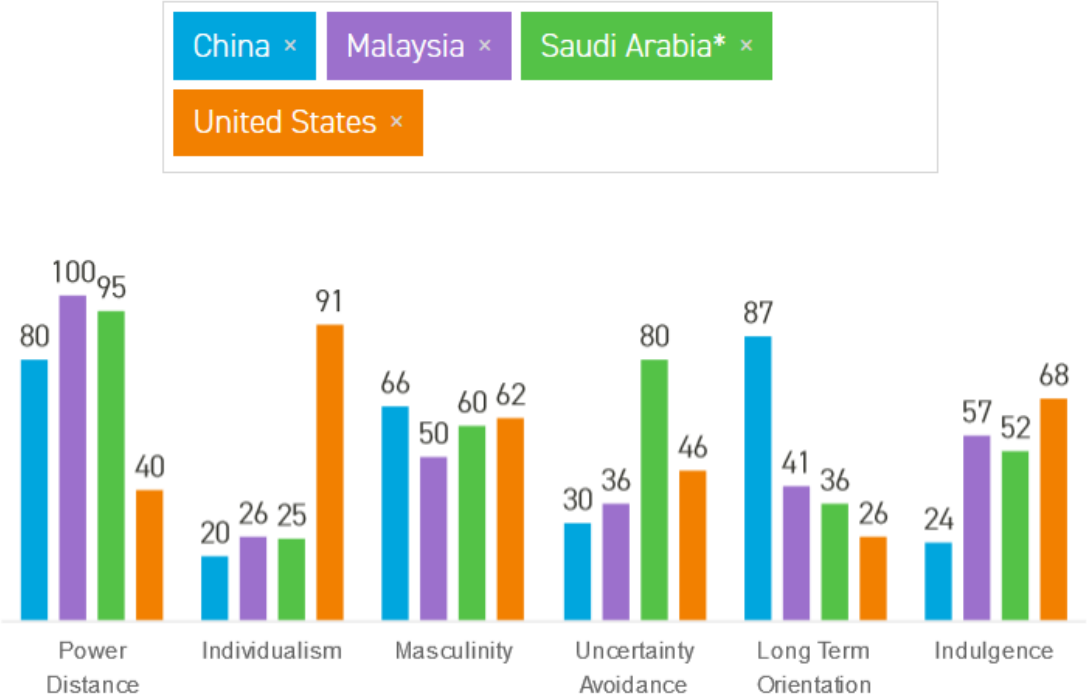
## Is Systems Engineering Applicable in all Cultures?

What are the examples of successes/failures of systems engineering implementations outside its original territories? What are those territories?

China Xinhua News



| | China × | Malaysia × | Saudi Arabia* × |
| --- | --- | --- | --- |
| United States × | | | |

| | Power Distance | Individualism | Masculinity | Uncertainty Avoidance | Long Term Orientation | Indulgence |
| --- | --- | --- | --- | --- | --- | --- |
| China | 80 | 20 | 66 | 30 | 87 | 24 |
| Malaysia | 100 | 26 | 50 | 36 | 41 | 57 |
| Saudi Arabia* | 95 | 25 | 60 | 80 | 36 | 52 |
| United States | 40 | 91 | 62 | 46 | 26 | 68 |

* estimated

https://www.hofstede-insights.com/

*"Investigating the Impact of Cultural Differences on Systems Engineering: A Case Study of Manned Space Flight Programs in the United States and China"*
(Qian, 2013)


NASA



28 June 2022 - Alsudairi
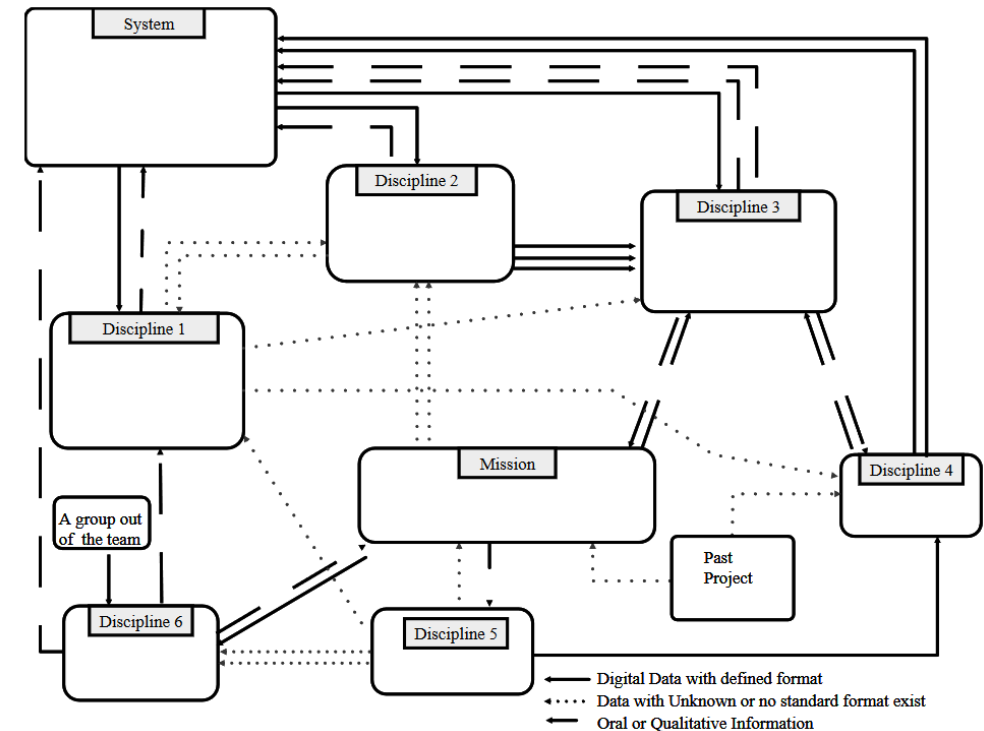
# Culture

**Definition of Culture**

Culture is an umbrella term which encompasses the social behavior and norms found in human societies, as well as the knowledge, beliefs, arts, laws, customs, capabilities, and habits of the individuals in these groups. (Tylor,1871)



## CULTURAL ICEBERG

When we talk about culture, we focus on "surface culture". These are things that we can see, hear and touch, like music, food, language, art.

This represents only the tip of the cultural iceberg. The biggest part of culture is hidden below the surface. These are values and beliefs that underlie behaviors of people from that culture. The more immersed we become in a new culture, the more these aspects are revealed to us.

