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Assessment of the user-led spatial configuration in the transitional shelters in Bantayan Island, Philippines

ROBERT MALAYAO[12], HELENE TEUFL[2], ARDESHIR MAHDAVI[2]

[1]DEPARTMENT OF ARCHITECTURE - UNIVERSITY OF SAN CARLOS

[2]DEPARTMENT OF BUILDING PHYSICS AND BUILDING ECOLOGY - TU WIEN

ABSTRACT

The study uses the Space Syntax Theory to analyse the user-led spatial configuration of the two types of transitional shelters (Shelter A and Shelter B). These are assessed against a Permanent Shelter in Bantayan Island seven years after Typhoon Haiyan. Conclusions from this research is envisioned to provide an evaluation of how the recipients maximized the use of the limited space as well as compare possible similarities or differences in the way users in transitional shelters configure their spaces against those living in a permanent shelter. These can ultimately guide the designs of future transitional shelters considering that many of them become permanent structures. Contrary to the "standard" procedure of the theory, the research followed an approach that is like what Monteiro (1997) and Sanni-Anibire et al (2018) did and used the AGRAPH software to generate the results. A further deviation is on the assessment of the activities according to the location of the furniture at the time the data is gathered. This is even if in principle, the furniture may be moved to another place in the shelter. Multiple occurrences of the same activity are recorded and numbered. Findings showed a lack of 'proper' distinction between private and public spaces, as well as a high percentage of activities being performed outside of the shelter's original volume. It can be surmised that the decisions that influenced the user-initiated spatial configuration are merely based on the available space in the structure regardless of the degree of privacy that the activity requires.

KEYWORDS

resident-initiated renovation, space planning, Typhoon Haiyan, temporary shelter, space syntax

1 INTRODUCTION

The Philippines is an archipelagic nation composed of roughly 7,641 islands with around 109 million inhabitants, according to the 2020 census (PSA, 2021). In the report published by the United Nations' World Risk Report in 2020, the country ranked 9th with a risk percentage of 20.69% (Behlert, et al., 2020). This could be due to the "geographical location of the Philippines [which] makes the country uniquely exposed to a plethora of hazards, including recurrent typhoons [at approximately 20 a year], earthquakes and 53 active volcanoes" (UNDRR, 2019, p. 9).

On November 8, 2013, Typhoon Haiyan locally known as Typhoon Yolanda tore through the central Philippines. The next day, it exited the Philippine Area of Responsibility. At its peak and prior to landfall, it recorded a windspeed of 170 knots (314.84 km/h) with a pressure of 895 mb (Knapp, et al., 2010); (Knapp, et al., 2018). Apart from the widely reported devastation in Tacloban and Ormoc City in the Eastern Visayas Region, the typhoon also barrelled through Northern Cebu and Bantayan Island. These are areas which "were directly in the path of Haiyan and [has] sustained heavy losses" (Opdyke, et al., 2016, p. 14).

The research is focused on the municipalities of Bantayan and Santa Fe in Bantayan Island. From the 2020 census, it has a combined population of 120,718 (PSA, 2021). The declaration as a "Wilderness Area" in 1981 by President Marcos and reinforced by the Philippine Senate in 1992 (Opdyke, et al., 2016) meant that private land ownership in the island is limited only through tax declaration and a deed of sale but not land titles.

In a newspaper article of Sabalo, as of November 2019, the National Housing Authority (NHA) and the Inter-Agency Task Force Yolanda (IATF-Yolanda) has built 2,491 permanent shelter for the victims of Haiyan in Bantayan Island (Sabalo, 2019). This means that since 2014, the government has only managed to build 22% of the allotted 11,125 houses for the residents of Bantayan Island affected by the typhoon. When a linear construction trend of 415 houses per year is assumed, it will take both agencies 20 more years to finish building all the 11,125 units. So, most recipients will be staying in the transitional shelter for almost one generation. It is of great interest therefore to know how the beneficiaries of these shelters are coping with their situation considering that transitional shelters are not designed to last for that long.

Research focusing on the resident-initiated renovations particularly on the permanent shelters for disaster survivors in the Philippines abound ((Carrasco, et al., 2016), (Ong, et al., 2016)). A handful of the research that delve into user-initiated renovations in transitional shelters were those from countries with a different cultural background than the Philippines. Moreover, these research typically focused on the modification process, the renovations done and its effect to the resident's lifestyles (Parva & Rahimian, 2014), (Wagemann, 2017), (Ashmore, et al., 2003), (Doninger, 2013), (Marcillia & Ohno, 2012). To supplement the body of knowledge in this field,

the research aims to look at the resident-initiated renovations by focusing and assessing the user-led spatial configurations for the activities of the beneficiaries and investigate how the recipients maximized the use of a very limited space. Finally, the research aims to compare the usage patterns between those in transitional shelters against those in a permanent shelter built for the same typhoon survivors to uncover possible similarities or differences in the way users organize their spaces.

2 THEORY

2.1 Philippine rural architecture

The settlement patterns in the Philippines especially in the Visayan region have individual houses that are detached and never coalesced as are the cases in the ancient Middle East (Klassen, 2010). The 'Laws of the Indies' implemented by Spain in their colonies are still very much evident in the layouts of the municipalities especially in the rural areas. The further one gets from the town centre however, the houses usually become sparsely situated.

Architecturally, in the rural areas of the country especially in Cebu, the nipa huts or locally referred to as the *"payag"* still has similar characteristics from what was reported by Antonio Pigafetta when their expedition reached the island in 1521 (Pigafetta, et al., 1906):

Their houses are constructed of wood, and are built of planks and bamboo, raised high from the ground on large logs, and one must enter them by means of ladders. They have rooms like ours; and under the house they keep their swine, goats and fowls.

In an anthropological research and documentation done by Hart (1959) in 12 floor plans in Caticugan, Negros, he observed that the structure has two main spaces: (1) a *"sala"* (large hall) that mixes a living, dining, and sleeping areas without partitions; and the (2) *"kocina"* (kitchen). However, "many residences have a third room, and a combined sleeping and storage room *(sulod)"* (Hart, 1959, p. 84). The kitchen was documented to be integrated into the main part of the house and not separated. According to Klassen (2010), the enlargements of the *"payag"* were usually done either through the addition of posts or more volumes (Klassen, 2010).

2.2 Space Syntax

Space syntax operates on the "proposition that the human society holds integrated spatial information and that the spatial environment or inhabited spaces is embedded with social information" (Asif, et al., 2018, p. 521). Assessing the configuration of spaces through numerical and graphical analyses allows the quantification of spatial properties and extract the relevant information through mathematical models.

Tracing how the spaces are arranged to serve human needs reflects the distinct trait of a society (Aspinall, 1993) (van der Voordt, et al., 1997). Thus, one can clearly say that the key aspects of the building's layout are how its spaces are related to the axes of movement, flexibility, suitability and safety (Asif, et al., 2018) (Mustafa & Hassan, 2013).

With the use of the theory in the research, a more quantitative means of assessing the way the beneficiaries of the transitional shelters planned and maximized their limited space may be made. These spatial configurations are assessed according to their degree of efficiency – depth , degree of integration and space-link ratio. Evaluation through these factors better shows an activity's interaction with a person in terms of how one can be able to fully roam the structure and spaces within the system.

Since its introduction, several "modifications" had been introduced by other researchers thereby expanding its application. One such case is the use of activities to analyze the spatial pattern of a home (Monteiro, 1997) or a laboratory (Sanni-Anibire, et al., 2018). Regardless, the means of syntactically analyzing the spaces or activities as well as the terminologies used remain the same. In this study, the assessments are done by finding the (1) Total Depth *(Equation 1)*; (2) the Mean Depth *(Equation 2)*; (3) the Relative Asymmetry (RA) *(Equation 3)*; (4) Integration *(Equation 4)*; and the Space-Link Ratio (R) *(Equation 5)*.

Equation 1: Total Depth (TD)

$$TD = \Sigma\ (D_1 * \#A) + \ (D_2 * \#A) + \ \ldots \ + \ (D_n * \#A)$$

D = Depth

#A = total number of activities along the same depth

Equation 2: Mean Depth (MD)

$$MD = \frac{TD}{(k-1)}$$

MD = Mean Depth

TD = Total Depth

k = total number of functions in the system

For RA, the result is between 0 and 1, with "low values indicating a space [with a shallow] system… that is a space which tends to integrate the system, and high values a space which tends to be segregated from the system" (Hillier & Hanson, 1984).

