

A questionnaire design for objective evaluation of performance of built facilities

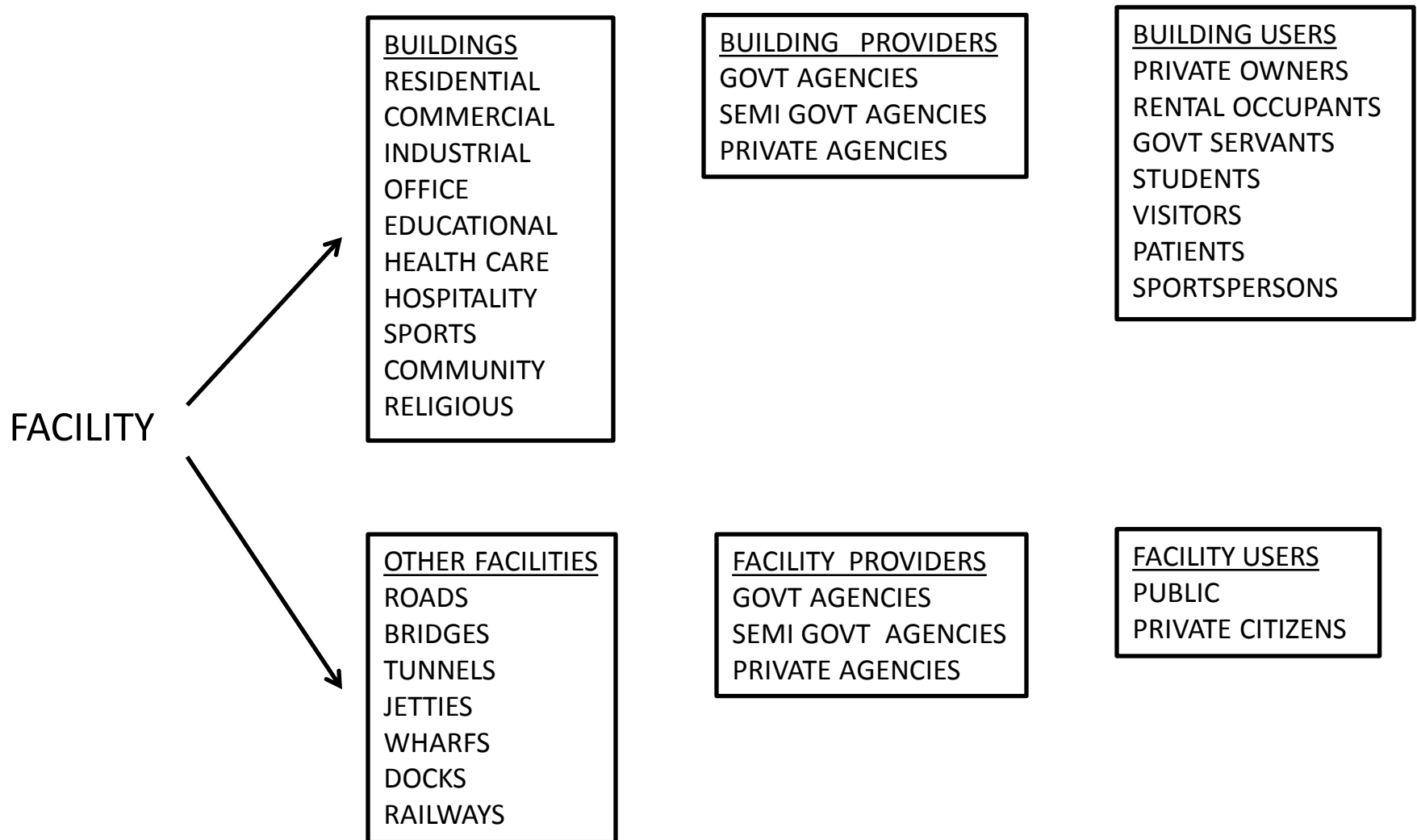
Dr Vinay Topkar
Professor

Col S Gopikrishnan