As you begin your program and start making new connections, do not judge the new culture only on what is immediately visible. Keep in mind what aspects of "deep culture" exist and how that comes into play. Actively participate in the new culture and take time to see what's below the surface.

*Source Beyond Culture (1976) by Edward T. Hall*

**SURFACE CULTURE**

Food
Flag   Festivals
Fashion   Holidays   Music
Performances   Dances   Games
Arts & Crafts   Literature   Language

**DEEP CULTURE**

Communication Styles and Rules:
facial expressions, gesture, eye contact, personal space, touching, body language, tone of voice, handling and displaying of emotion, conversational patterns in different social situations

Notions of:
courtesy and manners, friendship, leadership, cleanliness, modesty, beauty

Concepts of:
self, time, past and future, fairness and justice, roles related to age, sex, class, family, etc.

Attitudes toward:
elders, adolescents, dependents, rule, expectations, work, authority, cooperation vs. competition, relationships with animals, age, sin, death

Approaches to:
religion, courtship, marriage, raising children, decision-making, problem-solving

ciee

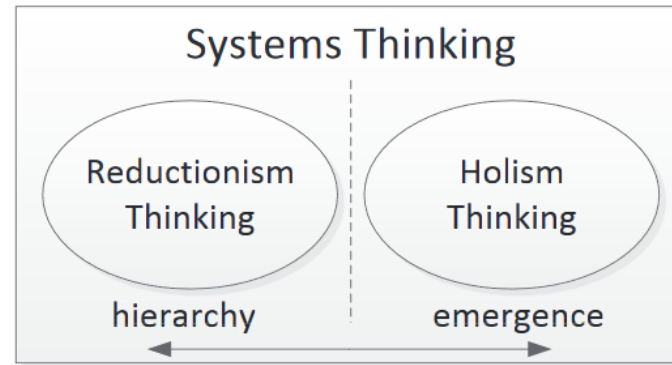# Unsuccessful Application: Concurrent Engineering in Japan

- Japanese Organization working on Satellites
- Tried to apply Integrated Concurrent Engineering (ICE) from 2002-2005, but did not succeed
- Some Reasons:
    - Hesitation for setting tentative design baseline: Chigau = different and wrong
    - Experience dependent
    - US and Europe works under specific job responsibilities but much more clearly than in most of the Japanese organizations.
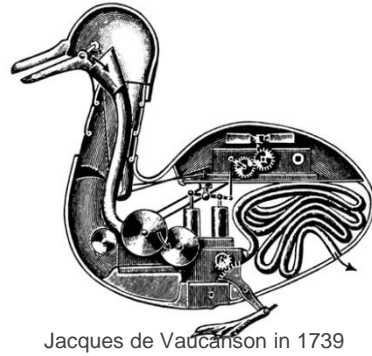


Ogawa, A., Rhodes, D.H., 2009. 6.3.4 Culture: A Key Factor for Implementing the Integrated Concurrent Engineering Approach. INCOSE International Symposium 19

# Western Vs Chinese Systems Engineering

## Systems Thinking

Reductionism Thinking — hierarchy

Holism Thinking — emergence

|  | Hard system approaches | Soft system approach |
|---|---|---|
| Objective system | Hard/well defined problem | Soft/ill-structured problem |
| Assumption of observed system | Systematic world | Metaphor/systemic mind |
| Problem solving style | End-means | Participation/debate/reform |
| Process goal | Optimization/satisfaction | Learning/satisfying |
| Acting focus | Goal-oriented | Process-oriented |
| Applying methods | Positive-empirical | Interpretive-exploratory |
| Acting philosophy thoughts | Reductionism/Do the thing right | Holism/Do the right thing |

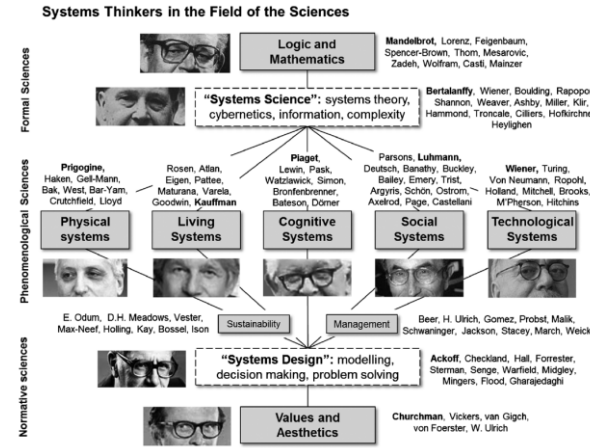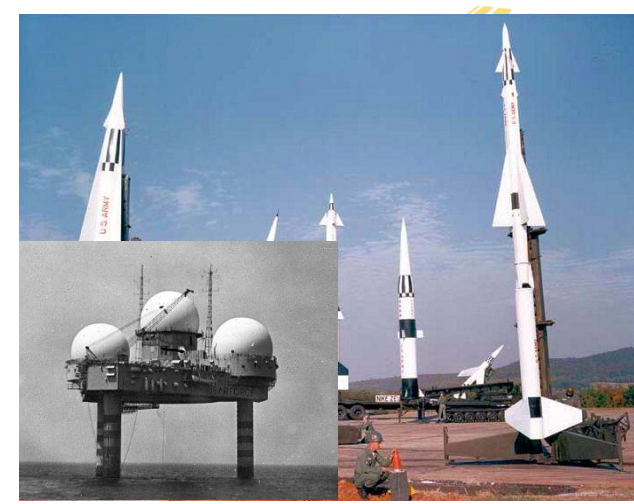Pan, X., Valerdi, R., Kang, R., 2013. **Systems Thinking: A Comparison between Chinese and Western Approaches**. Procedia Computer Science 16.