Equation 3: Relative Asymmetry (RA)

$$RA = \frac{2\ (MD-1)}{k-2}$$

MD = Mean depth

k = total number of spaces/functions in the graph/system.

Results in the measure of integration are interpreted as the higher the Integration value, the more integrated and connected the functions in the shelter are.

Equation 4: Measure of Integration

$$Integration = \frac{1}{RA}$$

On the other hand, the distributedness or non-distributedness of the nodes (activities/spaces) is measured through the space-link ratio *(R)*. It is "evaluated based on the value of 1, where values greater than 1 correspond to a higher degree of 'ringiness' and distributedness of a spatial system vis-avis, a high degree of flexibility and functional efficiency…" (Sanni-Anibire, et al., 2018, p. 6). The opposite, values that are less than one, will mean more depth of the spaces/activities and therefore a reduced functional efficiency.

Equation 5: Space-link ratio (R)

$$R = \frac{L + 1}{k}$$

L = number of lines of the link between spaces/activity

k = number of spaces/activity

3 METHODOLOGY

3.1 Research Procedure

Identification of the Sample

The shelters/permanent shelter that were included in the research were first identified from the published works of Opdyke, et al (2016), the data from the Humanitarian Shelter Working Group (HSWG) of sheltercluster.org (Cluster, 2014), and through ocular survey in the two municipalities – Bantayan & Santa Fe. From the list, an email was sent to the organizations requesting for permission to conduct the experiment in the shelters/permanent shelter that they built in the area. Due to the request of the organizations for anonymity when the work is published in peer-reviewed venues, the shelters included in the study are identified as 'Shelter A' and 'Shelter B'. The permanent shelter that used to compare the data from Shelters A & B are referred to as 'Permanent Shelter'. Apart from these, permission from the owners of the shelters (transitional and permanent) themselves were asked and received prior to the conduct of the field survey/ investigation. Ethical challenges encountered during the field survey a reduced only to respondents that limited the access to certain parts of the house such as bedrooms/spaces.

The shelters included in the research were done randomly. The "randomness" however was limited to either the proximity of the shelters to the road or by 'word-of-mouth' from the residents previously surveyed (snowball sampling). These methods were used since the standard random sampling methods are not possible as the organizations only identified the barangays that the structures were built and not their exact address or names of the recipients.

Documenting the Spatial Organization

The field survey was conducted in the whole month of February 2020. However, it was cut short because of the restrictions being implemented due to Covid-19 pandemic. The documentation of the spatial configuration of the activities in the shelter (permanent & transitional) are done through (1) taking photographs of the interior and surrounding areas of the shelter, (2) sketches done by the researcher following the descriptions of the respondents on the different activities done in the house, and (3) inclusion in the sketch the location of the furniture and the activities encountered during the fieldwork.

The study however assumed that the function is done where the furniture is found/located at the time the data is gathered even if in essence, they can be moved somewhere else. Moreover, the activities included in the study are only those that are within the boundary of the resident's "territory" as pointed out by the residents themselves or defined by a clearing in the space, placement of plants/other materials in the edges or by similar object that forms some sort of a fence.

Recording the Data

During the field survey, the respondents were also asked on the number of occupants in the shelter and how many below to the age group '18 years old & below' and '18 years old & above'. Once the activities and their location relative to the structure were identified, the justified graphs were made with the 'Access Road' that connects to the lawn of the property as the 'root'. The inclusion of the yards with the activity as "walking" presents the number of "spaces" leading to the main structure. Like the procedure of Monteiro (1997), the next step "consisted of the definition of a two-dimensional description called convex spaces" (Monteiro, 1997, p. 20.4). In this step, the "rectangles" represent the activities. The sizes of the rectangles are just an approximation on the space the furniture or activity occupies in the real world. The space syntax analysis was made by measuring the degree of integration, the depth of the activities and their space-link ratio. The creation of a justified graph from the 'convex spaces' using the AGRAPH software (Manum, et al., n.d.) allows the analysis of the depth of the activities, its degree of integration/ segregation, and its relationship with the links.

Following this, the activities listed are grouped under the categories that "represent[s the] different sets of domestic actions: household chores (HC), extended chores (EC), [Inter]active (IL) and passive (PL) leisure and personal/private(PN) and communal (CN) needs" (Monteiro, 1997, p. 20.3). Table 1 below shows the groupings of the activities according to their categories.

Table 1: List of activities per category

HOUSEHOLD CHORES [HC]		EXTENDED CHORES [EC]	COMMUNAL NEEDS [CN]
(CD) Clothes Drying	*(LS) Storing_Livelihood*	*(AR) Access Road*	*(DT) Dining*
(LD) Laundry Area	*(MS) Storing_Misc.*	*(LS) Feeding Livestock*	*(WD) Drinking*
(RC) Cooking_Elec_Rice	*(SS) Storing_shoes*	*(HW1) Transiting to Vol 1*	*(CF) Drinking Coffee*
(FP) Preparing Food	*(TB) Storing_Trash*	*(HW2) Transiting to Vol 2*	
(Ab) Cooking_Firewood	*(PK) Storing_Vehicle*	*(HWE) Transiting to Extension*	**PERSONAL NEEDS [PN]**
(CK) Cooking_Gas	*(WS) Storing_water*	*(YF) Front Yard*	*(BT) Bathing*
(DW) Dishwashing	*(TH) Watering plants*	*(YR) Rear Yard*	*(TL) Toilet*
(IR) Ironing	*(FS) Storing_firewood*	*(YS) Side Yard*	*(HY) Grooming*
(WH) Cooking_Elec_ Water Heater	*(KU) Storing_Kitchen utensils*	**INTERACTIVE LEISURE [IL]**	*(SM) Storing_Sleeping items*
(FS) Storing_Office files	*(SF) Storing_Food*	*(RA) Receiving guests*	*(AL) Praying*
(CS) Storing_Clothes	*(RF) Sotring_Refrigerator*	*(ST) Selling*	*(BD) Sleeping*
(CH) Storing_Clothes hang	*(DL) Storing_Laundry*	*(IL) Watching TV*	*(KS) Storing_School items*
PASSIVE LEISURE [PL]			*(MR) Mirror*
(TP) Calling	*(BC) Lounging*	*(KD) Playing toys*	*(CP) Urinating*
(RD) Listening to radio	*(GR) Playing instrument*		*(CM) Using computer*

Analysis of the Data

In contrast to the "standard" conduction of the space syntax theory, the study has assessed the spatial configuration of the house/shelter through the various activities performed in the different parts of the shelters/house. This approach is like the research of Monteiro (1997) and Sanni-Anibire et al., (2018). The variation is on the exclusion of the activities that occurred less than 10% in all the cases studied as well as those activities that occurred zero times in at least one of the transitional shelter or the permanent shelter. Multiple occurrences are also recorded according to the number of instances that they are encountered during the field survey.

The spatial configurations of the shelters are assessed by comparing the results of Shelter A against Shelter B and both against the Permanent Shelter. The data being compared were not only the degree of efficiency (depth, degree of integration and space-link ratio) but also the block plans, the justified graphs, and the number of each activity per category and their location inside the different volumes of the shelter. These comparisons are expected to not only allow a better view on the similarities/ differences between the shelters and the permanent shelters but also a better understanding on the measures the residents had to take or give up to fit "everything" in the space.

3.2 Cases Studied

Transitional Shelter Paradigms

The designs for emergency shelters are based on key indicators that are developed by different organizations with various factors and criteria being considered/ prioritized. In a simplified definition, the transitional shelter is an "intermediary" type of shelter that is intended to bridge emergency with permanence. The duration of how long they are ideally "allowed" to remain before the recipients are transferred to a permanent shelter depends on which "paradigm" one is following.

In the report of Rohwerder for the UK Government's Department for International Development (DFID), she highlighted three approaches or "paradigms" to transitional shelter as identified by different organizations. Each have not only distinctively defined the transitional shelters differently, but they also have varying process for the transitional shelter's sheltering process.

