AHP Comparison Framework

"What is the worth of a specific bridge construction technique in terms of a customer service criterion?"

Although information about questions like the previous one are vital in making the correct decision, it is very difficult, if not impossible, to quantify them correctly. Therefore, many decision-making methods attempt to determine the relative importance, or weight, of the alternatives for each criterion involved in a given decision-making problem.

Pairwise comparisons are used to determine the relative importance of each alternative for each criterion. In this approach the decision-maker has to express his opinion about the value of one single pairwise comparison at a time.

Each choice is a linguistic phrase. Some examples of such linguistic phrases are: "A is more important than B", or "A is of the same importance as B", or "A is a little more important than B", and so on.

For instance, when system A is compared to system B then the decision-maker has determined that system A is between to be classified as "essentially more important" and "demonstrated more important" than system B (see also Table1 and Table2). Thus, the corresponding comparison assumes the value of 6.

Table1 and Table2 are both representing the AHP comparison scales. The difference between these tables are in the way that scales are qualified (represented by words). Decision makers can consider both tables in the pairwise comparison process, to choose and assign the scores more rigorously.

Table 1: Scale of Relative Importances (according to Saaty, 1980)

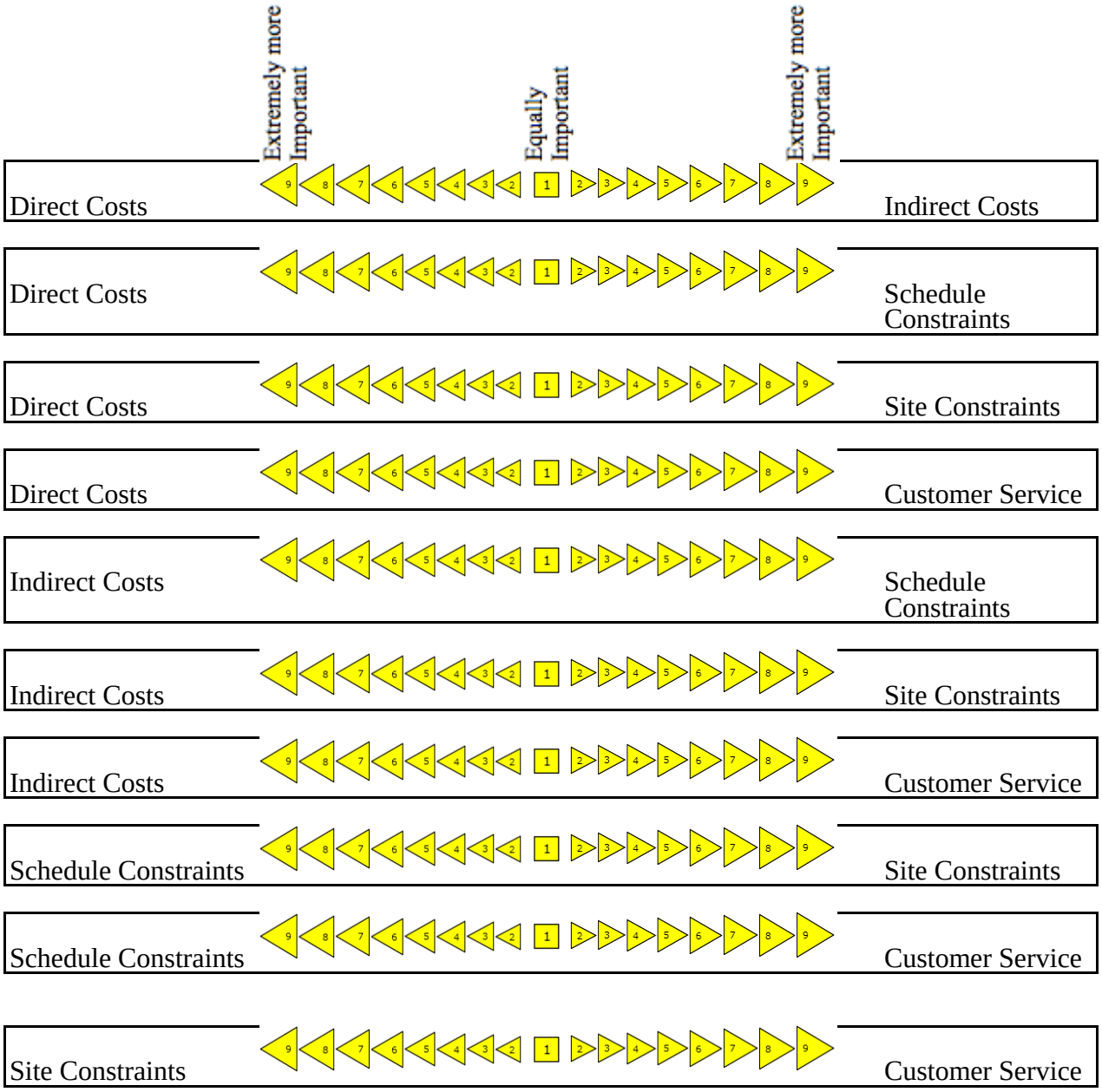
Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored and its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals of above nonzero	If activity i has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i.	

Table 2.