Systems Thinkers in the Field of the Sciences

Figure 3 Overview of systems thinkers and their position in the field of the sciences

(Hieronymi, 2013)

Jacques de Vaucanson in 1739

**Western SE**

Greek Philosophy Theology → Scientific Revolution → Mechanical Philosophy / Modernity → Systems Science → Post WWII Industry
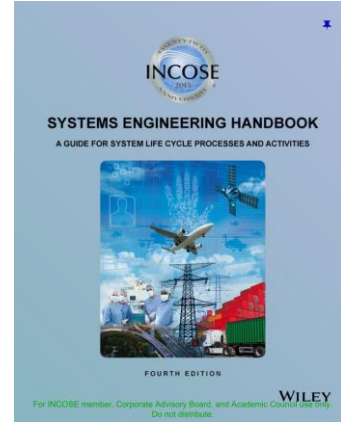
SYSTEMS ENGINEERING HANDBOOK
A GUIDE FOR SYSTEM LIFE CYCLE PROCESSES AND ACTIVITIES
FOURTH EDITION
WILEY

**Chinese SE**

Ancient Chinees → Marxism → Qian Xuesen → Modern Chinese Systems

Confucius (479 BC)

Dujiangyan Irrigation System (256 BC)

(Sanders and Jackie, 2016)

(2/3)

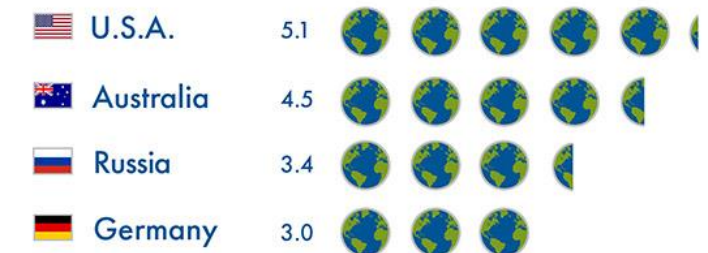# INCOSE Last IS & IW Related Topics to Culture

# Envisioning INCOSE and the United Nations Sustainable Development Goals

- Dana Polojärvi, Randall Anway, Ivan Taylor
- FUSE is the umprella
- Unifying towards UNSDGs
- Socio-anthropological model of macro-level change: How to make sure that SE applies correctly in all cultures (e.g. Dollar-street, Hunters & Gatherers Sys)
- Some regulations mightn't apply to all cultures, e.g. abortion
- How to define happiness? How to make sure its environmental friendly?
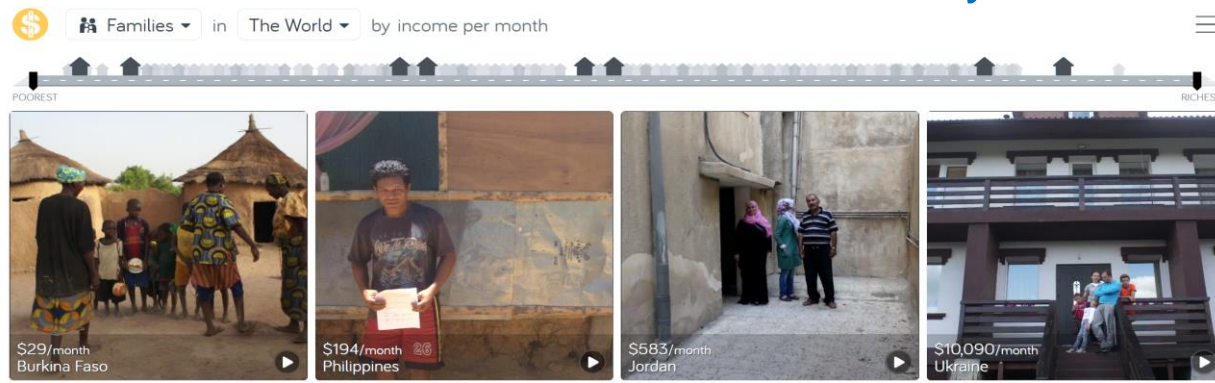
https://en.wikipedia.org/wiki/World_Happiness_Report

https://www.overshootday.org/how-many-earths-or-countries-do-we-need/

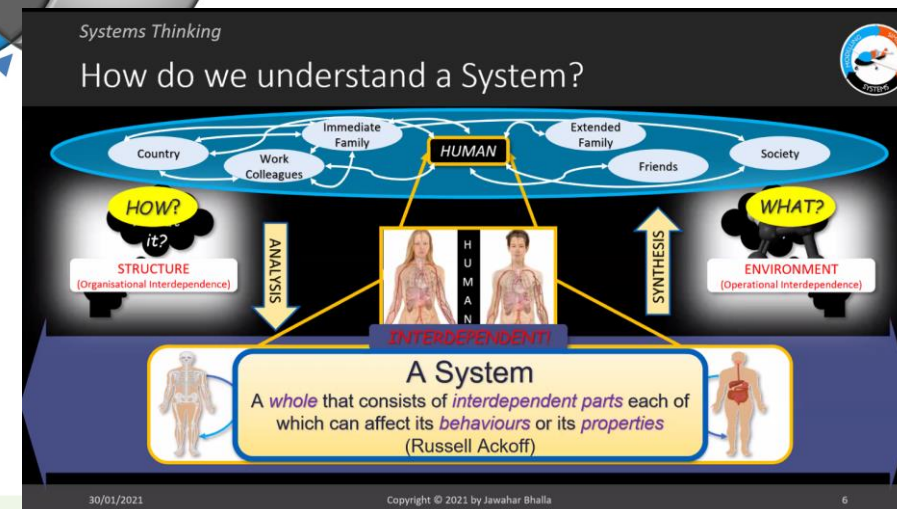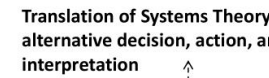# Extending the scope of SE to complex socio-technical systems

- Mike Jackson
- Successful Apollo, failure in 70s, socio-technical systems
- Opportunities for SE: supporting a mission economy (Mazzucato, 2021)
- SE principles build on systems principles that are general for all kinds of human activity systems (Rousseau, 2018)
- What are the ultimate goals which could unify objectives of all humankind?

# Systems Thinking, Round-Tables, Presentations

- Jawahar Bhalla, Chris Browne, Gary Smith, Chuck Keating, et. al.
- Data/Knowledge/Wisdom
- Human system
- Systems Theory
- Nature and society as the greater whole
- 9 transformational Powers (theory, philosophy, spirit, social…etc.)

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# Values in QM

- Barclay Brown, Hazel Woodcock, Bill Scheible, Larry Kennedy, Kim Stansfield
- Are values from nature, from nurture, chosen, unconscious, fixed or changeable?
- To better understand ZDA, we could investigate the differences between Western and Japanese cultures.
- Spirituality influence work values