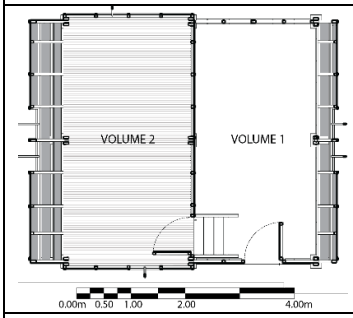
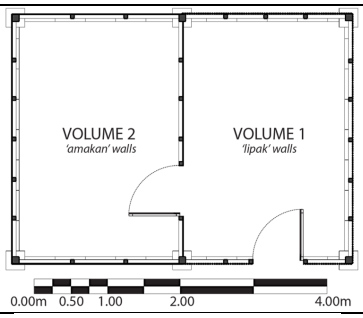
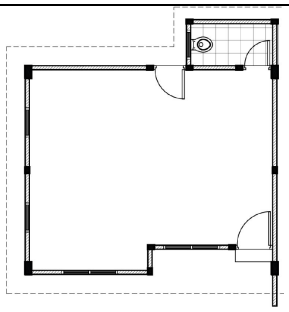
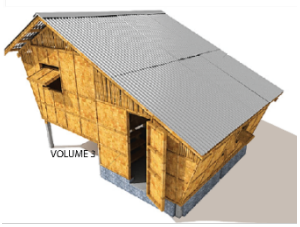
For the International Organization for Migration (IOM), transitional shelters follow an "incremental process rather than a multi-phased approach, whereby the shelter is built using all the shelter materials distributed" (Rohwerder, 2016, p. 2). Meaning, from IOM, transitional shelters "should be used only as part of an integrated and comprehensive shelter, settlement and reconstruction strategy" (IOM, 2012, p. 199). On the other hand, for the International Federation of Red Cross and Red Crescent Societies (IFRC), shelters "after [a] disaster involves an overlapping process of emergency, temporary, transitional, progressive, core and permanent housing" (Rohwerder, 2016, p. 2). One of the notions of the principle is the possibility of re-using the materials from which the post-disaster shelters were made from to permanent structures. A somewhat related concept by the USAID is its perception that transitional shelters "is intended to address short to medium term needs – up to three years – of disaster affected households [complementing] emergency shelter assistance" (USAID, n.d., p. 1).

Regardless of the paradigms however, they generally adhere to the minimum standards set by the Sphere Handbook: "Minimum [of] 3.5 sq.m. of living space per person, excluding cooking space, bathing area and sanitation facility" (Sphere Association, 2018, p. 254). Therefore, when the shelters were designed and implemented back in 2013 or 2014, the shelters should have a minimum area of 16.45 sq.m. This is since the Philippines has an average of 4.7 persons per household back in 2013 (Philippine Statistics Authority (PSA) [Philippines], 2014).

Cases Studied

Presented in Table 2 are the general information on the shelters (transitional and permanent) that were surveyed, assessed, and compared in the research as well as the limitations of the donated structure. The information particularly on the limitations of what the residents can and cannot do after the structure was donated were however only based on the descriptions given by the respondents.

Table 2: Information on the Cases Studied

Shelter A	Shelter B	Permanent Shelter
		
		
Of the three shelters built by the NGO in response to Haiyan, Shelter A is the 3rd design that is primarily inspired from a shelter designed by a research unit in a university in Cebu.	*The residents are expected to be the one to build their own kitchen, toilet, and bath. They are also given the opportunity to specify the location of the doors and "design" the walls of vol 1 with bamboo slats as preferred.*	*Built through the collaboration of two NGOs and the Municipality of Bantayan. The house is duplex type with 2 meters of setback from the rear and side, and 3 meters in the front.*
Dimensions: 4.80m x 4.50m Habitable volumes designed: Three (3) including the crawl space beneath vol. 2	Dimensions: 4.40m x 3.20m Habitable volumes designed: two (2)	Dimensions: 28.2 sq.m. excl. toilet & bath Habitable volumes designed: one (1)
Donation inclusions: *'amakan'* walls at exterior side only (vol 1 & 2), *'lipak'* floors (vol 2), concrete floor (vol 1), Corrugated G.I Sheet, doors & windows	Donation inclusions: *'amakan'* walls @exterior side only (vol 1 & 2), *'lipak'* walls @ exterior side only (vol 1), 2 or 3 layers of oncrete hollow block @ periphery, concrete floor (vol 2), Corrugated G.I Sheet, doors	Donation inclusions: concrete hollow block walls, Corrugated G.I Sheet, hollow core doors @ front & rear, plastic door @ CR, jalousie windows, toilet & bath, septic vault, pail flush water closet,
Built: Location of the original house of the recipient.		Built: Relocation of the residents who are mostly living in the nearby islets of Bantayan
Condition to beneficiary*: 1. Lot must be "owned" by recipient/ with permission from lot owner 2. Modifications are possible		Condition to beneficiary*: 1. Addition at front is not allowed 2. Repairs should use the same material/ paint color as originally given
'amakan' – Cebuano word for woven bamboo mat *'lipak'* – Cebuano word for bamboo slat * *based on what was mentioned by the beneficiary-respondents*		

Research Sample

Table 3 shows the sample sizes of the shelters in the study and compared against the total number of structures claimed to have been built by their respective organizations. Of interest is the varying number of shelters built according to the government, the Global Shelter Cluster and the organizations themselves. Further, for Shelter A, the organization who built it has also built shelters following two other designs. But in the data gathered, it did not distinctly identify the

number of shelters built according to what shelter design. Instead, they only presented an aggregated number of the shelter that they were able to build in the study area.

Table 3: Sample Size & location of samples

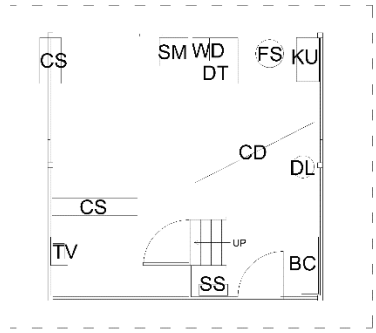
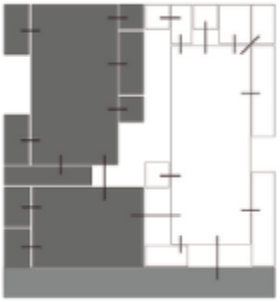
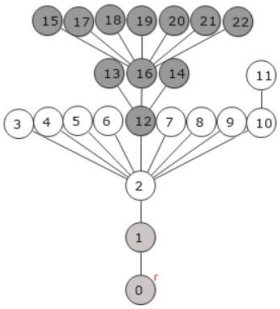
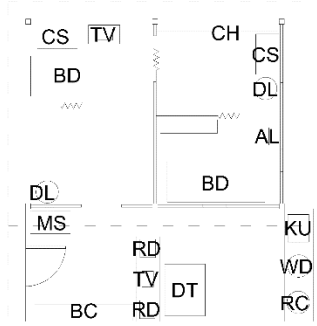
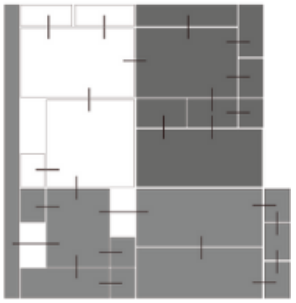
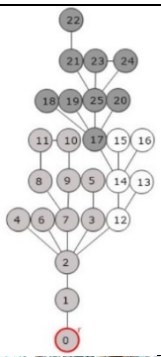
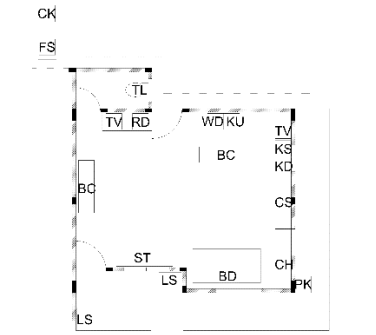
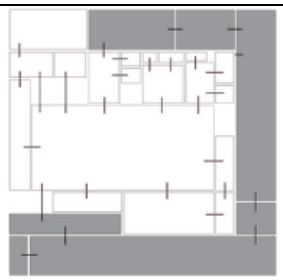
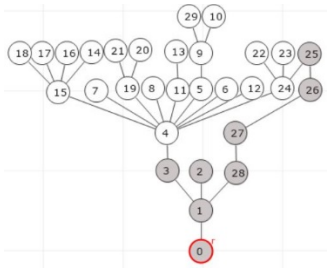
	Pop'n Size	Sample Size	Total Occupants			18 yrs old & above			18 yrs old & below		
			Min.	*Ave.*	*Max*	*Min.*	*Ave.*	*Max*	*Min.*	*Ave.*	*Max*
SHELTER A	861*	14	2	4.4	3	2	2.1	5	0	2.4	7
SHELTER B	354** 63***	15	1	5.3	11	1	2.7	6	0	2.7	5
PERMANENT SHELTER	216* 372***	18	2	5.7	11	2	2.8	5	0	2.9	6

** data from Global Shelter Cluster (ShelterCluster.org, 2014)*
*** data from the Disaster Risk Reduction Management Office of the Municipality of Sta. Fe*
**** data from organization*

The sketch plans from the photographs and description by the shelter (transitional and permanent) owners are translated into a floor plan emphasizing the location of the furniture/ activities encountered during the survey.

