

2.2. Algorithm development

Costless - Easy

Credit	Check Point	Effort & Difficulty (1-100 scale) (Time Consuming, Documentation, Verification, Review Works)	Increased Actual Cost (USD)			Normalized Unit Cost (USD/m ²)	Cost Factor
			Daegu Bank Building (High rise Building) Gold (70 Point) (37,332.5m ²)	KARI Building (Low rise Building) Silver (55point) (998m ²)	SK Chemical Vaccine Factory Gold (60 Point) (27,475m ²)		
SSc1	Site Condition	20	-	-	-	-	
SSc2	Site Condition	20	-	-	-	-	
SSc4.1	Public Transportation	20	-	-	-	-	
SSc4.3	Parking Plan	40	4,421	884	6,189	0.41	Parking Signage Parking Line
SSc4.4	Parking Area	40	-	-	-	-	
EAp3	System selection	30	-	-	-	-	
MRp1	Separate collection Location	30	2,653	354	1,768	0.16	Storage
MRc2	Documentation construction waste	45	-	-	-	-	
MRc4	Documentation Recycling material	45	-	-	-	-	
MRc5	Documentation local material	45	-	-	-	-	
IEQp1	Specification	40	-	-	-	-	
IEQp2	Smoking Location & Signage	30	884	442	442	0.16	Signage
IEQc7.1	Specification	40	-	-	-	-	
IEQc7.2	Survey Documentation	20			-	-	
	Sub-Total		7,958	1,680	8,399		

Costless – Hard

Credit	Check Point	Effort & Difficulty (1- 100 scale) (Time Consuming, Documentation Verification, Review Works)	Increased Actual Cost (USD)			Normalized Unit Cost (USD/m ²)	Cost Factor
			Daegu Bank Building (High rise Building) Gold (70 Point) (37,332.5m ²)	KARI Building (Low rise Building) Silver (55point) (998m ²)	SK Chemical Vaccine Factory Gold (60 Point) (27,475m ²)		
SSc3	Site Condition Site Treatment Verification	80			-	-	

SSc7.1	Site Condition Pavement Plan Verification	60	6,189	884	-	0.53	Brick pavement Permeable pavement
SSc8	Site Condition Building Plan Simulation	70			-	-	
EAc4	System Condition Refrigerant Calculation Pipeline plan	60			-	-	
MRc1.1	Reused Building No applicable to New building	70			-	-	
MRc1.2	Reused Building No applicable to New building	70			-	-	
MRc3	Reused Material No applicable to New building	90			-	-	
IEQc2	Design Application Documentation Verification	60	8,842	-	-	0.24	Ventilation System Upgrade
IEQc3.1	Construction management Documentation Verification	60	8,842	884	13,263	0.54	MERV-8 Filter Vacuum cleaner
IEQc8.1	Design application Site Condition	60			-	-	
IEQc8.2	Design application Site Condition	60			-	-	
	Sub-Total		23,873	1,768	13,263		

Cost – Easy

Credit	Check Point	Effort & Difficulty (1-100 scale) (Time Consuming, Documentation, Verification, Review Works)	Increased Actual Cost (USD)			Normalized Unit Cost (USD/m ²)	Cost Factor
			Daegu Bank Building (High rise Building) Gold (70 Point) (37,332.5m ²)	KARI Building (Low rise Building) Silver (55point) (998m ²)	SK Chemical Vaccine Factory Gold (60 Point) (27,475m ²)		
SSp1	Documentation	30	6,189	442	4,421	0.26	Water Retention & Screen Sedimentation Basin
SSc4.2	Design Application	20	8,842	884	8,842	0.48	Bicycle Rack
SSc5.1	Design	40			8,842	0.32	Landscaping