Evidence of Benefits of QFD: Comparing Change at Ford & Mazda

Lesson: **Early changes to clarify needs & concepts saves time, money...**



Value Based QM Builds a Quality Culture from the individual up to the 'business-as-a-system' by developing the 8 Attributes' of a 'Quality' Manager.! They drive individuals to focus on meeting their business and customer needs and priorities.
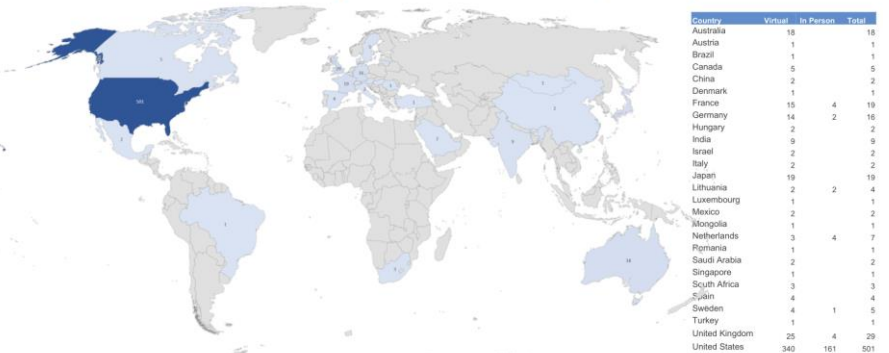
# Diversity, Equity and Inclusion

- Alice Squires, Alan Harding
- Vision for DEI
- Inclusive Language Assessment Tool



**Intrinsic**
Age / Generation
Gender Identity
Sexual Orientation
Mental/Physical Ability
Appearance
Beliefs/Values
Religion/Belief

**Employment**
Level in Company
Job/Role/Function
Length of Service
Area of Specialty/Expertise
Sector/Business Area
Military/Veteran Status
Work Experience
Customer

**Family**
Family Structure
Relationship/Marital Status
Caring Responsibility

**Interaction**
Communication Style
Behavioral Style
Personality
Thinking Style
Working Style

**Environment**
Country/Location
National Origin
Race/Ethnicity
Community/Culture
Socio-Economic Class
Language
Education

**INSIGHT**

This Issue's Feature:
**Diversity in Systems Engineering**

"Our diversity is not our problem. Our diversity is our promise."
—US Congressman Elijah Cummings

About the Participants - 27 Countries, 60 Chapters

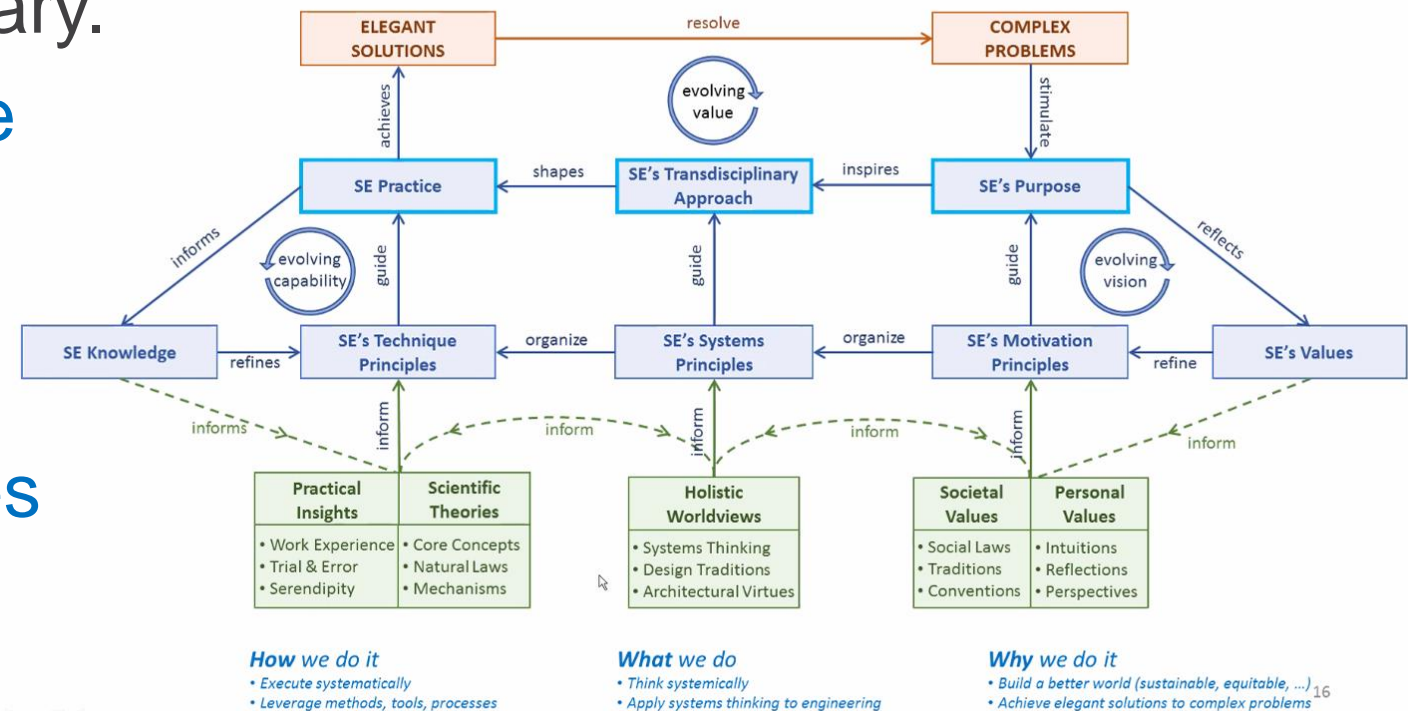| Country | Virtual | In Person | Total |
|---|---|---|---|
| Australia | 18 | | 18 |
| Austria | 1 | | 1 |
| Brazil | 1 | | 1 |
| Canada | 5 | | 5 |
| China | 2 | | 2 |
| Denmark | 1 | | 1 |
| France | 15 | 4 | 19 |
| Germany | 14 | 2 | 16 |
| Hungary | 2 | | 2 |
| India | 9 | | 9 |
| Israel | 2 | | 2 |
| Italy | 2 | | 2 |
| Japan | 19 | | 19 |
| Lithuania | 2 | 2 | 4 |
| Luxembourg | 1 | | 1 |
| Mexico | 2 | | 2 |
| Mongolia | 1 | | 1 |
| Netherlands | 3 | 4 | 7 |
| Romania | 1 | | 1 |
| Saudi Arabia | 2 | | 2 |
| Singapore | 1 | | 1 |
| South Africa | 3 | | 3 |
| Spain | 4 | | 4 |
| Sweden | 4 | 1 | 5 |
| Turkey | 1 | | 1 |
| United Kingdom | 25 | 4 | 29 |
| United States | 340 | 161 | 501 |

# Transdisciplinary Necessity

- Peter Brook, David Rouseau

- Involving societal & personal values, and transdisciplinary.

- holistic world view is more powerful in Eastern philosophies.

- What could we take from Islamic History and studies



Our Architectural Framework for the Evolving SE Discipline

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# Heuristics for SE: Useful or Dangerous? Outdated or Enduring?