Table 4 below presents a sample of the process by which the research underwent before the degree of efficiency for each activity are computed.

Table 4: Sample diagrams for the two transitional shelter & one permanent shelter

	FLOOR PLAN	BLOCK PLAN	JUSTIFIED GRAPH
SHELTER A - 04			
	CS – clothes storage *TV – television* *SS – shoe/slipper storage* *SM – sleeping mat storage* *WD – water dispenser* *DT – dining table* *FS – Food storage (pantry)* *KU – kitchen utensils* *CD – clothes drying* *DL – dirty laundry* *BC - bench*		
SHELTER B - 14			
	CS – clothes storage *BD – bed* *BC – bench* *DT – dining table* *WD – water dispenser* *AL – altar* *MS – sleeping mat storage* *TV – television* *DL – dirty laundry* *RD – radio/speaker* *RC – rice cooker* *KU – kitchen utensils* *CH – clothes hang*		
PERMANENT SHELTER - 06			
	CK – cooking - butane *TL – toilet* *RD – radio* *ST – mom& pop store* *WD – water dispenser* *BC – bench* *KS – school item storage* *CH – clothes hang* *PK – parking (motorcycle)* *FS – file storage* *TV – television* *BC – bench* *LS – livestock enclosure* *KU – kitchen utensils* *KD – kids' toys* *CS – clothes storage* *BD – bed*		
Legend for block plan & justified graph	*Volume 1*	*Volume 2*	*Extension*

4 RESULTS

4.1 Demographic Correlations

The correlation of the degrees of efficiency (depth, integration, and space-link ratio) against the demographic data (total number of occupants and age groups per household) are presented in Table 5. The numbers used are average values of the specific variables in each transitional shelter and the permanent shelter. The correlation between the variables were assessed according to their correlation coefficient: 'Very High' (±1.0 – ±0.90), 'High' (±0.90 – ±0.70), 'Moderate' (±0.70 – ±0.50), 'Low' (±0.50 - ±0.30), and 'Negligible' (±0.30 – 0.00). The thresholds were based on the "rule of thumb for interpreting the size of a correlation coefficient" (Mukaka, 2012).

The result of the assessment showed that only Shelter B has a low correlation between the total occupants of the shelter against the mean depth of the activities observed in the shelter. However, it is interesting to note that the number of 'adults' in both Shelter B and the Permanent Shelter has some positive correlation with the number of activities observed in the structures, its mean depth and integration. Although, the integration is inversely proportional for those in Shelter B.

Table 5: Demographics vs. degrees of efficiency

VARIABLE 1	VARIABLE 2	SHELTER A	SHELTER B	PERMANENT SHELTER
Total occupants	Mean Depth	0.24	0.46	-0.16
Total occupants	Total Activities	0.27	0.25	0.31
Number of adults (18 yrs. old above)	Total Activities	0.08	0.35	0.61
	Mean Depth	0.08	0.48	0.47
	Integration	-0.08	-0.35	0.51
	Space-Link	-0.35	-0.04	0.20
Number of minors (18 yrs. old below)	Total Activities	0.25	0.12	0.01
	Mean Depth	0.31	0.31	-0.08
	Integration	-0.14	-0.50	0.16
	Space-Link	-0.07	-0.25	0.44

4.2 Integration of Activities

For the Shelter A, as shown in Figure 1, the Extended Chore (EC) of 'Transiting the volumes' have the highest integration. Most passive leisure activities with the highest integration include 'lounging' and 'listening to the radio' followed by 'storing the livelihood paraphernalia' (HC) and 'dining' (CN). On the lower end, 'bathing' and 'defecating', both Private Needs (PN) have the least integration.

The data also supported that for Shelter A residents, 'praying' is considered as a very private activity considering its low integration with other activities. 'Sleeping' is also a mildly integrated activity with the high number of connections with other activities.

Aggregating the categories also showed that generally, the categories of Communal Needs (CN), Interactive Leisure (IL), and Passive Leisure (PL) ranges from the mildly integrated (5-6) to the most integrated (>6) activities in the shelter.

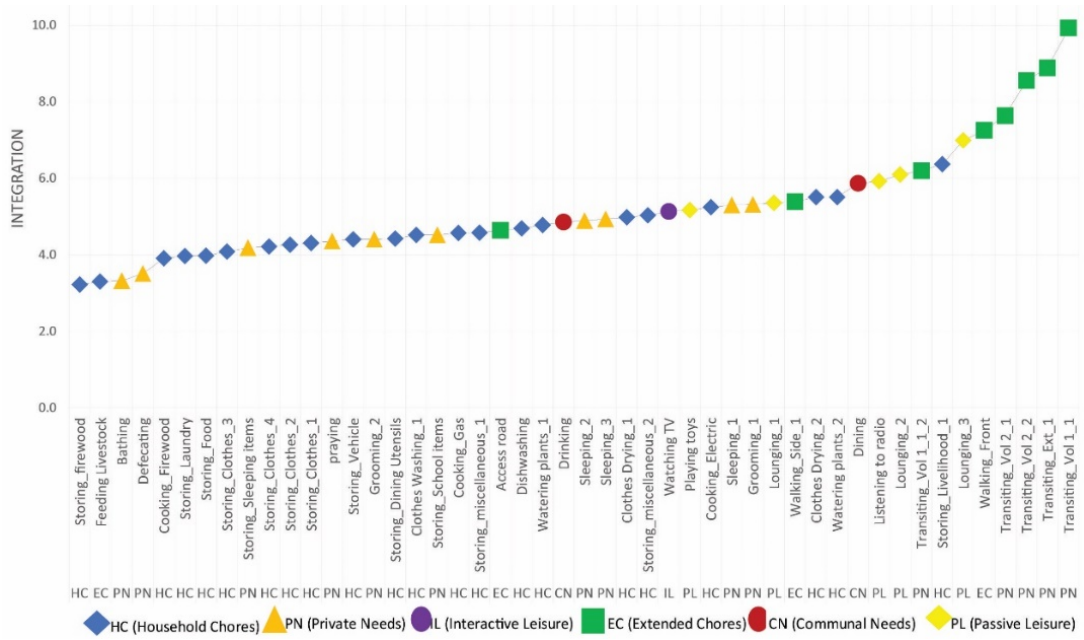


Figure 1: Degree of Integration of the Activities in Shelter A

For Shelter B, the activities under the category Passive Leisure (PL) especially those related to domestic chores are spread throughout the whole spectrum (Figure 2). However, 'watching television', an Interactive Leisure (IL) category activity along with 'dining' were among those in the most integrated activities. 'Praying' also has high integration which supported the idea that the residents of Shelter B generally see it is a public activity. It also goes without saying that 'sleeping' for the occupants of this type of shelter is mildly integrated with other activities.

The least integrated activities include 'clothes drying', 'defecating', and 'dishwashing' whereas those that involve 'storing' items have an average to below average degree of integration.
The categories of House Chores (HC) and Passive Leisure (PL) were also observed to be a mix of both highly integrated (>5), mildly integrated (4-5), and low integration (<4). In contrast, Interactive Leisure (IL) such as 'watching tv' is just mildly integrated while the category of Communal Need (CN) is only observed with high integration and low integration.