	Application & Verification						Native Planting
SSc5.2	Design Application	30	8,842	884	8,842	0.48	Native Planting Water Permeable Pavement
SSc7.2	Design Application	40			17,683	0.64	High SRI (Solar Reflection Index) Paint
WEp1	Design Application	30	63,218	1,768	48,630	1.75	Water Conserving Fixtures
WEc1	Site Condition Design Application	30	5,747	884	4,421	0.40	Native Planting
WEc3	Design Application	30	114,943		88,417	2.05	Water Conserving Fixtures
EAc6	Payment Contract	20		884	48,630	1.33	Purchase Green Power
IEQc3.2	Documentation Verification	45	8,842	884	8,842	0.48	Air Quality Test
IEQc4.1	Document Construction Application	40	28,736	1,105	22,104	0.89	Purchase Low VOC (Volatile Organic Compound) Material
IEQc4.2	Document Construction Application	40		1,547	30,946	1.34	Purchase Low VOC (Volatile Organic Compound) Material
IEQc6.1	Design Application	30	5,747	442	4,421	0.25	Purchase Desk Lamp
	Sub-Total		251,105	9,726	305,040		

Cost – Hard

Credit	Check Point	Effort & Difficulty (1-100 scale) (Time Consuming, Documentation Verification, Review Works)	Increased Actual Cost (USD)			Normalized Unit Cost (USD/m²)	Cost Factor
			Daegu Bank Building (High rise Building) Gold (70 Point) 37,332.5m²	KARI Building (Low rise Building) Silver (55point) 998m²	SK Chemical Vaccine Factory Gold (60point) 27,475m²		
SSc6.1	Design Application Site Condition Location & connection	70	224,138		172,414	6.14	Rainwater Storage Connection Pipe
SSc6.2	Design Application Site Condition	70			75,155	2.74	Rainwater recycling Facility

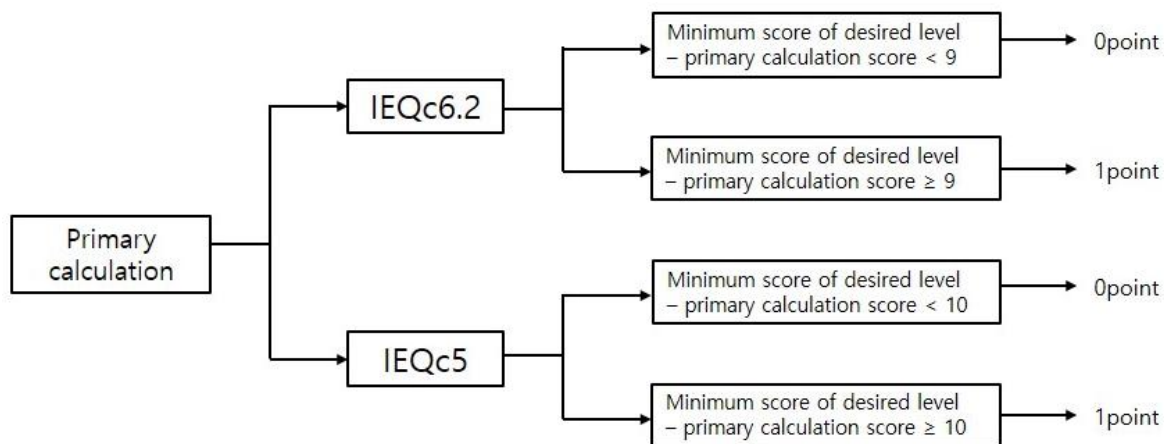
	Location & connection						
WEc2	Design Application Site Condition Location & connection	60	11,494		8,842	0.31	Wastewater treatment system
EAp1	Construction Application Documentation Verification	60	57,471	4,421	44,209	2.53	Commissioning Consulting
EAp2	Design Application System Selection Location & connection	60	397,878	4,421	221,043	7.71	Good Efficiency equipment System LED Lamp
EAc1	Design Application System Selection Location & connection	60	241,379	4,421	185,676	5.88	High Efficiency Equipment System High Efficiency Insulation System
EAc2	Design Application System Selection Location & connection	70			-	-	Renewable Energy System
EAc3	Design and Construction Application Documentation Verification	60		4,421	57,471	3.26	Commissioning Consulting
EAc5	Design and Construction Application Documentation Verification	80	132,626		159,151	2.90	BEMS (Building Energy Management System)
MRc6	Construction Application Documentation Verification	80			-	-	Renewable Product & Material
MRc7	Construction Application Documentation Verification	70			30,946	1.13	FSC (Forest Stewardship Council) Wood
IEQc1	Design Application System Selection Location & connection	60	17,683		8,842	0.40	CO2 Sensor Ventilation Controller
IEQc4.3	Construction Application Documentation Verification	80			-	-	Purchase Low VOC (Volatile Organic Compound) Material
IEQc4.4	Construction Application	70			-	-	Purchase Low VOC