- Dorothy McKinney, Chandru Mirchandani, Sarah Sheard, Peter Brook, Scott Jackson, Robert Halligan, Gan Wang
- Heuristics Database
- Chinese Heuristics
- Other cultures (e.g., Islamic) Heuristics



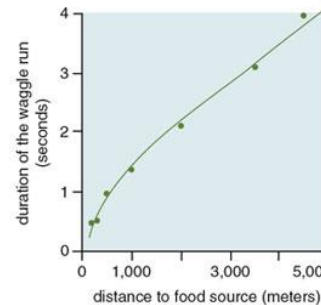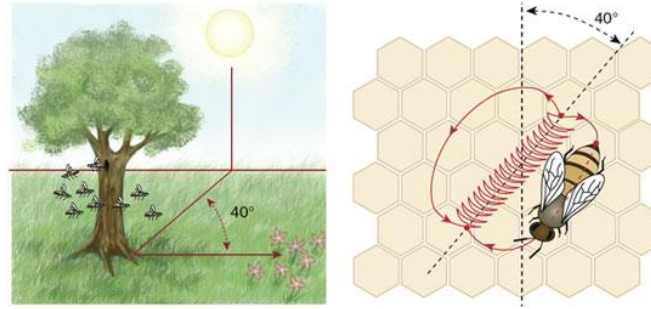| 成语 / 谚语 Proverb / Idiom / Saying | SE Applications |
|---|---|
| 麻雀虽小，五脏俱全。 *Small as it is, the sparrow has all the vital organs. (Qian Zhongshu, 1910–1998)* | A system – no matter how big or small, simple or complex – is a collection of necessary and interconnected components. This saying highlights the fundamental system concept and principles, and emphasizes the importance of a consistent SE approach. |
| 千军易得，一将难求。 *It is easy to find a thousand soldiers, but a general is hard to find. (Yuan Dynasty, 1279–1368)* | It stresses the difficulty of finding an outstanding leader, and the criticality of recruiting a critical personnel or leader for any successful project. |
| 当局者迷，旁观者清。 *The player confused; the spectator clear (Old Book of Tang, 941–945)* | While the person involved in the work may be lost in the details, the independent onlookers, usually calmer and more objective, have a better grasp of what is going on – highlighting the importance of "independent" design/peer reviews |

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48

# Japanese Society 5.0

- Masayoshi Arai
- Covid-19 → sectionalism
- Governance:
  - Past: reasoning of the state
  - Future: horizontal relationship
- Emerging challenges of SE in other cultures

# Natural Systems

- Gary Vincent, Curt McNamara, Kai Constantini
- Swarm Decision Making
- Emergence in Nature
- Folding and Unfolding
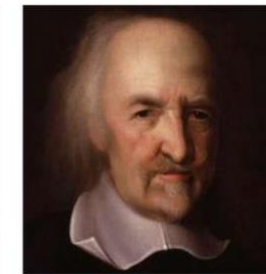- What are the philosophical point of view for Western, Eastern or Islamic Cultures?

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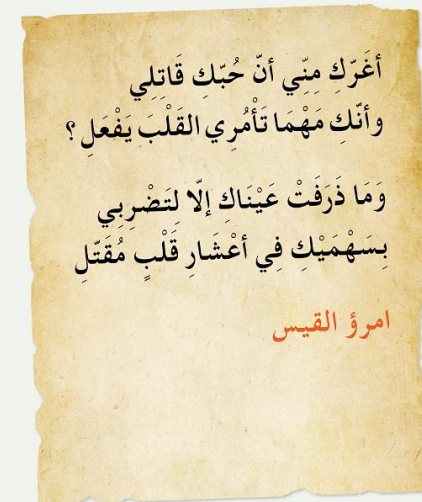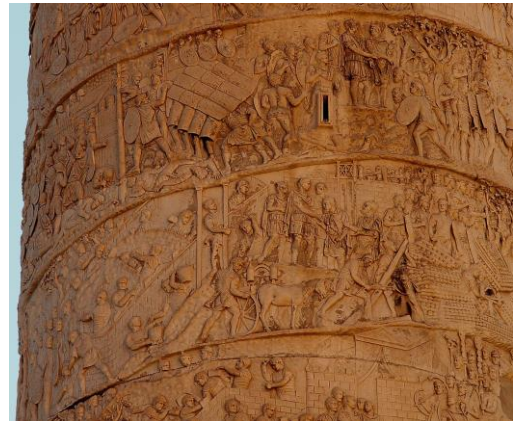
# Designing Systems by Drawing Pictures and Telling Stories

- Barclay R. Brown
- If a picture is worth 1000 words, what is a story worth?
- Pentagon Wars, Bradley Fighting Vehicle

- Visualization is culturally related (e.g. Poems have large impact on Arabic culture)

أَغَرَّكِ مِنّي أَنَّ حُبَّكِ قَاتِلي
وأَنَّكِ مَهْمَا تَأْمُري القَلْبَ يَفْعَلِ؟

وَمَا ذَرَفَتْ عَيْنَاكِ إلَّا لِتَضْربِي
بِسَهْمَيْكِ في أَعْشَارِ قَلْبِ مُقَتَّلِ

امرؤ القيس

Were you emboldened to abuse me because your love is my slayer
And whatever you command my heart to do, it does?

Your eyes do not shed tears except to pierce
With their two arrows the pieces of my slaughtered heart.

**IMRU' AL-QAYS**

**ARAB NEWS**

https://upload.wikimedia.org/wikipedia/commons/1/14/26_colonna_traiana_da_estt_05.jpg

https://www.ithra.com/files/6516/1042/9658/compressed.pdf

(3/3)

# Systems Engineering from an Islamic Perspective

## Question:

If looking to Systems Engineering from an Islamic Perspective would enhance the practice in Islamic countries, and in all over the World?