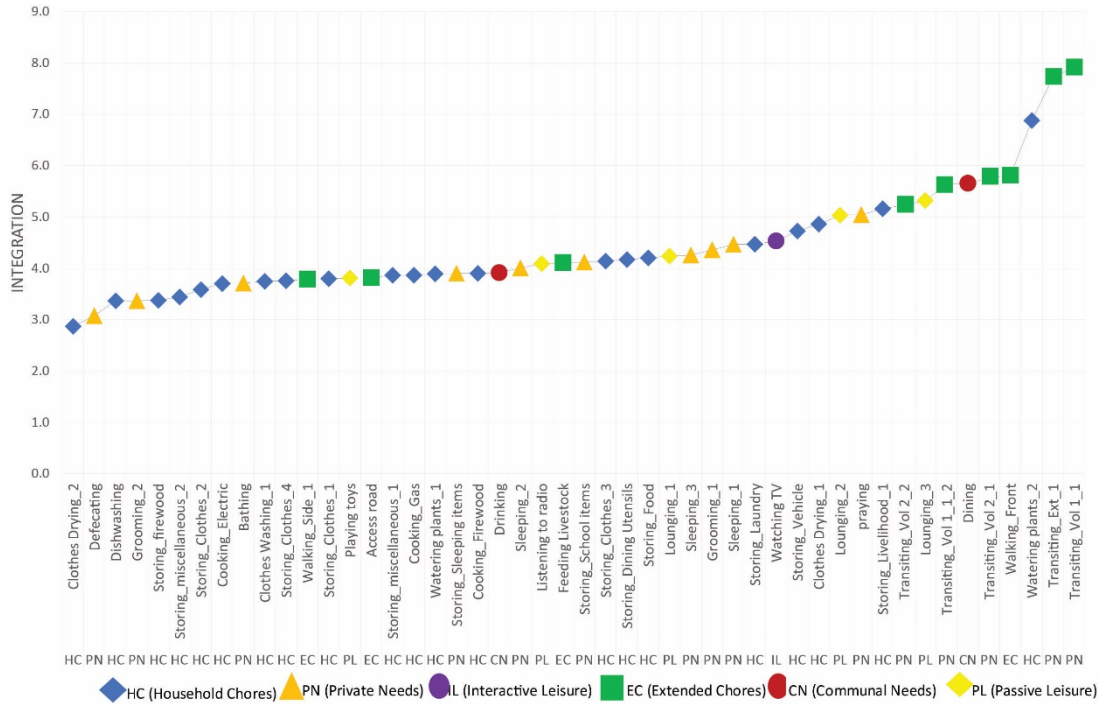


Figure 2: Degree of Integration of the Activities in Shelter B

On the Permanent Shelter, the activities in the category of Communal Needs (CN), Interactive Leisure (IL), and Passive Leisure (PL) are observed to be generally highly integrated with the activity of 'dining' as the most integrated following 'transiting the volume' activities. Those in the category of Private Needs (PN) have a mixture of integration that ranges from high-low integration. The activities under House Chores are between mid to low integration (Figure 3). 'Praying' as a private act is also supported by the low integration of the activity while 'sleeping', unlike the Shelter A and B, ranges from a mid to low integration.

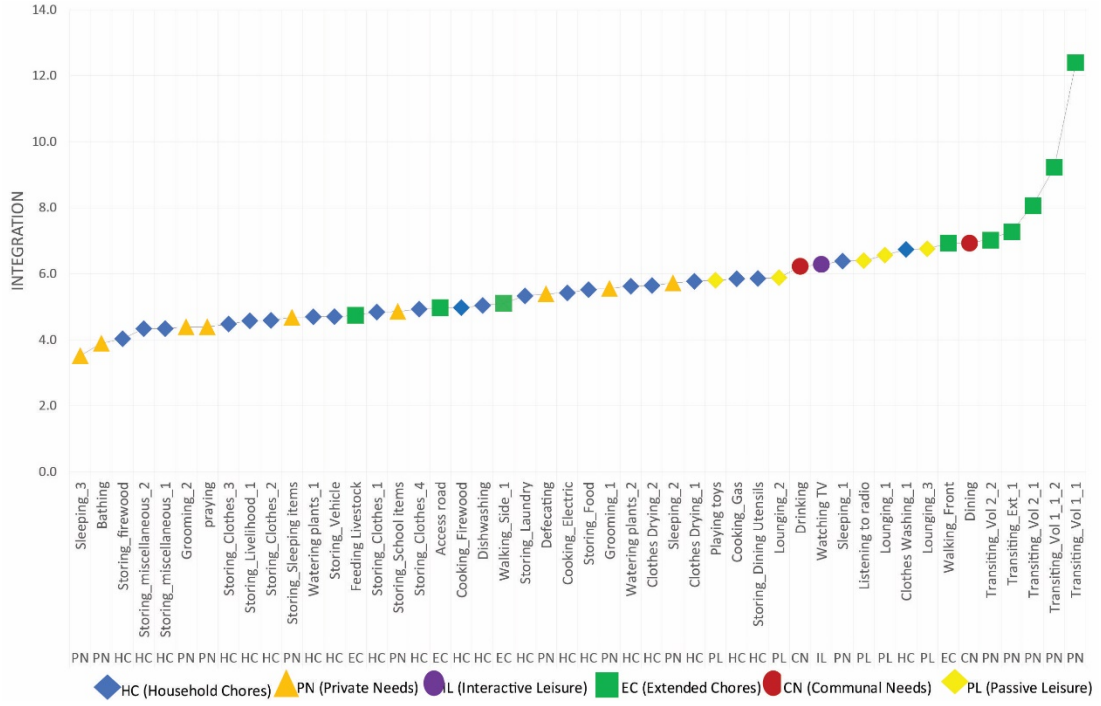


Figure 3: Degree of Integration of the Activities in the Permanent Shelter

In the three shelters (both the transitional shelters and the permanent shelter), the activity that involves 'storing' has lower integration than those that involves Passive Leisure. On the other hand, 'watching TV' in SHELTER B appears to be more integrated to the other spaces than those in SHELTER A while 'storing' is highly integrated in SHELTER A than in SHELTER B.

The survey also presented that the most connected space in both the transitional shelter (7 instances) and the permanent shelter (19 instances) is the living area. However, what is striking is that in the transitional shelter, the living area is closely followed by the 'access' road' as the most connected space at 6 instances. This could mean and as was observed in the field survey, that often, users in the transitional shelters must go out of the whole structure for them to perform another task such as to dine or to cook. Moreover, the data also presented that in the permanent shelter, there is only one space/activity that has the greatest number of connections but in the transitional shelters, there are as many as three for Shelter B and two for Shelter A. It was also observed that more than half of the time, the most connected space/activity in the transitional shelter are those that are located outside Volume 1 & 2.

As shown in Table 6, when the categories are identified into, Low, Mid and High integration, the overlapping of the categories are clearly seen in all the shelter types (transitional and permanent).

Table 6: Comparison of the Category's Degree of Integration

	LOW	MID		HIGH
SHELTER A	[HC], [PN]	5-6*	[EC], [HC], [PN], [CN], [IL], [PL]	[EC], [HC], [PL]
SHELTER B	[HC], [PL], [PN], [CN]	4-5*	[EC], [HC], [PN], [IL], [PL]	[EC], [HC], [CN], [PL]
PERMANENT SHELTER	[EC], [HC], [PN]	5*	[EC], [HC], [PN]	[EC], [HC], [IL], [CN], [PL]

***HC** (House Chores)* ***EC** (Extended Chores)* ***PN** (Private Needs)* ***CN** (Communal Needs)*
***IL** (Interactive Leisure)* ***PL** (Passive Leisure)*
**degrees of integration in every shelter*

However, what is most evident is that Shelter B has more activities with varying categories in different degrees of integration. What is also glaring is the presence of categories that were assumed to be of high integration but are also observed in the low integration e.g., Communal Needs in Shelter B.

4.3 Depth of Activities

The depth of the activities in SHELTER A can be grouped into 'six' clusters shown by the plateauing and the constant 'increase' of their Depth values (Figure 4). From these clusters, the upper three deepest clusters are predominantly household chores that involve 'storing'. The shallowest activities are either 'lounging', 'dining', 'grooming', and 'sleeping'.

It can also be surmised that as 'bathing' comes before 'defecating', for Shelter A, these activities are laid out in a similar sequence. This is the same instance as that of 'cooking using firewood' and the 'storage of the firewood'. 'Praying' as an activity is also seen as a very private activity while the activity of 'grooming' is both done in the public and a semi-public area of the shelter.

