

A RELATIONSHIP BETWEEN INDOOR AIR QUALITY AND ENERGY CONSUMPTION BASED ON OCCUPANCY BEHAVIOUR IN SRI LANKAN INDUSTRIAL BUILDINGS

The RII Analysis of factors affecting to Energy consumption, IAQ and Occupancy behavior

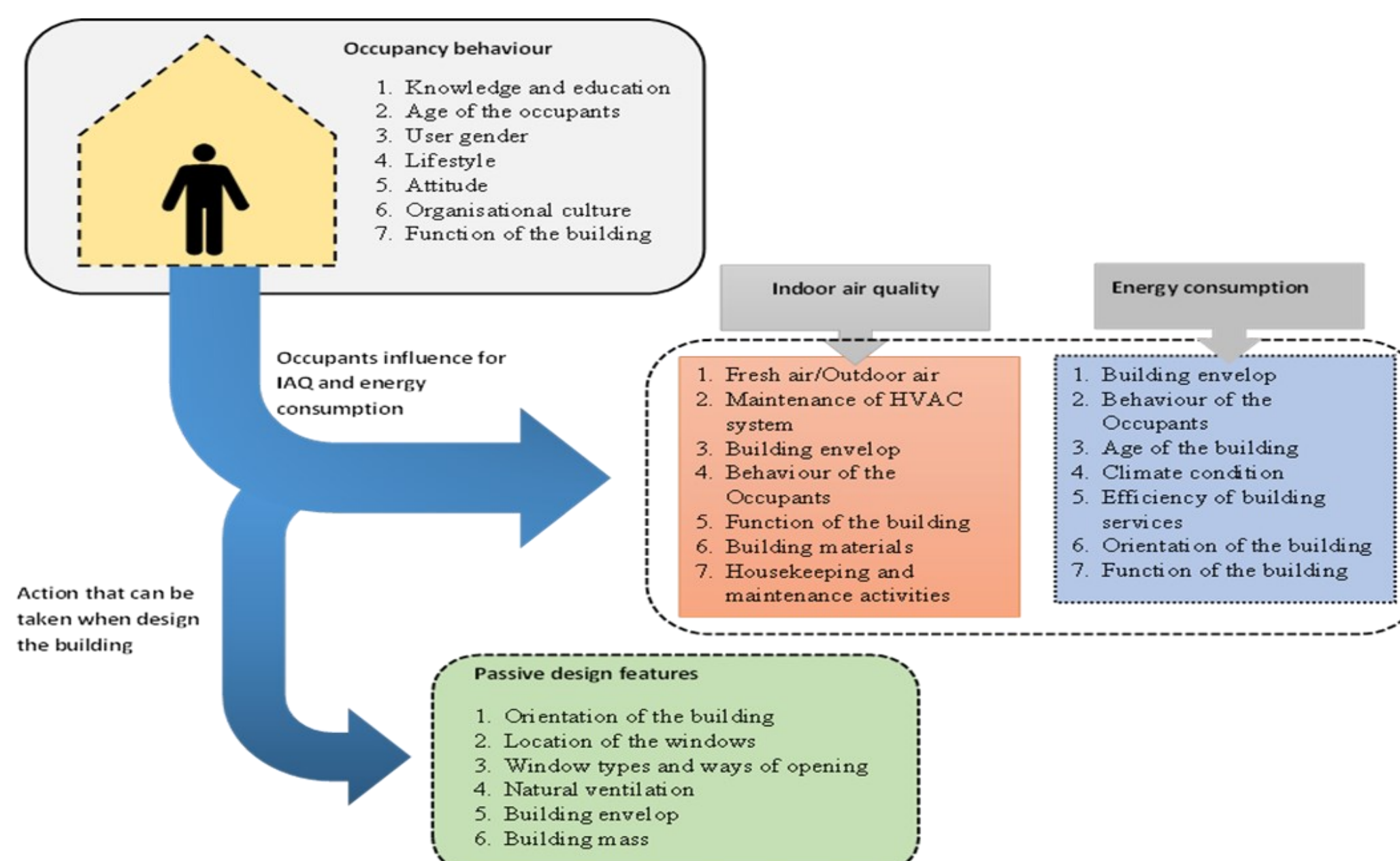
No	List of affecting factors	Rating Scores					RII Value	Rank	Overall rank
		Strongly Disagree	Disagree	Neither Agree or disagree	Agree	Strongly agree			
Energy Consumption									
E1	Behaviour of the Occupants	0	0	2	4	24	94.6	1	1
E2	Building envelop	0	0	0	20	10	86.6	2	5
E3	Climate condition	0	0	0	22	8	85.4	3	6
E4	Efficiency of building services	0	0	0	22	8	85.4	3	6
E5	Function of the building	0	0	4	20	6	81.4	5	11
E6	Orientation of the building	0	0	4	24	2	78.6	6	13
E7	Age of the building	0	0	14	16	0	70.6	7	17
Indoor Air Quality									
I1	Behaviour of the Occupants	0	0	0	12	18	92.0	1	3
I2	Fresh air/Outdoor air	0	0	0	16	14	89.4	2	4
I3	Building materials	0	0	2	20	8	84.0	3	8
I4	Housekeeping & maintenance activities	0	0	2	22	6	82.6	4	9
I5	Maintenance of HVAC system	0	0	4	22	4	80.0	5	12
I6	Function of the building	0	0	12	18	0	72.0	6	16
I7	Building envelop	0	4	4	20	2	62.6	7	20
Occupancy Behaviour									
O1	Knowledge and education	0	0	0	8	22	94.6	1	1
O2	Attitude	0	0	4	18	8	82.6	2	9
O3	Age of the occupants	0	0	6	24	0	76.0	3	14
O4	Function of the building	0	0	10	20	0	73.4	4	15
O5	Lifestyle	0	2	2	22	2	69.4	5	18
O6	Organisational culture	0	0	20	10	0	66.6	6	19
O7	User gender	0	4	12	14	0	56.0	7	21