Post Graduate Student

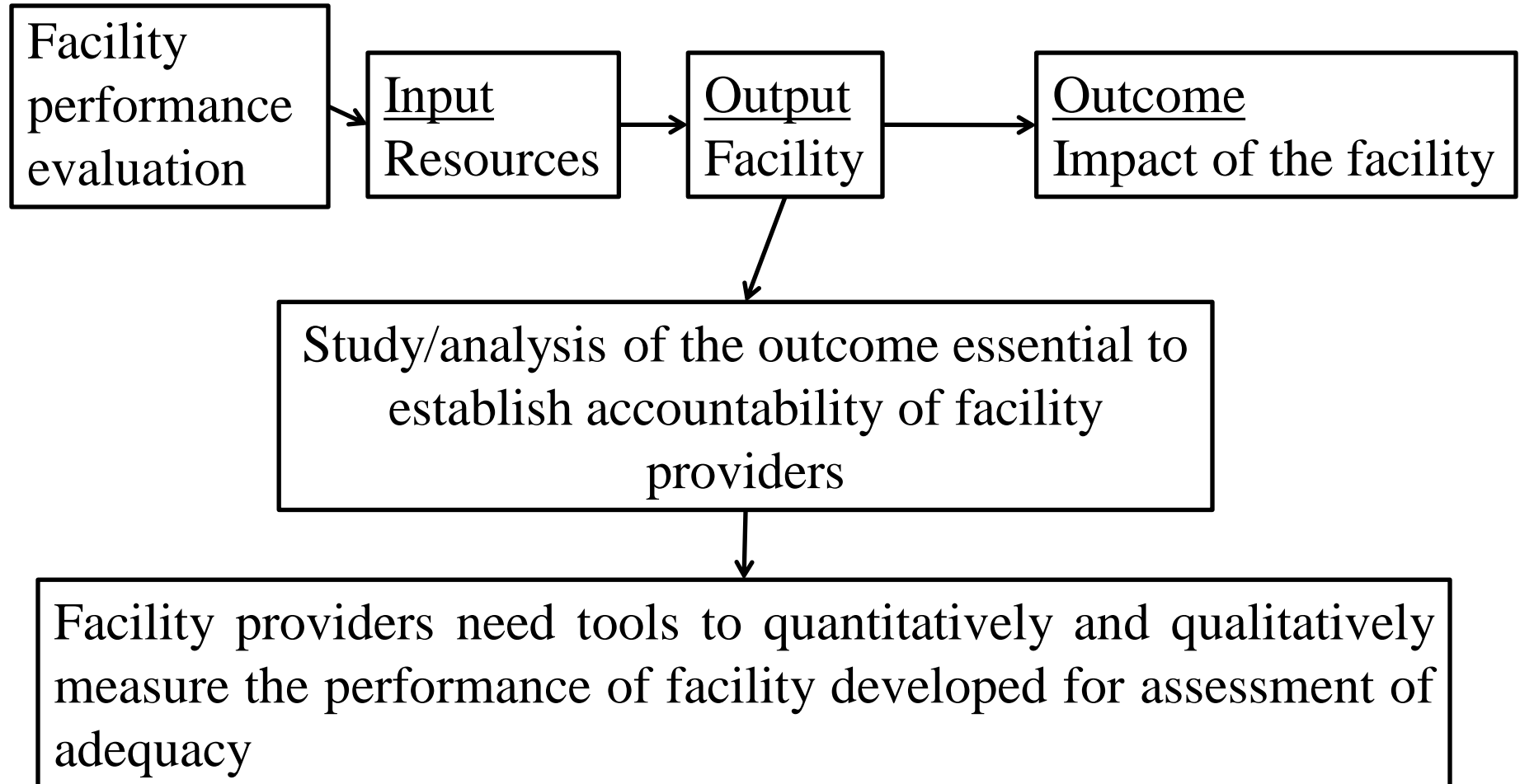
Civil and Environmental Engineering Department
Veer mata Jijabai Technological Institute, Mumbai, India