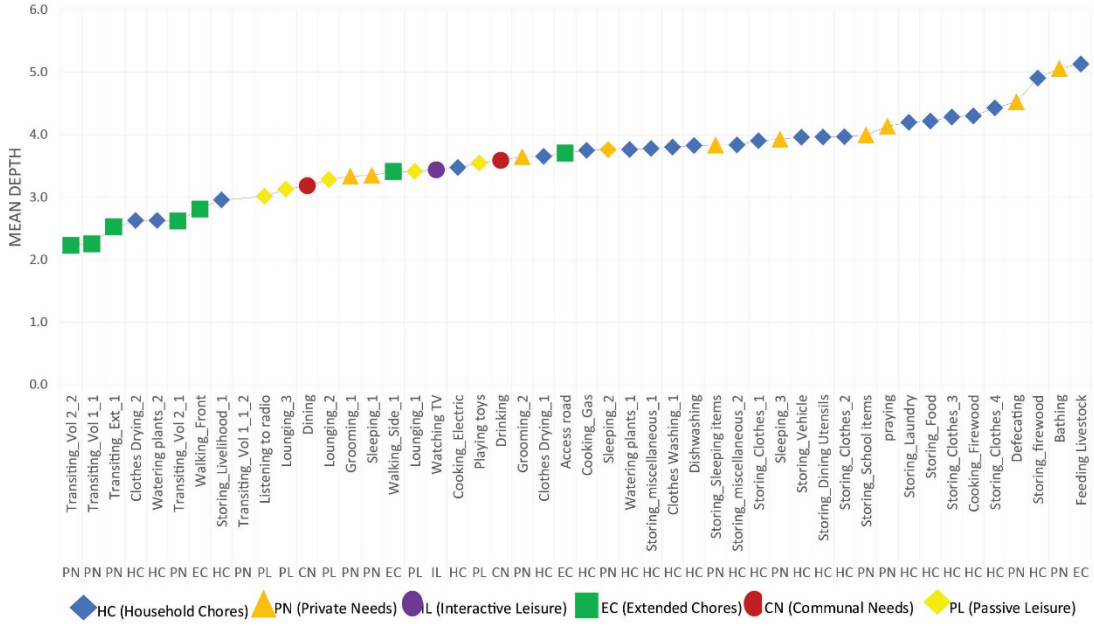


Figure 4: Depth of the Activities in Shelter A

The activities in SHELTER B, Figure 5, can be categorized into four categories. Those in the third category are mostly household chores. The activities with the lowest depths are 'dining' followed by 'lounging' and 'clothes drying' apart from transitioning between volumes. 'sleeping' also have lower depth compared to 'dishwashing' or defecating'. In terms of sequence, users of Shelter B were observed to have the activity of 'defecating' and then followed by the activity of 'bathing'.

As compared to Shelter A & the Permanent Shelter, 'praying' in terms of its depth, is done in a public or semi-public space of the house. 'Grooming' for Shelter B, like the Permanent Shelter is observed to be a very private act since it is the deepest activity after 'storing of miscellaneous items'.

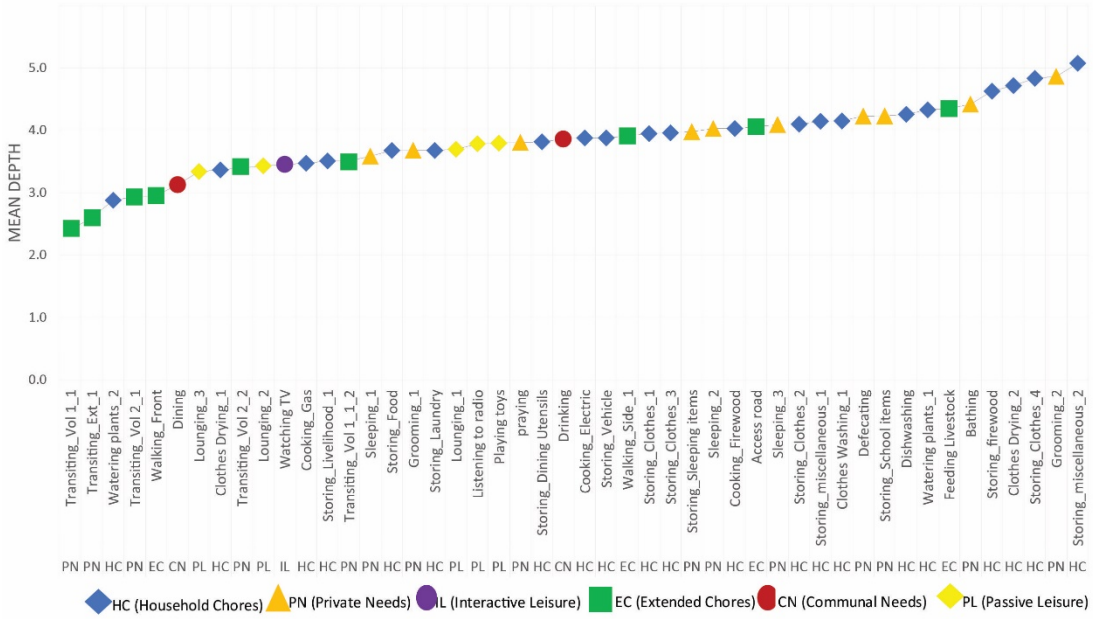


Figure 5: Depth of the Activities in Shelter B

The Permanent Shelter, Figure 6, shows a relatively gentle slope with steep slopes at the shallowest and deepest activities. The data also shows that the activities ‘dining’, ‘lounging’, ‘washing of clothes’, and ‘sleeping’ are the shallowest. Meanwhile the activity of ‘praying’ is seen as a very private act considering its depth while beds for ‘sleeping’ were observed to be in a mix of shallow areas and the deepest parts of the shelter.

On the relationship of ‘sleeping’ and the ‘storage of clothes’, in the Permanent Shelter, generally, one will encounter the ‘sleeping’ area before the ‘storage of clothes’. This is relatively like that of Shelter A since Shelter B were observed to have a more random sequence of ‘storage of clothes’ then ‘sleeping’ area then ‘storage of clothes.

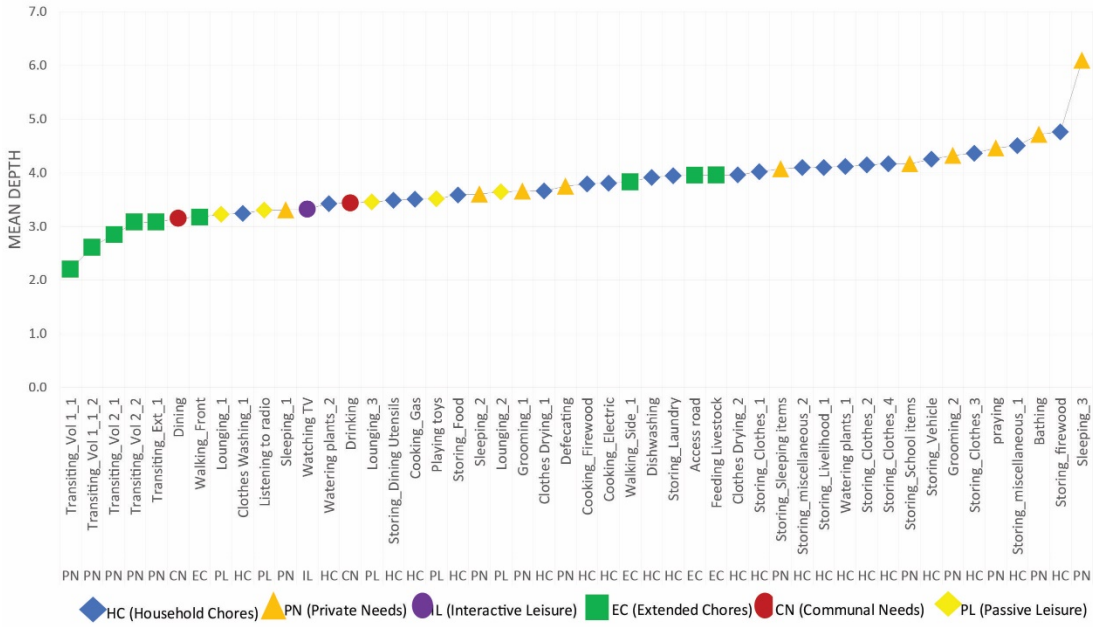


Figure 6: Depth of the Activities in the Permanent Shelter

When the shelters are compared against each other however, it shows that upon entering the space, in a Permanent Shelter, one will first encounter the place where the family dine (dining area) followed by the lounging area (living area) then clothes drying area – still in a semi-public part of the shelter. This sequence is also the same with Shelter B but for Shelter A, it is the other way around, the clothes drying area followed by the lounging area then the dining area.