Relationship	Value
perfect	equal ± 1
Strong	beyond or equals ± 0.7 .
Moderate	among ± 0.5 to ± 0.7 .
Weak	lies in the middle of ± 0.3 to ± 0.5
None	below than ± 0.3



Hypothesis Regarding Independent Variables and their Bivariate analysis

Hypothesis No	Hypothesis Content	Correlation Coefficient	Relation		Relationship Status	Rank
			(+)	(-)		
Hypothesis 1	Maintenance of HVAC system (I5) has a positive relationship with Building envelope (E2)	0.734	Yes	-	Strong	4
Hypothesis 2	Function of the building (I6) has a positive relationship with Behaviour of the Occupants (E1)	0.585	Yes	-	Moderate	6
Hypothesis 3	Building envelop (I7) has a negative relationship with Age of the building (E7)	-0.763	-	Yes	Strong	2
Hypothesis 4	Behaviour of the Occupants (I1) has a positive relationship with Climate condition (E3)	0.351	Yes	-	Weak	12
Hypothesis 5	Building materials (I3) has a positive relationship with the Efficiency of building services (E4)	0.756	Yes	-	Strong	3
Hypothesis 6	Housekeeping & maintenance activities (I4) has a positive relationship with the Orientation of the building (E6)	0.154	Yes	-	None	17
Hypothesis 7	Fresh air/Outdoor air (I2) has a positive relationship with the Function of the building (E5)	0.342	Yes	-	Weak	13
Hypothesis 8	Housekeeping and maintenance activities (I4) has positive relationship with Knowledge and education (O1)	0.985	Yes	-	Strong	1
Hypothesis 9	Building envelop (I7) has a positive relationship with Age of the occupants (O3)	0.268	Yes	-	None	15
Hypothesis 10	Building materials (I3) has a positive relationship with user gender (O7)	0.081	Yes	-	None	19
Hypothesis 11	Maintenance of HVAC system (I5) has positive relationship with Lifestyle (O5)	0.331	Yes	-	Weak	14
Hypothesis 12	Function of the building (I6) has positive relationship with Attitude (O2)	0.019	Yes	-	None	21
Hypothesis 13	Behaviour of the Occupants (I1) has a positive relationship with Organisational culture (O6)	0.494	Yes	-	Weak	10
Hypothesis 14	Fresh air/Outdoor air (I2) has a positive relationship with the Function of the building (O4)	0.664	Yes	-	Moderate	5
Hypothesis 15	Function of the building (E5) has a positive relationship with Knowledge and education (O1)	0.558	Yes	-	Moderate	8
Hypothesis 16	Efficiency of building services (E4) has positive relationship with Attitude (O2)	0.175	Yes	-	None	16
Hypothesis 17	Building envelope (E2) has a positive relationship with Age of the occupants (O3)	0.377	Yes	-	Weak	11
Hypothesis 18	Behaviour of the Occupants (E1) has a negative relationship with Lifestyle (O5)	0.518	Yes	-	Moderate	9
Hypothesis 19	Age of the building (E7) has positive relationship with Function of the building (O4)	-0.052	-	Yes	None	20
Hypothesis 20	Orientation of the building (E6) has a negative relationship with Organisational culture (O6)	-0.107	-	Yes	None	18
Hypothesis 21	Climate condition (E3) has a negative relationship with user gender (O7)	-0.572	-	Yes	Moderate	7



Guideline for a good balance between IAQ and rational use of energy based on the occupancy behaviour in Sri Lankan industrial constructions

A Relationship between Indoor Air Quality and Energy Consumption Based On Occupancy Behaviour in Sri Lankan Industrial Buildings

FARU 2020 International Research Conference

This research aims to provide a guideline for researchers, architects and designers with information on how to optimize good indoor air quality and energy usage within structure based on occupancy behaviour. Primarily, literature review was done and then, a preliminary survey was conducted with three industry experts to gain applicability of this research to the Sri Lankan industrial building. The questionnaire survey was conducted by distributing questionnaires among 40 industry experts who have experience in industrial building operation and 30 of them responded back. Microsoft excel data analysis package, relative important index and bivariate analysis were used to analyse the collected data. Cronbach alpha test was used to identify the reliability of the collected data set. The guideline for building operator and designers to balance between IAQ and energy consumption based on occupancy behaviour can improve the building efficiency was set.

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