- Present scenario
- Attributes
- Descriptors
- Questionnaire
- Pilot survey and validation

FACILITY



FACILITY PERFORMANCE EVALUATION



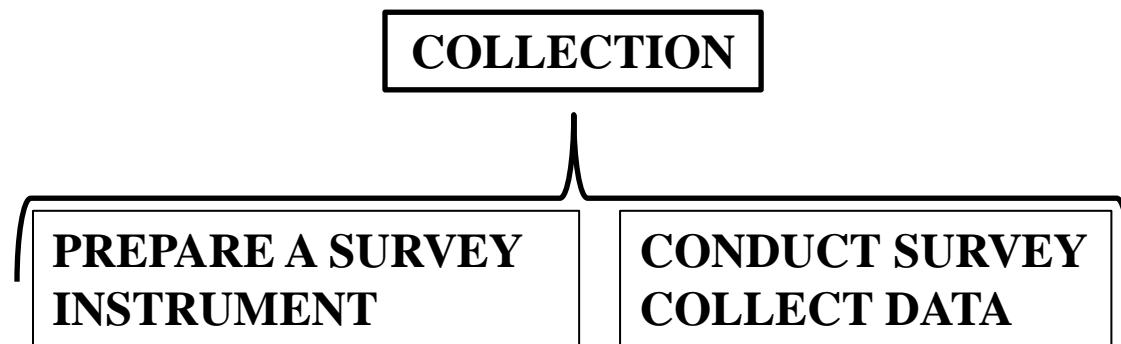
PRESENT SCENARIO IN FPE

- (1) **Hospital Building** - Igal M Shohet et al,(2003), “Integrated Maintenance Management of Hospital Buildings in Israel”, Journal of Construction Management and Economics
- (2) **Public Building** - Natasha Khalil et al,(2010), “Correlation analysis of building performance and occupants’ satisfaction via post occupancy evaluation for Malaysia’s public buildings”, Munich Personal RePEc Archives, paper No 19634
- (3) **High Rise Office Building** - N. E. M. Nik-Mat et al,(2011), “Assessing the maintenance aspect of Facilities Management through a Performance Measurement System: A Malaysian Case Study”, Procedia Engineering Journal, Elsevier
- (4) **Educational Building** - Abdul Lateef A. Et al, (2011) “Validation of Building Maintenance Performance Model for Malaysian Universities”, International Journal of Human and Social Sciences
- (5) **Residential Building** - MA Mohit and Mohammad Azim, (2012), “Assessment of residential satisfaction with public housing in Hulhumale’, Maldives” Journal of social and behavioral sciences, Elsevier Procedia,
- (6) **Public housing** - Eziyi Offia Ibem et al,(2013), “Performance evaluation of residential buildings in public housing estates in Ogun State, Nigeria: Users’ satisfaction perspective”, Elsevier Science direct, Frontiers of Architectural research

INFERENCES ON PRESENT SCENARIO



- A bank of different attributes of buildings could be gathered.
- Irrespective of the manner in which the results get interpreted, the process is same.
- Only the type of data collected , methods of data analysis and interpretation differs.
- Not much emphasis found in the data collection process in surveys.



Objective –To formulate an effective survey instrument to elicit more objective response from participants while conducting user satisfaction surveys for evaluation of performance of a facility

Methodology

- Compiling list of attributes
- Formulation of their descriptors
- Validation from respondents
- Designing of a questionnaire
- Identification of sample
- Conduct of pilot survey
- Analysis of collected data
- Inferences and conclusion

ATTRIBUTES

- Attributes identified through extensive literature survey. Initially 56 attributes reduced to 29 and finally brought down to 13.
- Type of facility, purpose of survey and focus group