With the activities/ depth divided into public space, semi-public, and private spaces as shown in Table 7 below, it clearly reflects that Shelter B has a more "chaotic" assignment of activities than both Shelter A and the Permanent Shelter. It is important to note however that despite the apparent chaos, the occupants still endeavored to provide some form of organization e.g., the Communal Needs are only limited to the Public Space except for the Shelter B where it reached the Semi-Public level.

Table 7: Comparison of the Category's Depth in relation to perceived privacy

	PUBLIC	SEMI-PUBLIC	PRIVATE
SHELTER A	[PN], [HC], [EC], [PL], [CN], [IL]	[PN], [EC], [PL]	[PN], [HC]
SHELTER B	[PN], [HC], [EC], [CN], [IL], [PL]	[PN], [EC], [HC], [CN], [PL]	[EC], [PN], [HC]
PERMANENT SHELTER	[PN], [EC], [CN], [IL], [PL]	[PN], [EC], [PL]	[PN], [HC]

HC *(House Chores)* ***EC*** *(Extended Chores)* ***PN*** *(Private Needs)*
CN *(Communal Needs)* ***IL*** *(Interactive Leisure)* ***PL*** *(Passive Leisure)*

4.4 Space-Link Ratio

Figure 7 shows that generally, both SHELTER A and Permanent Shelter have a ratio that is in the proximity of '1'. This meant that the way the two shelters are being used by its occupants presented the shelter's high flexibility and functional efficiency. As compared to Shelter B where although the space-link ratio places it in the proximity of the value of '1' the data are skewed towards 0.90.

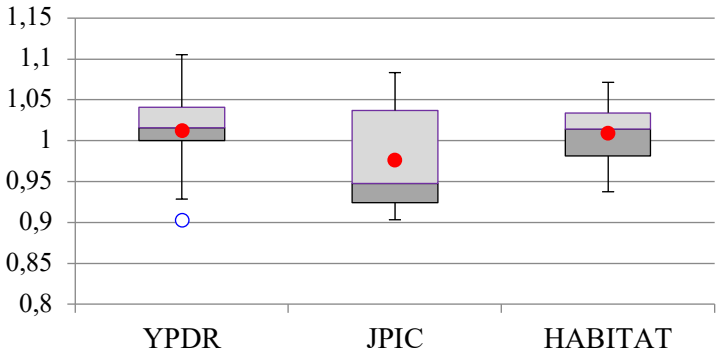


Figure 7: Space-Link Ratio

When the location of the activities observed are categorized according to its position: within volume 1, volume 2 or in the extension, Figure 8, it is noticeable to see a relatively equal division of the activities in Volume 1, Volume 2 and the Extension. This is without regard to whether the data is from a Transitional Shelter (Shelter A or Shelter B) or a Permanent Shelter. It is however

important to note that of the three structures being studied, Shelter B shows to have a higher tendency to place more activities in the extension than in the original volumes donated by the organizations.

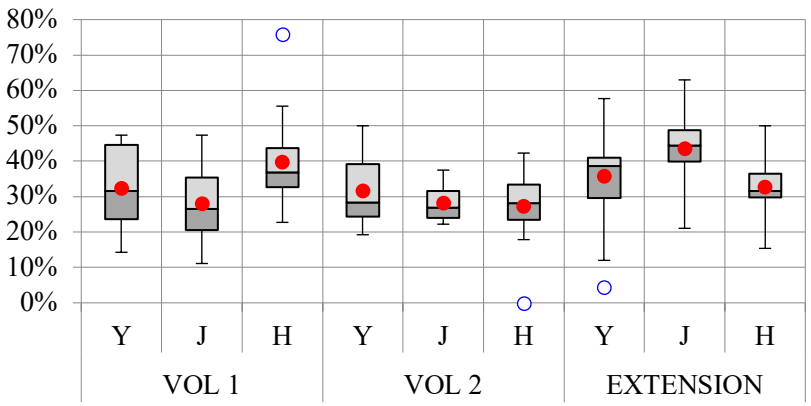


Figure 8: Division of Activities per volume

The radar graph in Figure 9 presents the frequency in percentage by which activities are performed in the different parts of the extension area. Since the Permanent Shelter is a duplex type of structure, the opportunity to "expand" is only possible in one side of the structure. For Shelters A & B, Side 1 and Side 2 do not necessarily refer to the left or right side of the structure observed, Volume 1 is not always placed at the right or left side of Volume 2. Moreover, 'Side 2' in the figure below meant that shelters (both transitional and permanent) were observed to have conducted activities in Side 1 as well.

Presented in the diagram below that for Shelter A, despite the original design of the structure to expand at the front and the side so the ability of the structure to function aerodynamically at the side is kept (Ravina, 2015), residents were still observed to conduct activities at the sides. In some situations, in fact, residents of Shelter A were even observed to have either removed the inclined walls in Volume 1 or kept them but heard comments from the residents that the inclined walls are troublesome. On the other hand, For Shelter B, most expansions were observed in either the front or the side part of the shelter and rarely in the rear part of the shelter. Finally, activities in the expansion space by the residents in the Permanent shelter were observed to have been done mostly in the rear or front of the shelter.

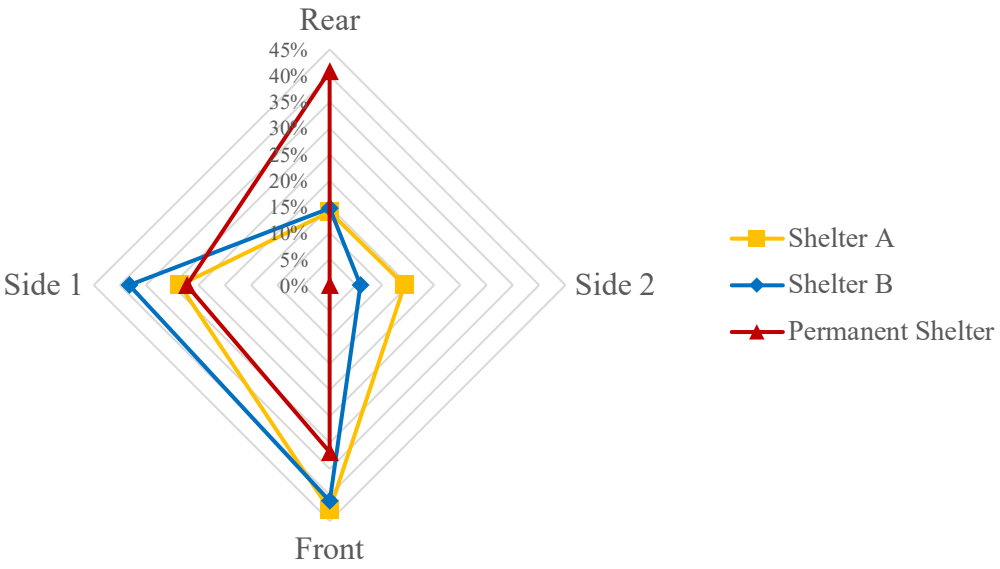
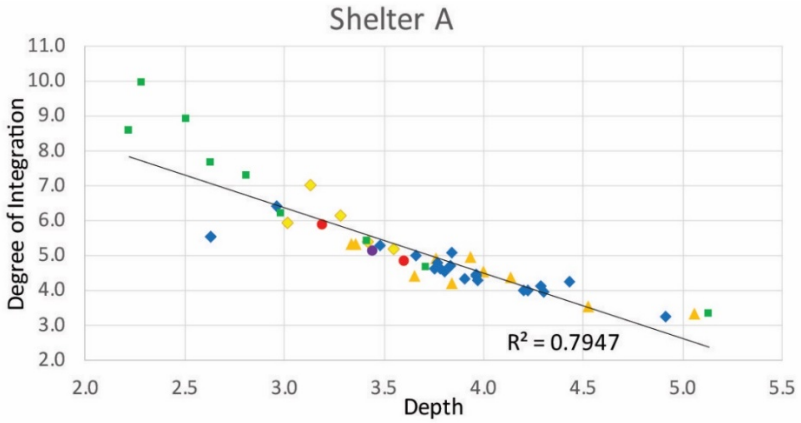


Figure 9: Percentage of conduction of activities outside Volume 1 & 2 (extension area)

4.5 Activity Correlations

The data, Figure 10, shows a negative correlation between the degree of integration of the activities and its depth for Shelter A (0.89), Shelter B (-0.87) and Permanent Shelter (-0.87). This supported the observations such as the activity of 'Praying' being done in a public space (low integration & high depth) for Shelter A & the Permanent Shelter. It can also be observed that regardless of the relatively similar R^2 value of the shelters, the activities in the Permanent Shelter are more clustered than those in the Transitional Shelter. The provision and inclusion of the rear door in the items donated by the NGOs to the beneficiaries may have played a role in this as in the transitional shelters, only the main door is provided.