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	**Definition**	**Explanation**
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

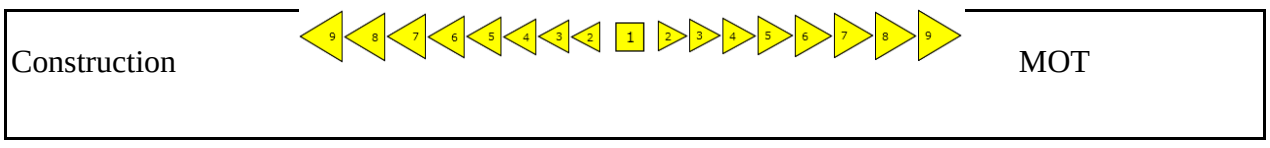
Please indicate the level of preference by choosing the most descriptive score (both value and direction) in the rubrics below.

Level 1



Level 2

Direct Costs:

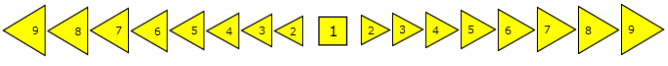


Construction		Design and Construct Detours
Construction		Right of Way
Construction		Project Design and Development
Construction		Maintenance of Essential Services
Construction		Construction Engineering
Construction		Inspection, Maintenance and Preservation
Construction		Toll Revenue
MOT		Design and Construct Detours
MOT		Right of Way
MOT		Project Design and Development
MOT		Maintenance of Essential Services
MOT		Construction Engineering
MOT		Inspection, Maintenance and Preservation

MOT		Toll Revenue
Design and Construct Detours		Right of Way
Design and Construct Detours		Project Design and Development
Design and Construct Detours		Maintenance of Essential Services
Design and Construct Detours		Construction Engineering
Design and Construct Detours		Inspection, Maintenance and Preservation
Design and Construct Detours		Toll Revenue
Right of Way		Project Design and Development
Right of Way		Maintenance of Essential Services
Right of Way		Construction Engineering
Right of Way		Inspection, Maintenance and Preservation
Right of Way		Toll Revenue
Project Design and Development		Maintenance of Essential Services

Project Design and Development		Construction Engineering
Project Design and Development		Inspection, Maintenance and Preservation
Project Design and Development		Toll Revenue
Maintenance of Essential Services		Construction Engineering
Maintenance of Essential Services		Inspection, Maintenance and Preservation
Maintenance of Essential Services		Toll Revenue
Construction Engineering		Inspection, Maintenance and Preservation
Construction Engineering		Toll Revenue
Inspection, Maintenance and Preservation		Toll Revenue

Indirect Costs:

User Delay		Freight Mobility
User Delay		Revenue Loss

User Delay		Livability During Construction
User Delay		Road Users Exposures
User Delay		Construction Personnel Exposure
Freight Mobility		Revenue Loss
Freight Mobility		Livability During Construction
Freight Mobility		Road Users Exposures
Freight Mobility		Construction Personnel Exposure
Revenue Loss		Livability During Construction
Revenue Loss		Road Users Exposures
Revenue Loss		Construction Personnel Exposure
Livability During Construction		Road Users Exposures
Livability During Construction		Construction Personnel Exposure

Road User Exposure		Construction Personnel Exposure

Schedule Constraints:

Calendar or Utility or RxR or Navigational		Marine and Wildlife
Calendar or Utility or RxR or Navigational		Resource Availability
Marine and Wildlife		Resource Availability

Site Constraints:

Bridge Span Configurations		Horizontal/ Vertical Obstructions
Bridge Span Configurations		Environmental
Bridge Span Configurations		Historical
Bridge Span Configurations		Archaeological Constraints
Horizontal/Vertical Obstructions		Environmental
Horizontal/Vertical Obstructions		Historical

Horizontal/Vertical Obstructions		Archaeological Constraints
Environmental		Historical
Environmental		Archaeological Constraints
Historical		Archaeological Constraints

Customer Service:

Public Perceptions		Public Relations

Level 3

Construction: ABC		Conventional
Maintenance of Traffic (MOT): ABC		Conventional
Design and Construct Detours: ABC		Conventional
Right of Way (ROW): ABC		Conventional
Project Design and Development: ABC		Conventional

Maintenance of Essential Services:

ABC  Conventional

Construction Engineering:

ABC  Conventional

Inspection, Maintenance and Preservation:

ABC  Conventional

Toll Revenue:

ABC  Conventional

User Delay:

ABC  Conventional

Freight Mobility:

ABC  Conventional

Revenue Loss:

ABC  Conventional

Livability During Construction:

ABC  Conventional

Road Users Exposure:

ABC  Conventional

Construction Personnel Exposure:

ABC  Conventional

Calendar or Utility or RxR or Navigational:

ABC  Conventional

Marine and Wildlife:

ABC  Conventional

Resource Availability:

ABC  Conventional

Bridge Span Configurations:

ABC  Conventional

Horizontal/Vertical Obstructions:

ABC  Conventional

Environmental:

ABC  Conventional

Historical:

ABC  Conventional

Archaeological Constraints:

ABC  Conventional

Public Perception:

ABC  Conventional

Public Relations:

ABC  Conventional