S No	Attributes	
1	Physical condition	Building integrity like cracks, leakage, seepage, dampness etc
2	Space	Size/grouping of rooms, Common areas, open spaces etc
3	Indoor air	Ventilation and air conditioning for thermal comfort
4	Illumination	For adequacy and visual comfort
5	Safety and security	Against fire, lightning, accidents, infections, insects and crime level
6	Accessibility	Connectivity, internal roads, staircases, lifts, escalators
7	Air, Noise and water	Environmental aspects of quality of air, water and noise
8	Waste disposal	Including garbage collection and disposal
9	Drainage	Rain water, sewage and sullage
10	Finishes	Internal and external finishes
11	Amenities	Drinking water, washrooms, water and electricity supply etc
12	Aesthetics	Including landscaping, visual comfort, psychological comfort etc
13	Parking	Its location and adequacy

DESCRIPTORS

- Characteristics of all these attributes listed through extensive study of literature – National Building Code 2005, CPWD Manuals, relevant text books and journal papers

ILLUMINATION

S No	Characteristic	Description
1	Uniformity	Uniformly lit to perform the tasks and improve performance
2	Glare	Has proper shading devices to avoid glare
3	Visual comfort	Does not cause any visual discomfort like flickering, over lighting
4	Safety	Promotes safety of occupants during movement
5	Control	Has easily accessible control to both natural and artificial lighting
6	Lighting type	Also provides for natural lighting
7	Appearance	Improves the appearance of the area
8	View	Has a choice for view to outside
9	Psychological effect	Has positive psychological impact on the occupant
10	Maintenance	Facilitates easy access and handling for maintenance
11	Energy savings	Facilitates energy savings

QUESTIONNAIRE

- Stages in formulation

- (a) Content

- (b) Range and scale

- (c) Item generation, wording and order

- Rules followed during questionnaire formulation

- (a) Clarity

- (b) Item length

- (c) Negative terminology

- (d) Double barreled questions

- (e) Language

- (f) Generic questions

- (g) Bias

- (h) Neutral opinion

- (j) Threatening questions

- (k) Ambiguous questions

- (l) Danger words

- (m) Multiple choice

- (n) Cryptic writing

- (o) Simplicity

QUESTIONNAIRE FORMAT

<u>Illumination</u>					
(a) How adequate is the provision for natural lighting?					
Highly adequate	Quite adequate	Barely adequate	Not adequate	Highly inadequate	
(b) How uniform is the illumination that allows you to perform the tasks?					
Highly uniform	Quite uniform	Barely uniform	Not uniform	Highly un uniform	
(c) How glaring is the illumination on your eyes?					
No glaring	Barely glaring	Glaring	Quite glaring	Highly glaring	
(d) How much visual comfort do you feel against flickering, over illumination?					
Highly comfort	Sufficient comfort	Bare comfort	Slight discomfort	High discomfort	
(e) How does the illumination contribute to safety of movement?					
Highly safe	Quite safe	Barely safe	Unsafe	Highly unsafe	
(f) How accessible is the control to natural lighting?					
Highly accessible	Quite accessible	Barely accessible	Not accessible	Highly inaccessible	
(g) How accessible is the control to artificial lighting?					
Highly accessible	Quite accessible	Barely accessible	Not accessible	Highly inaccessible	
(h) How adequate is the illumination to improve appearance of the area?					
Highly adequate	Quite adequate	Barely adequate	Not adequate	Highly inadequate	
(i) What is the degree of ease for handling for maintenance?					
Very easy	Quite easy	Barely easy	Not easy	Highly uneasy	
(j) How efficient are the provisions for ventilation with respect to energy savings?					
Highly efficient	Quite efficient	Barely efficient	Inefficient	Highly inefficient	
(k) What is the psychological impact of the lighting on you?					
Highly positive	Quite positive	Barely positive	Negative	Highly negative	

TOTAL QUESTIONS NEEDING VALIDATION

S No	Attribute	Number of question items
1	Physical condition	5
2	Space	9
3	Indoor air	10
4	Illumination	11
5	Safety and security	14
6	Accessibility	7
7	Air, Noise and Water	3
8	Waste disposal	3
9	Drainage	2
10	Finishes	5
11	Amenities	8
12	Aesthetics	3
13	Parking	2