	Documentation Verification						(Volatile Organic Compound) Material
IEQc5	Design Application System Selection Location & connection	60	57,471		17,683	1.09	Filter MERV-13 Entryway System Room Ventilation System
IEQc6.2	Design Application System Selection Location & connection	60			-	-	Under Floor Air Conditioning System
Sub-Total			1140141	17,683	981,432		

Total Increased Cost (A)	1,423,076	30,857	1,308,134		
Total Construction Cost (B)	69,967,856	3,798,428	53,050,397		
Increased Cost Rate (A/B x 100)	2.03%	0.81%	2.47%		

2.2.4. Partial algorithm

Example of the Priority credit algorithm



3.1. Specimen

Project A: Estimated scorecard and cost

Sustainable Sites (SS)

	Score	Unit Cost (USD)	Cost (USD)
SSp1	-	0.446	16,666.09
SSc1	1		
SSc2	5		
SSc3	0		
SSc4.1	6		
SSc4.2	1	0.536	19,999.31
SSc4.3	3	0.446	16,666.09
SSc4.4	2		
SSc5.1	0	0.402	
SSc5.2	1	0.714	26,665.75
SSc6.1	1	Calculated as Equation(10)	60,535.71
SSc6.2	0	0.893	
SSc7.1	1	0.893	33,332.19
SSc7.2	1	0.625	23,332.53
SSc8	0		
SUM	22		180,531.59

Water Efficiency (WE)

	Score	Unit Cost (USD)	Cost (USD)
WEp1	-	3.223	
WEc1	4	1.786/2.679/3.571/5.357	9,279.7
WEc2	0	0.893/1.339	
WEc3	3	2.679/3.125/3.571/4.018	133,328.75
SUM	7		142,608.45

Energy and Atmosphere (EA)

	Score	Unit Cost (USD)	Cost (USD)
EAp1	-	3.125	116,662.66
EAp2	-		
EAp3	-		
EAc1	6	Calculated as Equation(11)	347,693.56
EAc2	1	2.679/4.464/5.804	99,996.56
EAc3	2	0.446	
EAc4	2		
EAc5	0	2.679	
EAc6	0	0.893	
SUM	11		564,352.78

Materials and Resources (MR)

	Score	Unit Cost (USD)	Cost (USD)
MRp1	-	0.268	9,999.66
MRc1.1	0		
MRc1.2	0		
MRc2	2		
MRc3	0		
MRc4	2		
MRc5	2		
MRc6	0		
MRc7	0	0.446	
SUM	6		9,999.66

Indoor Environmental Quality (IEQ)

	Score	Unit Cost (USD)	Unit Cost (USD)
IEQp1	-		
IEQp2	-	0.268	9,999.66
IEQc1	1	0.446	16,666.09
IEQc2	1	0.223	8,333.05
IEQc3.1	1	0.804	29,998.97
IEQc3.2	1	0.446	16,666.09
IEQc4.1	1	0.714	26,665.75
IEQc4.2	1	0.714	26,665.75
IEQc4.3	0	0.446	
IEQc4.4	0	0.446	
IEQc5	0	0.625	
IEQc6.1	1	0.446	16,666.09
IEQc6.2	0	0.464	
IEQc7.1	1		
IEQc7.2	1		
IEQc8.1	0		
IEQc8.2	0		
SUM	9		151,661.45