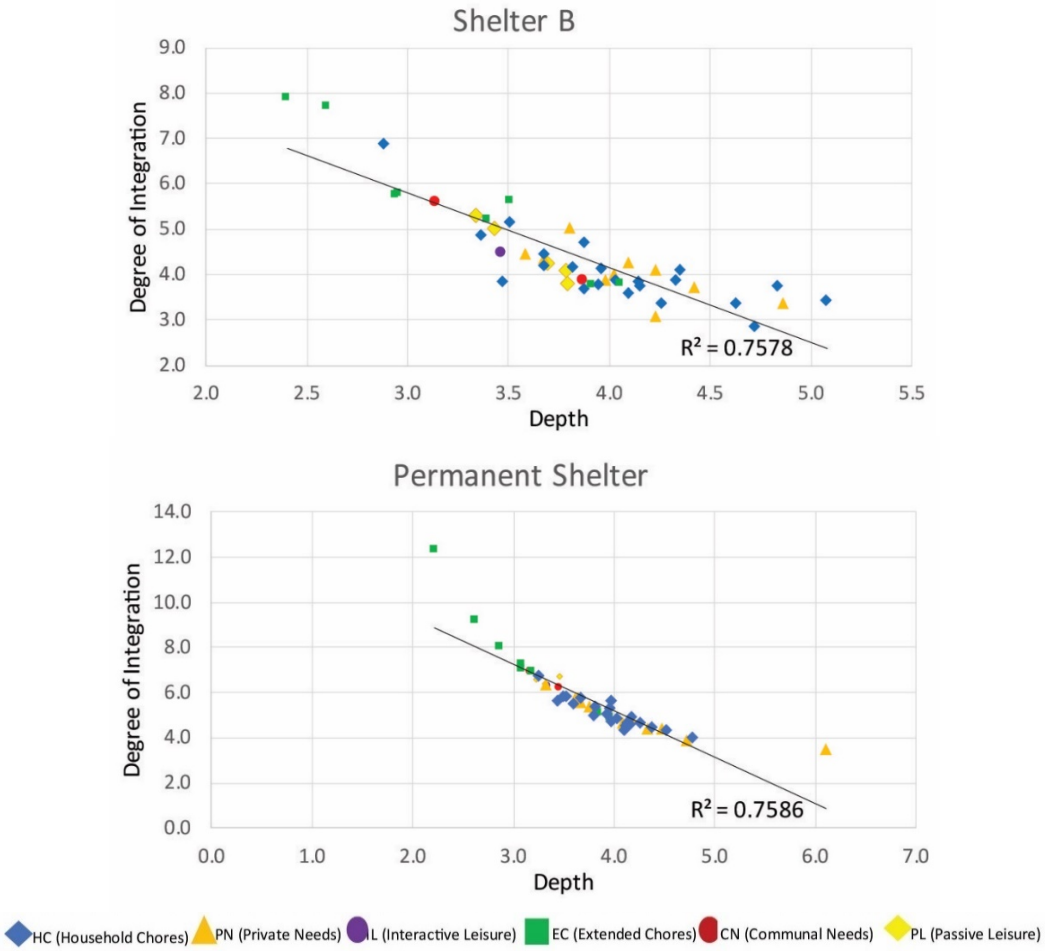


Figure 10: Correlation of the Activities

As seen in Table 8, when the categories are assigned to specific degrees of integration per level of privacy (public, semi-public and private), the similarities of the organizational approaches of those living in the transitional shelter against in the permanent shelter emerges. This meant that despite the differences in the type of the structure, the residents of the permanent shelter are

Table 8: Comparison of the categories on perceived privacy and the degree of integration

PUBLIC AREA	**HIGH**	**MID**	**LOW**
SHELTER A	EC, HC, PL	EC, HC, PN, IL, PL, CN	HC, PN
SHELTER B	EC, HC, CN	EC, HC, PN, IL, PL	HC, PN, CN
PERMANENT	EC, HC, CN, IL, PL	EC, HC, PN	EC, HC, PN
SEMI-PUBLIC	**HIGH**	**MID**	**LOW**
SHELTER A		EC, PN, PL	PN
SHELTER B	EC, HC, CN	EC, HC, PN, PL	HC, PN, CN
PERMANENT	EC, HC, PL	EC, HC, PN	EC, HC, PN
PRIVATE	**HIGH**	**MID**	**LOW**
SHELTER A		HC, PN	HC, PN
SHELTER B	HC, EC,	HC, EC, PN	HC, PN
PERMANENT	HC	HC, PN	HC, PN

***HC** (House Chores)* ***EC** (Extended Chores)* ***PN** (Private Needs)*
***CN** (Communal Needs)* ***IL** (Interactive Leisure)* ***PL** (Passive Leisure)*

organizing the spaces inside their places in a similar manner as how those living in transitional shelters are doing. However, the absence and reduced number of categories observed in the Shelter A may have been due to the inclined walls of the structure where most residents are observed to remove the inclined walls in Volume 1 when extensions were made.

5 CONCLUSIONS

Attempt at organization

The research has presented that regardless of the type of shelter, the residents have tried, up to a certain point, to provide some semblance of organization and demarcation of privacy in their shelters. The 'organizational chaos' that followed may have occurred when the structure is past its 'breaking point' or limitation of the adjustments that it can handle. Therefore, considering that the shelter recipients only received the shelters without any training on how to maintain or organize their space, proves that the 'traditional lifespan' of a transitional shelter can basically be extended if residents are also taught how to properly organize their place.

Similarities in the organization

Since the residents of both the transitional shelter and the permanent shelter were seen to have practiced some level of organization, it effectively disproves the notion that transitional shelters are more chaotic than the permanent shelter. The peculiarities such as the sequence of 'clothing storage – sleeping area – clothing storage' for Shelter B could in fact be due to how the size limitation of the structure has led (or forced) the residents to just assign activities based on the available space that is big enough to accommodate that activity. This is without regard to the appropriateness of that activity in that area e.g., sleeping space in the public area. The notion of a similar way of organizing the space by the residents of the transitional shelter with those in the permanent shelter however opens the question on whether this behavior is also similar to those whose houses were built in normal conditions.

Area for Expansion

Expansions are done not only due to the number of inhabitants but also for other reasons such as cultural and according to the core beliefs of the inhabitants. Both play an important role in 'moving on'. But without considering how the residents 'expands' their structure to accommodate their user-initiated renovations may make the building's form as more of an obstacle than aids their growth. For example, for Shelter A, Volume 3 or the crawl space underneath Volume 2 is designed to be used by the residents. However, only 32% of the beneficiaries were in fact observed to have used the space either as a place for storage or play area for their children.

The relatively equal number of activities conducted in the extension of the shelters (both transitional and permanent shelters) unequivocally demonstrated the importance of the extension spaces to the functioning of the shelters. This meant that without the possibility to place

extensions, especially for the transitional shelter, the organization of the activities would undoubtedly be more chaotic than what is observed at the present. Furthermore, this also means that for cases like in the Philippines where transitional shelters are more likely to become permanent structures, ample spaces for expansion should be considered during construction and site selection. This also holds true to the Permanent Shelter. This is also an important consideration when the type of transitional sheltering process/ paradigm is identified by the organization who wishes to construct/ design a similar structure.

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