Validation

- (1) Translational validity – To check the content and layout
- (2) Construct validity – To check the relevance of attributes and characteristics
- (3) Reliability – To check internal consistency of the questionnaire

VALIDATION PROCESS

1 – Translational validity

1(a) – Content: Attributes and characteristics chosen through literature survey

Circulated among industry experts and vetted

Opinions received from respondents during survey

Content ensured to be suitable for an hospital

1(b) – Face: Feasibility – A separate scale for ‘Can’t say’

Readability

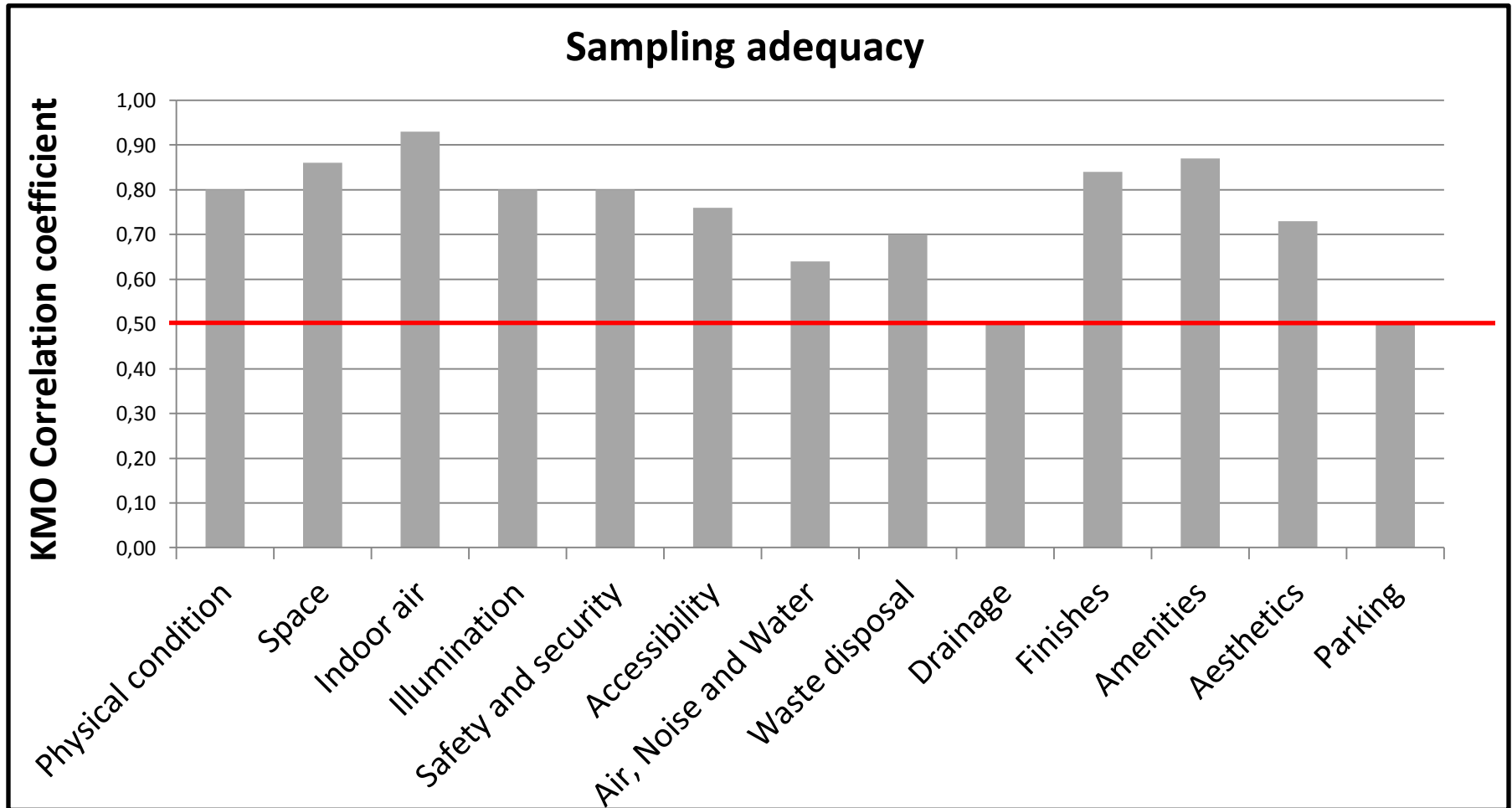
Ease of comprehension

Layout and style – Tick box

VALIDATION PROCESS

2 – Construct validity

2(a) – Sampling adequacy

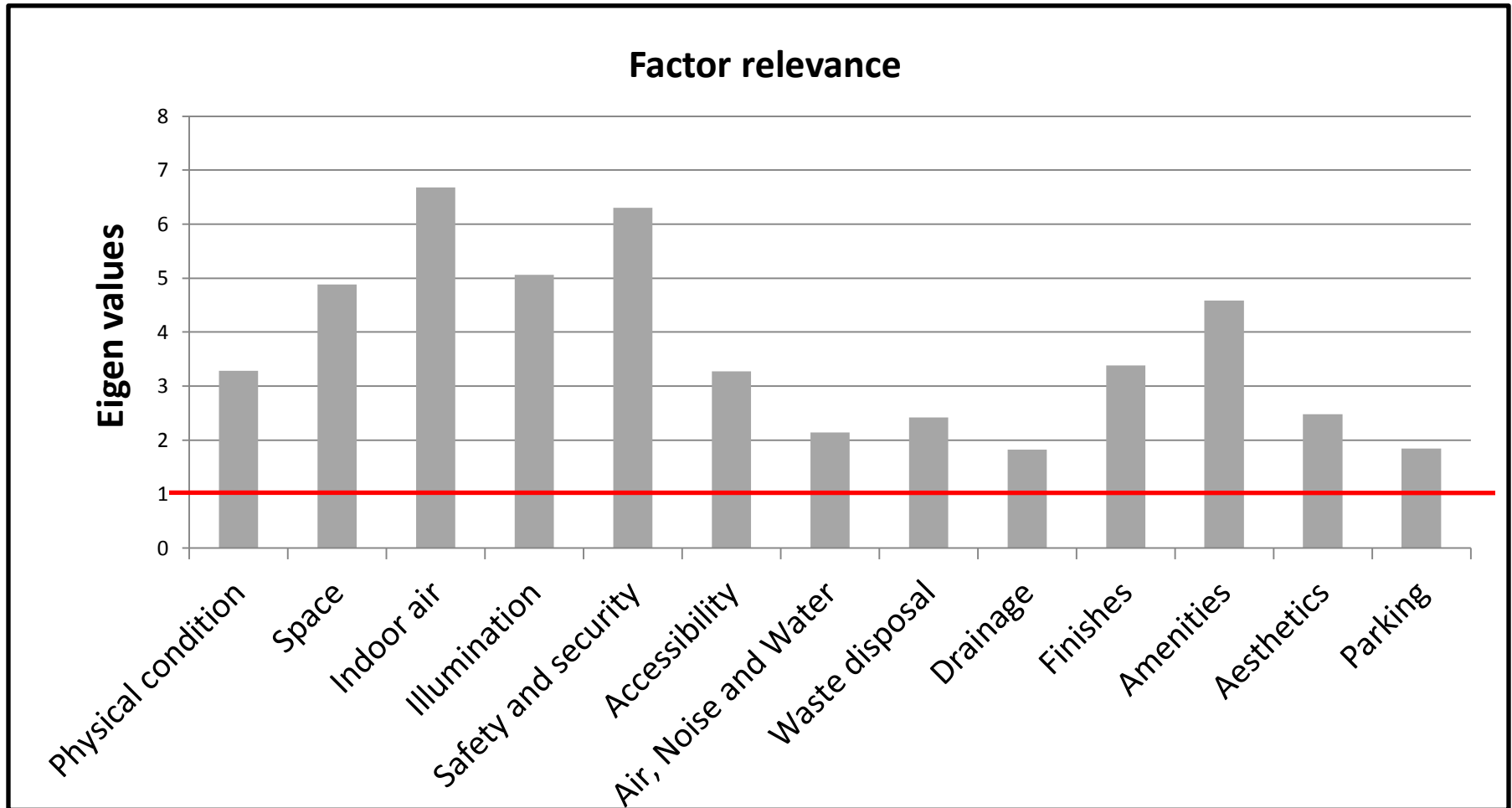


KMO correlation coefficient should be minimum 0.5 to consider the sample size adequate

