Decision Making – A Scientific Approach
We As Humans

• Human Mind
  • Process vast quantities of info
  • very short amount of time
  • can make a decision while balancing all of the variables

• Some Good and Some Bad

• History if full of examples

• The difference in successes and failure may be so small that its root can never be found.

• People spend careers getting pHd’s examining and pouring over a decision was made, right or wrong
How Do We Make Decisions

- Knowledge
- Political Winds Are A Blowing
- History – if we don’t learn from our history we are doomed to repeat it
- Gut Feel
- Sit around and talk about it – General Consensus
- Subjective
- Spouse tells us what to do

- Objective – Data Centric -
Table 3  Pairwise comparison matrix of the main criteria with respect to the Goal

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<tr>
<th></th>
<th>Flexibility</th>
<th>Opportunities</th>
<th>Security</th>
<th>Reputation</th>
<th>Salary</th>
<th>Priorities</th>
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<td>3</td>
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<td>4</td>
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Table 4  Pairwise comparison matrix for the sub-criteria with respect to Flexibility

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<th>Work</th>
<th>Priorities</th>
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Table 5  Pairwise comparison matrix for the alternatives with respect to Potential increase in salary

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<th>Int'l Co</th>
<th>College</th>
<th>State Univ.</th>
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<td>1/5</td>
<td>1/2</td>
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Decision Making
Overview

• Do it everyday
• Situation Vary
• Complexity Vary
• Consequences Vary
• Information / Knowledge Vary
• Time To Make Decision Vary
• Who Is Involved In Making Decision Vary
• Methodology Must Vary
Ideal

• Philosophical Mantra
  • Greatest Good vs Individual Importance
• Objective vs Subjective Decision
• Defendable
• Transparent
• Evidence Based

• No decision is perfect – may just be right for that time and place
Step 1 - Define Scope / Limit of Decision Making

• What are you going to make a decision about
• What is In
• What is Out
Step 2 - Methodology

• How Are You Going To Do It
  • Flip A Coin
  • In Your Head
  • Mathematical Models – Pairwise * (As complicated as you want)
Step 3 – Identify Decision Criteria

• What Will You Base Your Decision On
• Iterative Process
• Define the Decision Criteria
• How Will You Score
Car – Decision Criteria

• Cost
• Reliability
• Comfort
• History
• Features
Car – Decision Criteria

• Cost
  • Purchase Cost
  • Maintenance Cost
  • Fuel Economy
  • Insurance

• Reliability
  • Warranty
  • Reports

• Comfort
  • Ride
  • Features

• History
  • Subjective History
  • Relation With Dealer

• Features
  • The Cool Stuff
Car – Decision Criteria - Scoring

- Bowling vs Golf
- Scale
  - Out of (10,20,50,100,1000....)
- Scoring
  - Defined
    - 2 = Definition
    - 4 = Definition
    - 6 = ETC
  - Linear / Reverse Linear
Step 4 – Criteria Importance / Weight

• Are All Decision Criteria Equal
• If Not - How To Distribute?
• Assign Weight
• Calculate Weight
  • Pairwise
Pairwise Comparison

• L. Thurstone 1927 – Law of Comparative Judgement
• Mathematical Comparison of one Option to Another
• Asks a Simple Question - Is $A >$, $<$ or $=$ to $B$
  • If $A > B$ then $A =2$ and $B = 0$
  • If $A = B$ then $A = 1$ and $B = 1$
  • If $A < B$ then $A = 0$ and $B = 2$
• This can be used to place options in hierarchical order
# Calculate Weight

<table>
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<tr>
<th>Cost</th>
<th>Reliability</th>
<th>Comfort</th>
<th>History</th>
<th>Features</th>
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<th>Weight</th>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>XXXXXXXXXX</td>
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2 = Defender More Important Than Challenger
1 = Defender As Important Than Challenger
0 = Defender Less Important Than Challenger

Total 20
Step 5 - Score

• Start Scoring Options
• Iterative Process In Beginning
• Prepare to Challenge Previous Made Decisions/Assumptions
• Gut Check – Does This Look Right
• Adapt
• Don’t Forget Ideals
Scoring - Options

• A – Honda Accord
• B – Ford Mustang
• C – Chevy 2500 Turbo Diesel Dually
• D – Toyota Sienna
<table>
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Step 6 – Validate Scores

- Prepare to Challenge Previous Made Decisions/Assumptions
- Gut Check – Does This Look Right
- Adapt
- Don’t Forget Ideals
Step 7 – Manipulate Score

• Play With Decision Weights
  • Neutral
  • Inversion
  • Partial Inversion

• Does The Same Option Keep Coming to the Top?
Modified Axis Results

- Honda
- Toyota van
- Chevy Truck
- Mustang
Neutral Weights

- Honda
- Toyota Van
- Chevy Truck
- Mustang
Step 8 – Validate and Make Final Decision / Recommendation