Innovation (ID)

	Score	Unit Cost (USD)	Cost (USD)
IDc1-5	3		0
IDc6	1		0
SUM	4	-	0

Regional Priority (RP)

	Score	Unit Cost (USD)	Cost (USD)
RPc1-4	3		0
SUM	3	-	0

SUM

	Total Score	Total Cost (USD)
	62	1,049,153.93

Project A: Actual scorecard

Sustainable Sites (SS)

	Score
SSp1	-
SSc1	1
SSc2	5
SSc3	0
SSc4.1	6
SSc4.2	1
SSc4.3	3
SSc4.4	0
SSc5.1	0
SSc5.2	1
SSc6.1	1
SSc6.2	0
SSc7.1	1
SSc7.2	0
SSc8	0
SUM	19

Water Efficiency (WE)

	Score
WEp1	-
WEc1	4
WEc2	2
WEc3	4
SUM	10

Energy and Atmosphere (EA)

	Score
EAp1	-
EAp2	-
EAp3	-
EAc1	9
EAc2	0
EAc3	0
EAc4	2
EAc5	3
EAc6	0
SUM	14

Materials and Resources (MR)

	Score
MRp1	-
MRc1.1	0
MRc1.2	0
MRc2	2

MRc3	0
MRc4	2
MRc5	2
MRc6	0
MRc7	0
SUM	6

Indoor Environmental Quality (IEQ)

	Score
IEQp1	-
IEQp2	-
IEQc1	1
IEQc2	1
IEQc3.1	2
IEQc3.2	1
IEQc4.1	1
IEQc4.2	0
IEQc4.3	0
IEQc4.4	1
IEQc5	1
IEQc6.1	2
IEQc6.2	0
IEQc7.1	1
IEQc7.2	1
IEQc8.1	0
IEQc8.2	1
SUM	

Innovation (ID)

	Score
IDc1-5	5
IDc6	1
SUM	6

Regional Priority (RP)

	Score
RPc1-4	4
SUM	

SUM

	Score
	70

Project B: Estimated scorecard and cost

Sustainable Sites (SS)

	Score	Unit Cost (USD)	Cost (USD)
SSp1	-	0.446	445.54
SSc1	1		
SSc2	5		
SSc3	0		
SSc4.1	6		
SSc4.2	1	0.536	534.64
SSc4.3	3	0.446	445.54
SSc4.4	2		
SSc5.1	0	0.402	
SSc5.2	0	0.714	
SSc6.1	0	Calculated as Equation(10)	
SSc6.2	0	0.893	
SSc7.1	1	0.893	891.07
SSc7.2	1	0.625	623.75
SSc8	0		
SUM	20		2,940.54

Water Efficiency (WE)

	Score	Unit Cost (USD)	Cost (USD)
WEp1	-	3.223	
WEc1	4	1.786/2.679/3.571/5.357	1,071.43
WEc2	0	0.893/1.339	
WEc3	2	2.679/3.125/3.571/4.018	3,118.18
SUM	6		4,190.18

Energy and Atmosphere (EA)

	Score	Unit Cost (USD)	Cost (USD)
EAp1	-	3.125	3,118.75
EAp2	-		
EAp3	-		
EAc1	3	Calculated as Equation(11)	3,982
EAc2	0	2.679/4.464/5.804	
EAc3	2	0.446	
EAc4	2		
EAc5	0	2.679	
EAc6	0	0.893	
SUM	7		7,100.75

Materials and Resources (MR)