VALIDATION PROCESS

2 – Construct validity

2(b)(i) – Confirmatory factor analysis - Eigenvalues



Eigen values should be minimum 1 to consider the attributes to be relevant

VALIDATION PROCESS

2 – Construct validity 2(b) (ii) – Factor analysis – Factor loadings

PHYSICAL CONDITION	
	F1
a	0.763
b	0.851
c	0.805
d	0.819
e	0.810

SPACE	
	F1
a	0.768
b	0.753
c	0.825
d	0.788
e	0.784
f	0.774
g	0.607
h	0.515
i	0.759

INDOOR AIR	
	F1
a	0.809
b	0.819
c	0.873
d	0.784
e	0.802
f	0.849
g	0.830
h	0.814
i	0.847
j	0.853

ILLUMINATION	
	F1
a	0.761
b	0.780
c	0.016
d	0.718
e	0.751
f	0.738
g	0.619
h	0.704
i	0.704
j	0.707
k	0.612

SAFETY & SECURITY	
	F1
a	0.605
b	0.449
c	0.700
d	0.787
e	0.723
f	0.716
g	0.731
i	0.650
j	0.747
k	0.725
l	0.719
m	0.609
n	0.695
o	0.417

ACCESSIBILITY	
	F1
a	0.551
b	0.789
c	0.775
d	0.534
e	0.720
f	0.778
g	0.577

AIR, NOISE, WATER	
	F1
a	0.855
b	0.906
c	0.763

FINISHES	
	F1
a	0.847
b	0.816
c	0.732
d	0.871
e	0.840

AMENITIES	
	F1
a	0.795
b	0.333
c	0.830
d	0.810
e	0.840
f	0.723
g	0.791
h	0.801

AESTHETICS	
	F1
a	0.933
b	0.882
c	0.910

PARKING	
	F1
a	0.960
b	0.960

DRAINAGE	
	F1
a	0.953
b	0.953

The factor loadings should be minimum 0.5 to consider the characteristics as relevant to the attribute

