Assessment of Users Perception on Congestion in Train Terminal Building

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Abstract

Generally, the world seeks for an efficient means of transportation. Recent advancement in technology, has sort to remedy the issues of transportation in the design of train terminals. However, there is a challenge of congestions within train terminals. This is due to the inadequate provision of crowd control features. This research is aimed at assessing user's perception on congestion in train terminal buildings in some purposively selected train terminals in Nigeria. The method used in carrying out this research is descriptive survey method which implored the use of questionnaires for data collection. This was administered to 180 users, of which 156 responded. Subsequently, the questionnaires were analysed on SPSS software package using descriptive and inferential statistics and the result were presented with the use of tables and charts. Based on the user's perception, 38% of the users are attracted by entertainment, 13% are attracted by the restaurant, while 49% are attracted by place of worship. Results shows that worship areas are the major sources of crowd attraction within the terminal. Furthermore, the trend of booking in the train terminal deduces that crowd congestion is on the high side. The study has revealed that, the provision of spatial crowd control features is given little consideration in most of the train terminals assessed. The research recommends that spaces that attract crowd should be placed far away from each other and the introduction of a booking gallery should be incorporated in the design of train terminals.

keywords: congestion, crowd control features, spatial interaction, train terminal, user's perception.

1.0 INTRODUCTION

Over the past few decades, pedestrian crowd control has emerged as an important issue to architects and planners all around the world. There have been numerous incidents in which crowd stampedes and evacuation have resulted in injuries and fatalities (Shiwakoti *et al*., 2008; Shi *et al*., 2015). Particularly transport hubs pose a significant challenge in the management and security of a large volume of passengers during special events and unexpected service disruptions (Fridolf *et al*., 2013; Pender *et al*., 2013; Pender *et al*., 2014; Shiwakoti *et al*., 2016, 2017). A train terminal is a building constructed to enable people feel comfortable while waiting for the train, it offers a temporary environment for loading or unloading of passengers (Ballis and Golias, 2003). Crowd is said to be 'a large gathering of people' it is also referring to as a sizable number of People gathered in a specific location and at a particular time with common goals and Displaying common behaviour. According to Wijermans (2011) crowd refers to that huge gathering of different people at a particular place, at the same time.

Understanding crowd behaviour involves various approaches such as theoretical physics, sociology, psychology, computational science (Challenger *et al*., 2009b). Spatial crowd control features are architectural approach or practice which ensures large crowds are managed to prevent outbreak of crushes, affrays, fights involving disorderly people or riot. The railway transportation is one of the safest means of transportation due to its economic value as well as levels of safety of persons and goods. However, the railway transportation is mostly overcrowded.

There have been several natural or man-made disasters that have prompted the evacuation of passengers in major train stations, resulting in fatalities and injuries (Shi et al., 2012; Fridolf *et al*., 2013). As such, there is need to address, pedestrian crowd control within train terminal, to reduce overcrowding and also ensure peoples safety. This research assessed the user's perceptions on congestion in train terminal building in some selected train terminals in Nigeria by getting information from the users of the train terminals, it includes the staffs, security, visitors and travellers present. The essence is to provide information that could be used for policy making on crowd management in train terminal. It is believed that the perception of the users on congestion in train terminals will access users inputs on management of crowd

1.0 LITERATURE REVIEW

2.1 Crowd in Train Terminals

One of the characteristic features of a train terminals is the massive influx of people and Passenger traffic in train terminals has increase rapidly. The problem of passengers crowding and detaining on platform has led to passenger's discomfort, elongating travel time and increase in safety risk Ndubisi (2014). But the stations in these various cities are only simple structures put in place in the time of locomotive trains without the features of modern train station designs. The safety of users of these train stations is at serious jeopardy due to the lack of adequate safety measures in their designs. The problem of passengers crowding and detaining on platform has led to passenger's discomfort, elongating travel time and increase in safety risk. A lot of train terminal are suffering from the problem of high level of pedestrian density (Xu *et al*., 2014). Numerous statistical analysis performs in Europe, china and the United States (Abril *et a*l., 2008; Baysari *et al*., 2008; Ben-Eila and Ettema, 2011; Kyriakidis *et al*., 2012) reveal that many injuries occurs during boarding and alighting processes. One way to optimize these services is to improve quality in the train control process and also orderliness using crowd control measures. Complex architectural configuration with poor egress can hazardous situations as seen in previous disasters (Chertkoff and Kushigian, 1999). According to Assis (2004), to assure the safety of terminal operations, various counter measure has been put into practice, which include changing the train route scheme and control of passenger's flow. Various studies have been carried out on effect of control measures, such as a simulation of macroscopic pedestrian flow, which was done by Bauer for the design of crowd control measures for public transport after the occurrence of special events (Bauer *et al*., 2007). Passengers flow control measure are divided into the station level, the line level and the regional level (ling, 2013).