• Overall Winner - Toyota Van

• Why
  • Not top of normal distribution
  • Consistently came out in the top
  • Price difference small enough to pay for that extra to get those things that could not be quantified
Real Life Example

• 2009 DHW reviewed Process to Distribute $10.0M in Infrastructure Repair Funding
• Past Process Distribution of $ Based on % of Size & Op Budget
  • CDHA – 42.7%
  • IWK – 9.7%
  • DHA 5 – 3.6%
• Difficult for Small DHA’s to Deal With Large $ Project
• Not Taking Into Consideration Medical Operational Needs
Real Life Example

• Need
  • More Transparency
  • Address Medical Operation Needs – Priority

• Volume
  • Over 140 Requests = $150M
  • Could Not Review All Requests

• Requirements
  • Simple
  • Robust
  • Transparent
  • Defendable
  • Auditable
Real Life Example

**Safety**
- a. Definition - Risk to Life and Limb
- b. Score
  - i. 0 – Business as Usual
  - ii. 2 – Discomfort
  - iii. 4 – Minor Injury
  - iv. 6 – Serious Injury
  - v. 8 – Single Death
  - vi. 10 – Multiple Death

**Impact on Operations**
- a. Definition - How it will impact services
- b. Score
  - i. 0 – Business as Usual
  - ii. 2 – Impacting Service Areas
  - iii. 4 – Impacting Patient Care Areas
  - iv. 6 – Shut Down Service Care
  - v. 8 – Shut Down of Patient Area
  - vi. 10 – Shut Down All Facility

**Code/ Standard Violation/ Liability**
- a. Definition - There is a violation or deviation from an acceptable Code or Standard
- b. Score
  - i. 0 – Business as Usual
  - ii. 2 – Due Diligence
  - iii. 4 – Liability / Standard Violation
  - iv. 6 – Code Violation
  - v. 8 – Written Order From Authority Having Jurisdiction (AHJ) to Act Within Time Limit
  - vi. 10 – Written Order From AHJ Immediate Action

**Probability of Occurring**
- a. Definition - The odds/timing that an incident will occur
- b. Score
  - i. 0 – Business as Usual
  - ii. 2 – > 1 Year
  - iii. 4 – 6 months
  - iv. 6 – 2 months
  - v. 8 – Imminent (Testing Conclusive)
  - vi. 10 – Already Happened/ Emergency Plan in effect

**Facility Utilization**
- a. Definition – How this project will impact the service to the provincial population
- b. Score
  - i. 0 – Minor Impact
  - ii. 2 – Medium Impact
  - iii. 4 – Impact Community
  - iv. 6 – Impact regional or Complete Community Capability
  - v. 8 – Impact Province or Complete Regional Capability
  - vi. 10 – Complete Provincial Capability

**Operational Cost Impact**
- a. Definition – The impact of a project on operational cost.
- b. Score
  - i. 0 – Significant Increase in Operating Costs (Greater than 20%)
  - ii. 2 – Minimal Increase on Operating Costs (Less than 10%)
  - iii. 4 – Slight Increase on Operating Costs (Less than 5%)
  - iv. 6 – Slight Reduction on Operating Costs (Less than 5%)
  - v. 8 – Minimal Reduction in Operating Costs (Less than 10%)
  - vi. 10 – Significant Reduction in Operating Costs (Greater than 20%)
# Weighted Matrix

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Total</th>
<th>Weight</th>
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<td>B</td>
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<td>5%</td>
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<tr>
<td>E</td>
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<td>18%</td>
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<td>f. Operational Cost Impact</td>
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Please Note: Only the "Yellow" highlighted sections need to be scoted the "Blue" highlight Sections are autoformated

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Please Note: Only the "Yellow" highlighted sections need to be scoted the "Blue" highlight Sections are autoformated
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<th>PRO</th>
<th>POP</th>
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<th>SCORE</th>
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<tr>
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<td>QEII Centennial</td>
<td>Cyclotron Roof</td>
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<td>8</td>
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<tr>
<td>3</td>
<td>NWCH</td>
<td>Install Sprinkler System</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>9</td>
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<td>8</td>
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<td>8</td>
<td>10</td>
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<td>Passive to Active Scavenging OR's 1-8</td>
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Benefits

- Category Scoring
  - Windows
  - Roofs
- Sponsors By In
- Acceleration Of Decision Making
- Concentrate Teams Level Of Effort
- Start Seeing Trends In Needs
  - Develop Evidence for Business Cases
Conclusion

• Is It Easy? No Not At First But It Gets Easier The More You Use It
• Can It Be Used For Everything? Yes
• Should Be Used For Everything? No
• Can I Help You With It? Yes

• How Big Was The Fish I Caught This Week?
Questions