	Score	Unit Cost (USD)	Cost (USD)
MRp1	-	0.268	267.32

MRc1.1	0		
MRc1.2	0		
MRc2	2		
MRc3	0		
MRc4	2		
MRc5	2		
MRc6	0		
MRc7	0	0.446	
SUM	6		267.32

Indoor Environmental Quality (IEQ)

	Score	Unit Cost (USD)	Cost (USD)
IEQp1	-		
IEQp2	-	0.268	267.32
IEQc1	0	0.446	
IEQc2	0	0.223	
IEQc3.1	1	0.804	801.96
IEQc3.2	1	0.446	445.54
IEQc4.1	1	0.714	712.86
IEQc4.2	1	0.714	712.86
IEQc4.3	0	0.446	
IEQc4.4	0	0.446	
IEQc5	0	0.625	
IEQc6.1	1	0.446	445.54
IEQc6.2	0	0.464	
IEQc7.1	1		
IEQc7.2	1		
IEQc8.1	0		
IEQc8.2	0		
SUM	7		3,386.07

Innovation (ID)

	Score	Unit Cost (USD)	Cost (USD)
IDc1-5	2		0
IDc6	1		0
SUM	3	-	0

Regional Priority (RP)

	Score	Unit Cost (USD)	Cost (USD)
RPc1-4	3		0
SUM	3	-	0

SUM

Total Score	Unit Cost (USD)	Total Cost (USD)
52		17,884.86

Project B: Actual scorecard

Sustainable Sites (SS)

	Score
SSp1	-
SSc1	0
SSc2	5
SSc3	0
SSc4.1	6
SSc4.2	1
SSc4.3	3
SSc4.4	2
SSc5.1	0
SSc5.2	1
SSc6.1	0
SSc6.2	0
SSc7.1	1
SSc7.2	0
SSc8	0
SUM	19

Water Efficiency (WE)

	Score
WEp1	-
WEc1	4
WEc2	0
WEc3	0
SUM	4

Energy and Atmosphere (EA)

	Score
EAp1	-
EAp2	-
EAp3	-
EAc1	7
EAc2	0
EAc3	2
EAc4	2
EAc5	0
EAc6	2
SUM	13

Materials and Resources (MR)

	Score
MRp1	-
MRc1.1	0
MRc1.2	0

MRc2	2
MRc3	0
MRc4	1
MRc5	2
MRc6	0
MRc7	0
SUM	5

Indoor Environmental Quality (IEQ)

	Score
IEQp1	-
IEQp2	-
IEQc1	0
IEQc2	0
IEQc3.1	1
IEQc3.2	1
IEQc4.1	1
IEQc4.2	1
IEQc4.3	0
IEQc4.4	0
IEQc5	0
IEQc6.1	1
IEQc6.2	0
IEQc7.1	1
IEQc7.2	1
IEQc8.1	0
IEQc8.2	0
SUM	7

Innovation (ID)

	Score
IDc1-5	5
IDc6	1
SUM	6

Regional Priority (RP)

	Score
RPc1-4	4
SUM	

SUM

Total Score
55

Project C: Estimated scorecard and cost

Sustainable Sites (SS)

	Score	Unit Cost (USD)	Cost (USD)
SSp1	-	0.446	8,596.88
SSc1	1		
SSc2	5		
SSc3	0		
SSc4.1	6		
SSc4.2	1	0.536	10,316.25
SSc4.3	3	0.446	8,596.88
SSc4.4	2		
SSc5.1	1	0.402	7,737.419
SSc5.2	1	0.714	13,755
SSc6.1	0	Calculated as Equation(10)	85,857.14
SSc6.2	0	0.893	17,193.75
SSc7.1	1	0.893	17,193.75
SSc7.2	1	0.625	12,035.63
SSc8	0		
SUM	22		178,282.46

Water Efficiency (WE)