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# Applying Systems Engineering for Specific Culture

| Greek Philosophy **Theology** | → | Scientific Revolution | → | Mechanical Philosophy / Modernity | → | Systems Science | → | Post WWII Industry |

**Islam**
- Submission
- Revelation
- Justice & Search for Truth

→

**Implementation: e.g. Golden Islamic Age**
- Fusion of cultures
- Baghdad, Cordoba

**Actual Risks & Opportunities**

**Applying SE in X Project in KSA/Malaysia**

| Ancient Chinees | | Marxism | → | Qian Xuesen | → | Modern Chinese Systems |

# Real Life-Cycle



Islam
- Submission
- Revelation
- Justice & Search for Truth

Revelation

Validation

Unseen

Birth

Death

Interpretations

Verification

Witnessed

Fiqh (Islamic jurisprudence)

Actions

# Real Life-Cycle Emergence of Imam Malik Fiqh

## Utilizing of Imam Malik Fiqh in Napoleonic Code

(The World of Islamic Civilization (1884), Gustave Le Bon)
(Legalization Comparisons (1947), Sayeed Hasan)
(Effects of Imam Malik Fiqh in French Law, Contract as an Example, PhD Thesis, Bin Khodah Hamzah, University of Abu-Bakr Balqaid (2017)

# Real Life-Cycle

Revelation

Validation

Birth

Death

Interpretations

Verification

Unseen

Witnessed

Examples of Fiqh (Islamic jurisprudence):
1. How to do Prayer when you are sick
2. Guarding children rights
3. Disappeared man for 4 years
4. Sea transportation trade rules
5. Discussion teachings

Actions

# Real Life-Cycle

Revelation

Validation

Unseen

Birth

Death

Interpretations

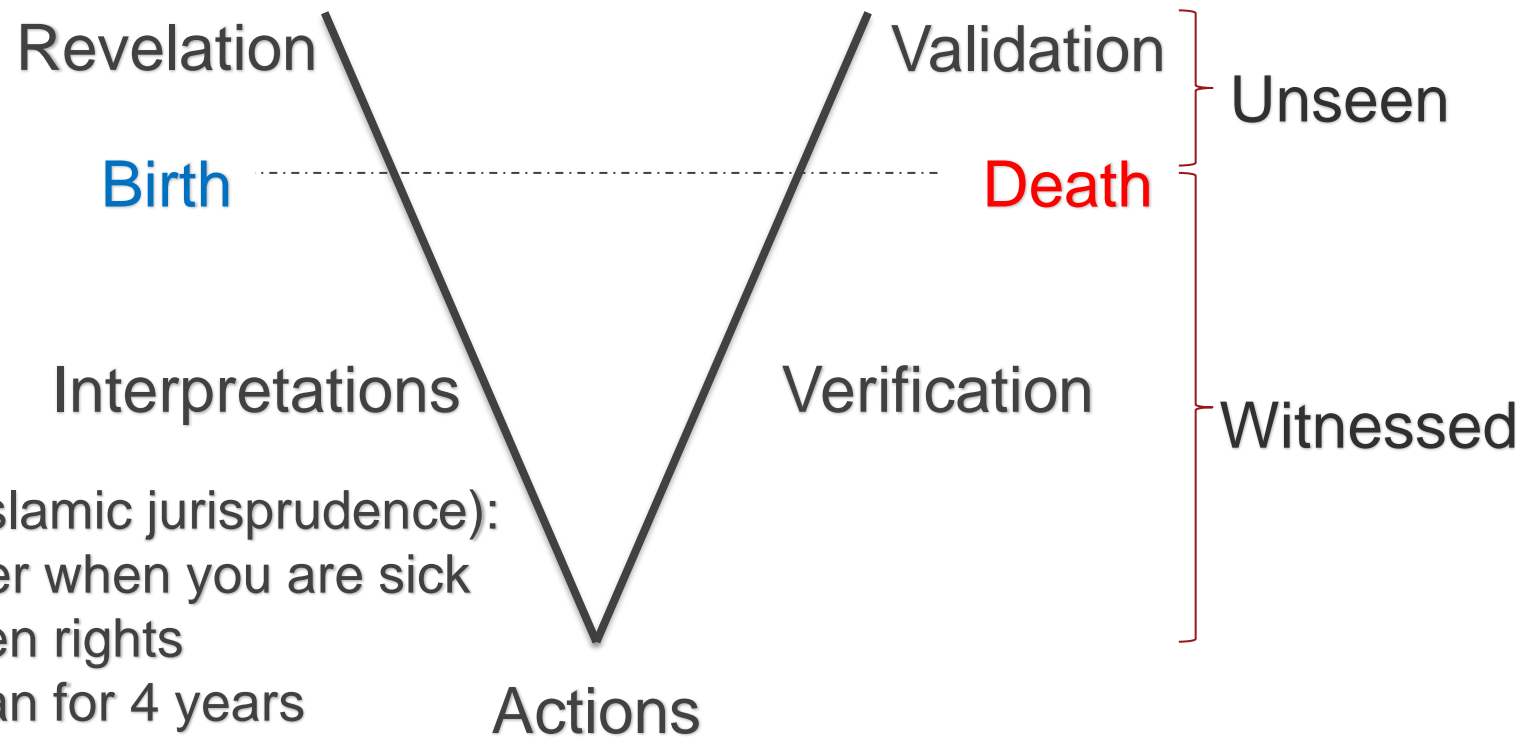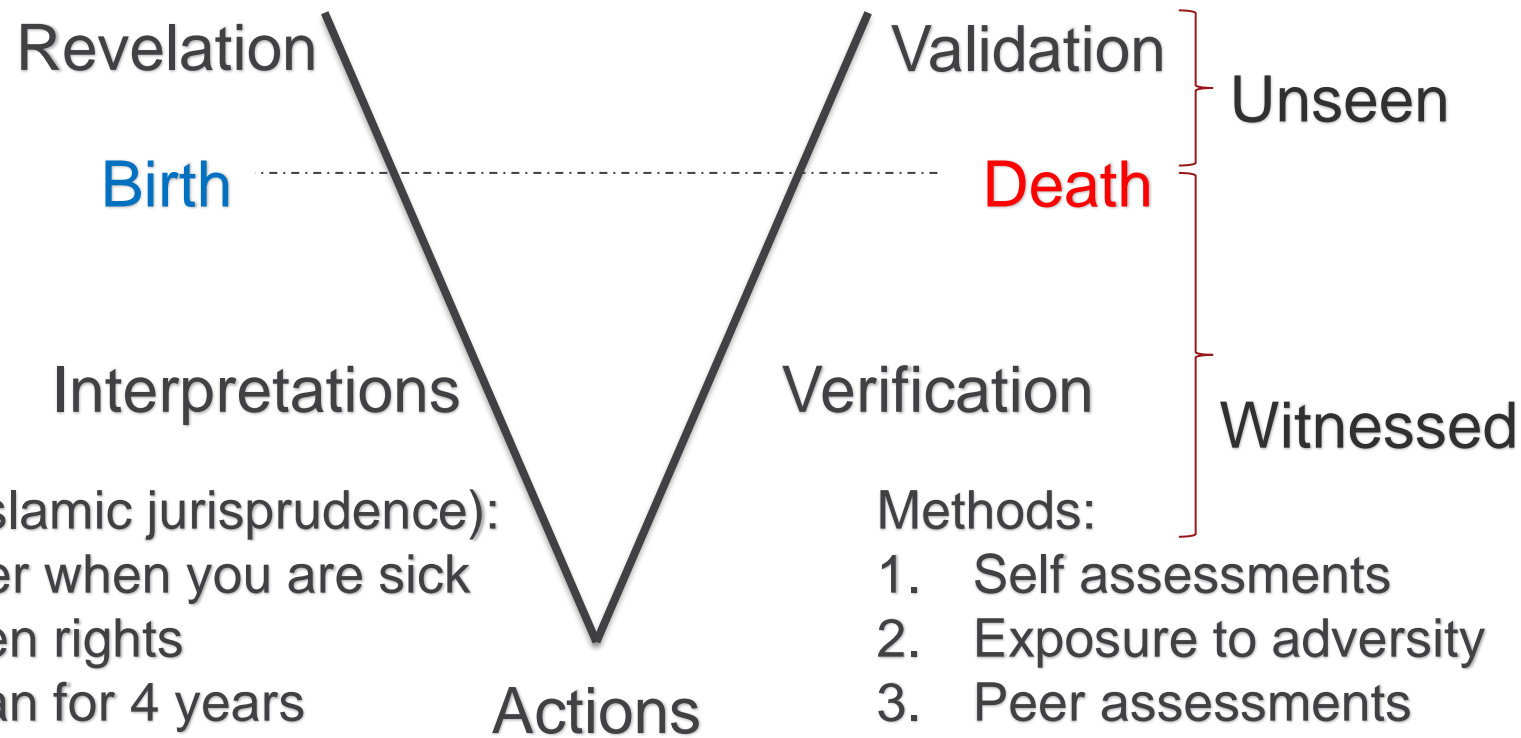Verification