VALIDATION PROCESS

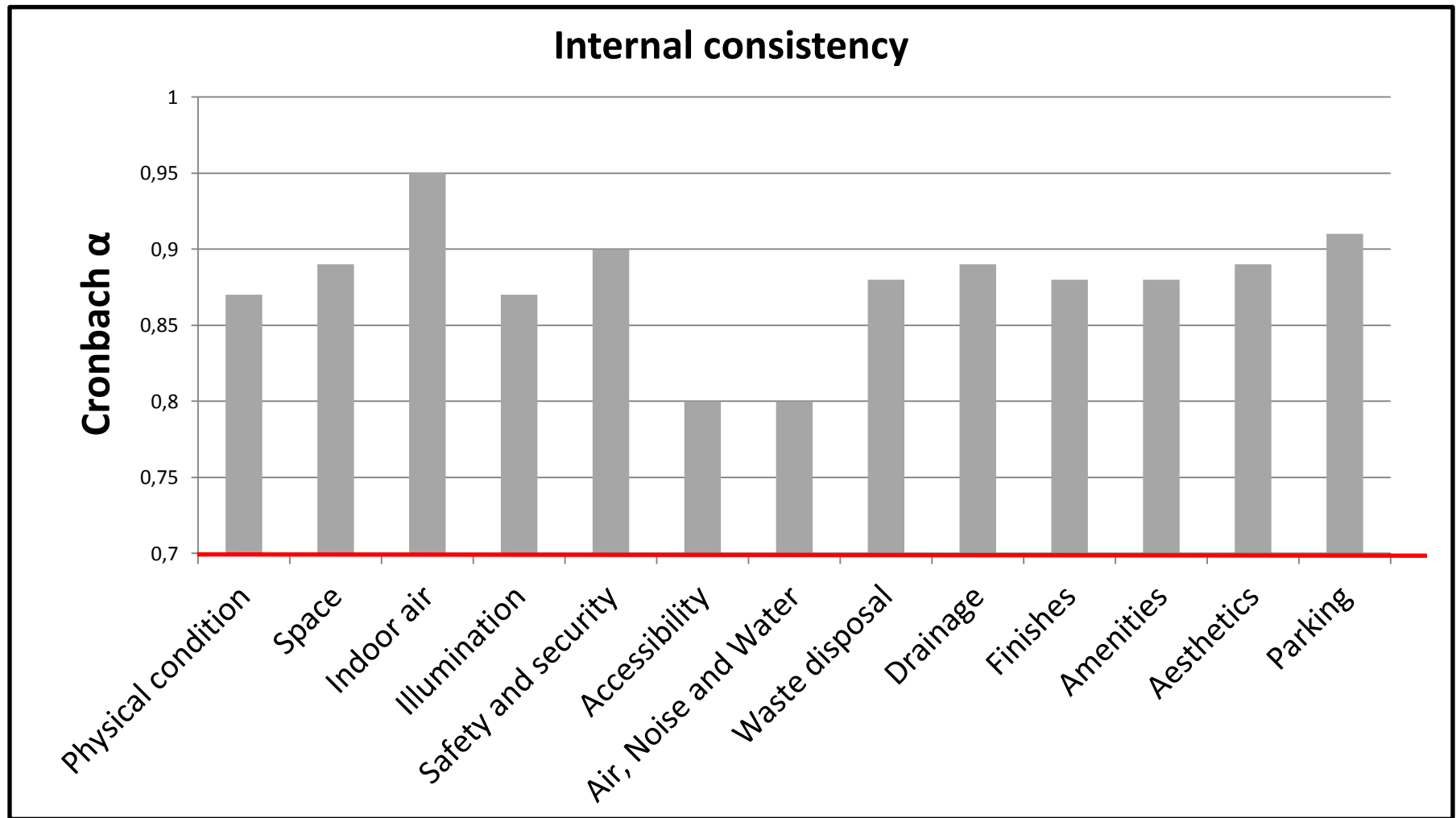
2 – Construct validity

2(b) (ii) – Factor analysis – Factor loadings

S No	Question	Factor loading
Illumination		
4(c)	(c) How glaring is the illumination on your eyes?	0.016
Safety and security		
5(b)	(b) How safe do you feel in the building against falling from windows and terraces?	0.449
5(o)	(o) How safe do you feel against electrical accidents due to loose electric fittings, hanging wires etc?	0.417
Amenities		
11(b)	(b) How much positive impact does a religious space in the building have on you?	0.333

VALIDATION PROCESS

3 – Reliability



Cronbach alpha should be minimum 0.7 to consider the questionnaire to be internally consistent

RESULT SUMMARY

- 1 – Content validity – Contemplated on dropping questions, 82 questions retained
- 2 – Face validity – Tick box can be dropped, Instructions for ‘Can’t say’ can be included in section I
- 3 – Construct validity – Identification of attributes confirmed as appropriate
- 4 – Construct validity – Identification of characteristics under attributes found appropriate
- 5 – Reliability – Questionnaire found internally consistent

DISCUSSIONS

- (1) High response rate
- (2) Time required for survey
- (3) Length of questionnaire
- (4) Need for vernacular questionnaire
- (5) Deviation in user response
- (6) Impact of objectivity – Immediate and long term

LIMITATIONS

- (1) Technical content
 - (2) Applicability of the questionnaire
 - (3) Time for conducting the surveys
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CONCLUSION

- (1) Credibility of the questionnaire
- (2) Ethical issues
- (3) Future scope of work