	Score	Unit Cost (USD)	Cost (USD)
WEp1	-	3.223	
WEc1	4	1.786/2.679/3.571/5.357	62,641.07
WEc2	0	0.893/1.339	25,790.63
WEc3	3	2.679/3.125/3.571/4.018	68,775
SUM	7		157,206.7

Energy and Atmosphere (EA)

	Score	Unit Cost (USD)	Cost (USD)
EAp1	-	3.125	60,178.13
EAp2	-		
EAp3	-		
EAc1	6	Calculated as Equation(11)	703,876.74
EAc2	1	2.679/4.464/5.804	51,581.25
EAc3	2	0.446	
EAc4	2		
EAc5	0	2.679	
EAc6	0	0.893	
SUM	11		815,636.12

Materials and Resources (MR)

	Score	Unit Cost (USD)	Cost (USD)
MRp1	-	0.268	5,158.13

MRc1.1	0		
MRc1.2	0		
MRc2	2		
MRc3	0		
MRc4	2		
MRc5	2		
MRc6	0		
MRc7	0	0.446	
SUM	6		5,758.13

Indoor Environmental Quality (IEQ)

	Score	Unit Cost (USD)	Unit Cost (USD)
IEQp1	-		
IEQp2	-	0.268	5,158.13
IEQc1	1	0.446	8,596.88
IEQc2	1	0.223	4,298.44
IEQc3.1	1	0.804	15,474.38
IEQc3.2	1	0.446	8,596.88
IEQc4.1	1	0.714	13,755
IEQc4.2	1	0.714	13,755
IEQc4.3	0	0.446	
IEQc4.4	0	0.446	8,596.88
IEQc5	0	0.625	12,035.63
IEQc6.1	1	0.446	8,596.88
IEQc6.2	0	0.464	8,598.75
IEQc7.1	1		
IEQc7.2	1		
IEQc8.1	0		
IEQc8.2	0		
SUM	9		184,832.81

Innovation (ID)

	Score	Unit Cost (USD)	Cost (USD)
IDc1-5	3		0
IDc6	1		0
SUM	4	-	0

Regional Priority (RP)

	Score	Unit Cost (USD)	Cost (USD)
RPc1-4	3		0
SUM	3	-	0

SUM

Total Score	Total Cost (USD)
62	1,341,116.21

Project C: Actual scorecard

Sustainable Sites (SS)

Score	
SSp1	-
SSc1	1
SSc2	0
SSc3	0
SSc4.1	6
SSc4.2	1
SSc4.3	3
SSc4.4	2
SSc5.1	0
SSc5.2	1
SSc6.1	1
SSc6.2	1
SSc7.1	0
SSc7.2	1
SSc8	0
SUM	10

Water Efficiency (WE)

Score	
WEp1	-
WEc1	4
WEc2	2
WEc3	4
SUM	10

Energy and Atmosphere (EA)

Score	
EAp1	-
EAp2	-
EAp3	-
EAc1	0
EAc2	0
EAc3	2
EAc4	0
EAc5	3
EAc6	2
SUM	7

Materials and Resources (MR)

Score	
MRp1	-
MRc1.1	0
MRc1.2	0

MRc2	2
MRc3	0
MRc4	2
MRc5	2
MRc6	0
MRc7	0
SUM	6

Indoor Environmental Quality (IEQ)

	Score
IEQp1	-
IEQp2	-
IEQc1	1
IEQc2	1
IEQc3.1	1
IEQc3.2	1
IEQc4.1	1
IEQc4.2	0
IEQc4.3	0
IEQc4.4	1
IEQc5	1
IEQc6.1	1
IEQc6.2	0
IEQc7.1	1
IEQc7.2	1
IEQc8.1	0
IEQc8.2	0
SUM	10

Innovation (ID)

	Score
IDc1-5	5
IDc6	1
SUM	6

Regional Priority (RP)

	Score
RPc1-4	4
SUM	4

SUM

Total Score
60