Witnessed

Examples of Fiqh (Islamic jurisprudence):
1. How to do Prayer when you are sick
2. Guarding children rights
3. Disappeared man for 4 years
4. Sea transportation trade rules
5. Discussion teachings

Actions

Methods:
1. Self assessments
2. Exposure to adversity
3. Peer assessments
4. Justice system

# Example of Cultural Implementation

{فبما رحمة من الله لنت لهم ولو كنت فظا غليظ القلب لانفضوا من حولك فاعف عنهم واستغفر لهم وشاورهم في الأمر فإذا عزمت فتوكل على الله إن الله يحب المتوكلين} [سورة آل عمران:159].

(And by the Mercy of Allah, you dealt with them gently. And had you been severe and harsh-hearted, they would have broken away from about you; so pass over (their faults), and ask (Allah's) Forgiveness for them; and consult them in the affairs. Then when you have taken a decision, put your trust in Allah, certainly, Allah loves those who put their trust (in Him).)

{والذين استجابوا لربهم وأقاموا الصلاة وآتو الزكاة وأمرهم شورى بينهم ومما رزقناهم ينفقون} [سورة الشورى:38].

(And those who answer the Call of their Lord [i.e. to believe that He is the only One Lord (Allah), and to worship none but Him Alone], and perform As-Salat (Iqamat-as-Salat), and who (conduct) their affairs by mutual consultation, and who spend of what We have bestowed on them;)

{يا أيها الذين آمنوا إن جاءكم فاسق بنبأ فتبينوا أن تصيبوا قوماً بجهالة فتصبحوا على ما فعلتم نادمين} [سورة الحجرات:6].

(O you who believe! If a rebellious evil person comes to you with a news, verify it, lest you harm people in ignorance, and afterwards you become regretful to what you have done.)



System Life Cycle Processes — Decision Management Process (Clause 6.3.3)

# Needs – Requirements – Use Cases

<<Quran>>
يَا أَيُّهَا الَّذِينَ آمَنُوا اسْتَعِينُوا بِالصَّبْرِ وَالصَّلَاةِ إِنَّ اللَّهَ مَعَ الصَّابِرِينَ