2.2 Crowd management categorization

Crowdedness in train terminal and metro stations has led to serious problems, significant safety issues such as passengers being push off the platform (Tirachini *et al*., 2013). Crowd in train terminals decrease the passenger's comfort which causes decrease in evaluations of operators. The efficiency of the system as a whole will decrease with larger crowd due to necessary larger dwell times. According to Berlonghi (1995), "crowd management includes all measures taken in the normal process of facilitating the movement and enjoyment of people "Crowd control refers to a reactive process to influence the crowd. Crowd management refers to a pro-active way to guide the crowd (Berlonghi, 1995).There are four strategies for crowd management

(Hoogendoorn and Daamen,2004). These include to increase throughput, prevent blockades, distribute traffic and limit inflow (Hoogendoorn, 2011). In order to increase the throughput, most important bottlenecks in the infrastructure should be identified and possibly adapted. The second strategy is to prevent blockades such as people standing still on main routes and crossing flows. The available infrastructure should be efficiently used and an equal distribution of traffic over space or time contributes to that in the third strategy. The final strategy is to limit the inflow, in order to ensure the number of pedestrians remains below the critical density.

3.0 RESEARCH METHOD

The collection of data relied on the use of a closed-ended questionnaire. According to Creswell (2014) the sample size (n) was calculated using the equation following the number of participants that is considered adequate. The visitors, guards, retailers, travellers and the staffs in the selected train terminals constituted the sample population for the study. Using a simple random sampling design, a total of 180 participants were administred a questionnaire in the study area. A total of 156 copies were returned which sums up like 87% of the questionnaire administred. The data collected from the respondents were subjected to both descriptive and inferential statistical analysis and the results were presented in tables and charts. Nine train terminals were selected out of the cities served with rail road currently according to the Nigerian Railway Corporation, Ndubisi (2014) using purposive sampling. The nine terminals were selected based on the average passenger traffic of 250 commuters a day. The table below shows the list of the train terminal selected:

TABLE 1: List of Selected Train Terminals in Nigeria

S/N	NAME OF TRAIN TERMINALS
1	Kano Train Terminal
2	Minna Train Terminal
3	Zaria Train Terminal
4	Jos Train Terminal
5	Idu Train Terminal
6	Kubwa Train Terminal
7	Abuja Metro station
8	Offa train terminal
9	Lagos Train Terminal

Source: Author's field work (2019)

4.0 RESULT FINDINGS AND DISCUSSIONS

4.1 Users Perception on Safety in Train Terminal Design

One-hindered and eighty (180) questionnaires were administered during the field work among the selected train terminals, twenty (20) questionnaires each to every train terminal. One-hindered and fifty-six (156) i.e. 87% of the questionnaires were returned out of the total of one-hindered and eighty (180) administered. The Table 2 shows the distribution of questionnaire to the train terminal users.

Table 2: Distribution of Questionnaire to Train Terminal Users

S/N	Category	Valid responses	Invalid responses	Total
1	Staff	20	4	24
2	Traveler	73	10	83
3	Retailer	12	3	15
4	Visitor	40	2	42

5	Guards	11	5	16
	Total	156 (87%)	24 (13%)	180 (100%)

Source: Author's field work (2019)

The Table 3 shows the preference in vehicular drop off and pick up points. The percentage of vehicle drop off for both arriving and departing passengers, provided in the selected train terminals are, 53% of the users prefer to have more than one vehicle drop off and pick up point, 38% prefer to have separate vehicle drop off and pick up point, while 9% prefer to have the same vehicle drop off and pick up point. Results from this section shows that majority of the users prefer having more than one vehicle drop off and pick up point. This means that having one drop off and pick up point result to vehicular traffic congestions as both activities conflict each other. This implies that the time it takes a commuter to drop off a vehicle is different from the time it takes a commuter to be picked up by a vehicle. Fig 1 gives a summary of preference vehicular drop off and pick up points.

Table 3: Preference in vehicular drop off and pick up points

S/N	Category	Having the Same vehicular drop off and pick up point	Having separate vehicular drop off and pick up point	Having the more than one vehicular drop off and pick up point
1	Staff	1	7	12
2	Traveler	9	24	40
3	Retailer	1	5	6
4	Visitor	1	18	21
5	Guards	2	5	4
	Total	14(9%)	59 (38%)	83 (53%)

Source: Author's field work (2019)