<<Quran>>
والذين استجابوا لربهم وأقاموا الصلاة وآتوا الزكاة وأمرهم شورى بينهم ومما رزقناهم ينفقون
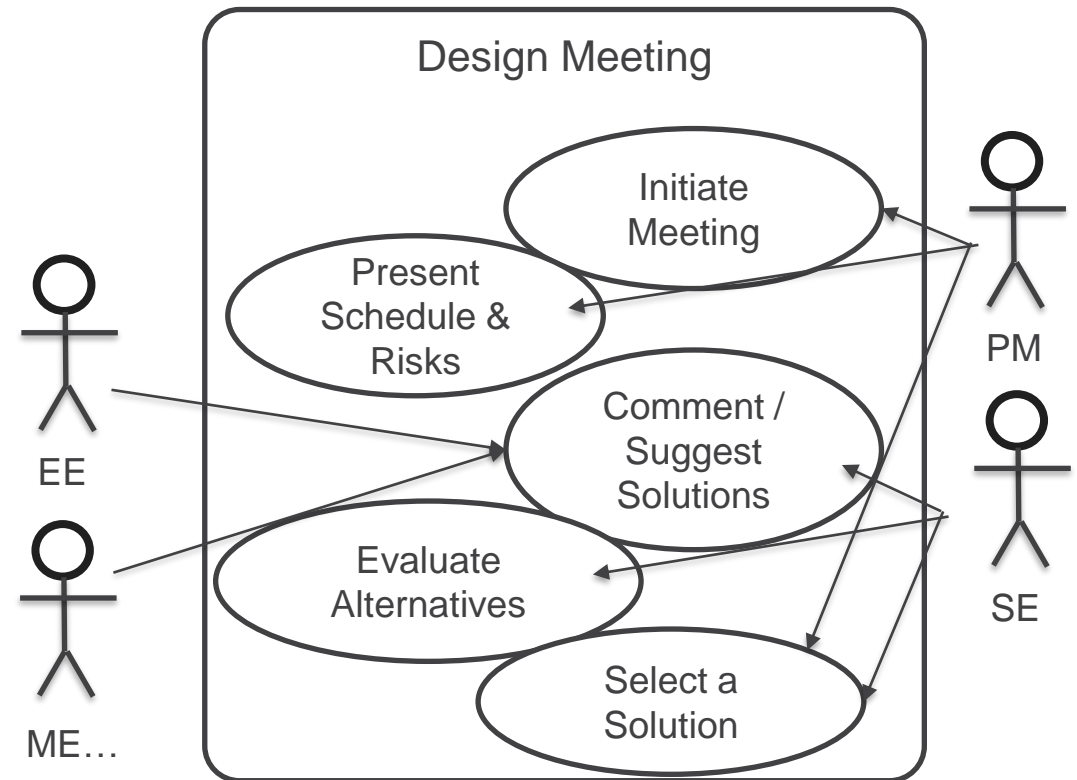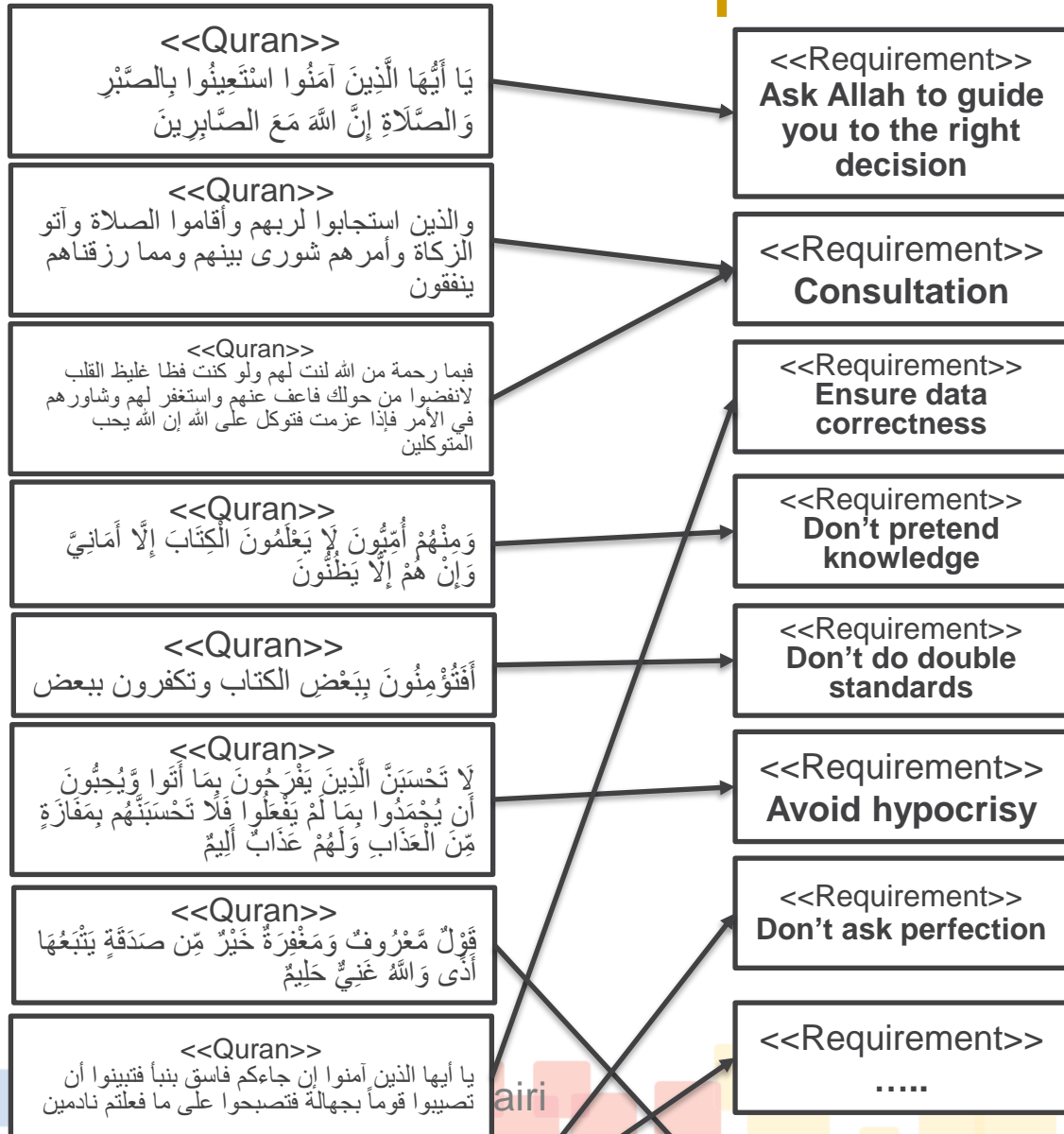
<<Quran>>
فبما رحمة من الله لنت لهم ولو كنت فظا غليظ القلب لانفضوا من حولك فاعف عنهم واستغفر لهم وشاورهم في الأمر فإذا عزمت فتوكل على الله إن الله يحب المتوكلين

<<Quran>>
وَمِنْهُمْ أُمِّيُّونَ لَا يَعْلَمُونَ الْكِتَابَ إِلَّا أَمَانِيَّ وَإِنْ هُمْ إِلَّا يَظُنُّونَ

<<Quran>>
أَفَتُؤْمِنُونَ بِبَعْضِ الكتاب وتكفرون ببعض

<<Quran>>
لَا تَحْسَبَنَّ الَّذِينَ يَفْرَحُونَ بِمَا أَتَوا وَّيُحِبُّونَ أَن يُحْمَدُوا بِمَا لَمْ يَفْعَلُوا فَلَا تَحْسَبَنَّهُم بِمَفَازَةٍ مِّنَ الْعَذَابِ وَلَهُمْ عَذَابٌ أَلِيمٌ

<<Quran>>
قَوْلٌ مَّعْرُوفٌ وَمَغْفِرَةٌ خَيْرٌ مِّن صَدَقَةٍ يَتْبَعُهَا أَذًى وَاللَّهُ غَنِيٌّ حَلِيمٌ

<<Quran>>
يا أيها الذين آمنوا إن جاءكم فاسق بنبأ فتبينوا أن تصيبوا قوماً بجهالة فتصبحوا على ما فعلتم نادمين

<<Requirement>>
**Ask Allah to guide you to the right decision**

<<Requirement>>
**Consultation**

<<Requirement>>
**Ensure data correctness**

<<Requirement>>
**Don't pretend knowledge**

<<Requirement>>
**Don't do double standards**

<<Requirement>>
**Avoid hypocrisy**

<<Requirement>>
**Don't ask perfection**

<<Requirement>>
**…..**

Design Meeting

Initiate Meeting

Present Schedule & Risks

Comment / Suggest Solutions

Evaluate Alternatives

Select a Solution

EE

ME…

PM

SE

# Conclusion

- Culture has a significant influence on SE
- Tailoring process need to be made to insure cultural fit
- INCOSE with its WGs is trying to make an International SE to fit all cultures
- Looking to SE from an Islamic perspective would enhance the practice in Islamic countries, and in all over the world

# Questions?

32<sup>nd</sup> Annual **INCOSE** international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

www.incose.org/symp2022

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