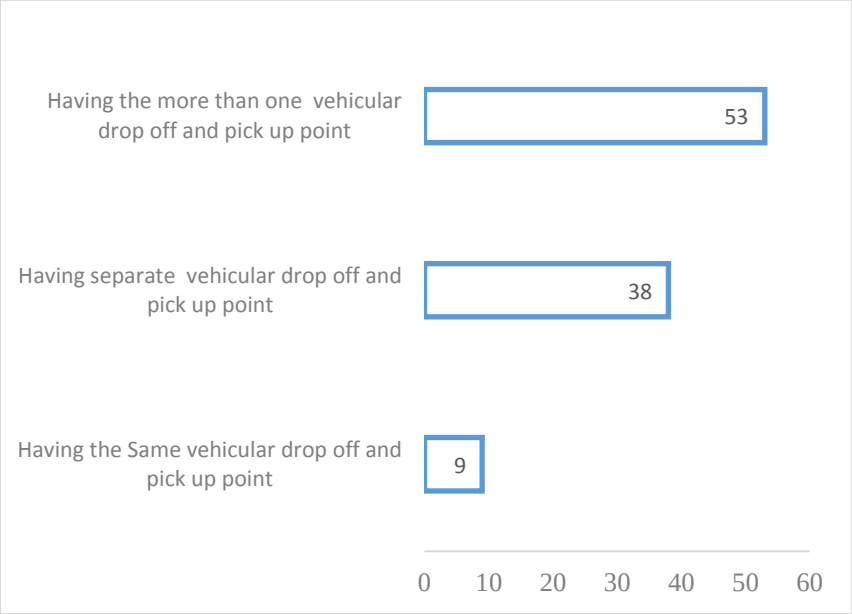

Fig 1: Preference in vehicular drop off and pick up points

Source: Author's field work (2019)

The Table 4 shows the use of combined table booking has resulted to crowd congestion in train terminals. Commuters will have to come directly to the terminal for booking, which causes delay and reduction in travel time. The chart in Fig. 2 reveals the percentage of the different ways ticket is sold out in the selected train terminals. The users at 28% prefer combine table booking ,45% prefer online booking techniques, 19% prefer do it yourself booking while 8% prefer booking in the train. Results from this section shows that majority of the train terminal users preferred booking online. This implies the trend of booking in the train terminal deduces that crowd congestion is on the high side.

Table 4: Preference in Booking Method

S/N	Category	Combined Table booking	Online booking	Do it your self-booking	Booking in the train
1	Staff	5	9	4	2
2	Traveler	18	33	15	7
3	Retailer	2	6	2	2
4	Visitor	14	19	7	2
5	Guards	5	4	2	1
	Total	44(28%)	71 (45%)	30 (19%)	14(8%)

Source: Author's field work (2019)

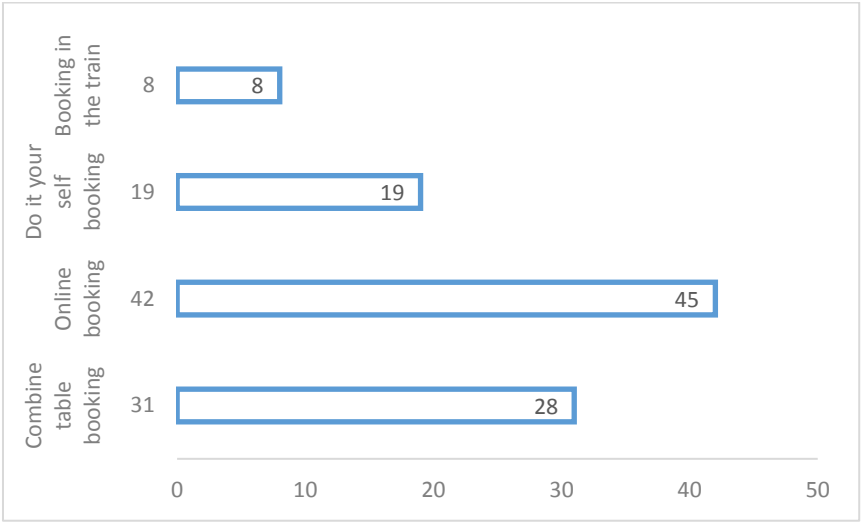

Figure 2: Preference in Booking Method

Source: Author's field work (2019)

The Table 5 shows that Crowd in the selected train terminals are attracted by different activities and facilities, depending on what a commuter does best. The Fig. 3 reveals the percentage of the different facilities that attract crowd in the train terminal. The assessed user's perception shows that 38% of the users are attracted by entertainment, 13% are attracted by the restaurant, while 49% are attracted by place of worship. Results from this section shows that worship areas are the major sources of crowd attractor within the terminal. This implies that, close proximity of spaces in the terminal induce crowd congestion.

Table 5: Crowd attractors

S/N	Category	Place of worship	Entertainment	Restaurant
1	Staff	10	8	2
2	Traveler	30	34	9
3	Retailer	6	4	2
4	Visitor	25	10	5
5	Guards	6	3	2
	Total	77(49%)	59 (38%)	20 (13%)

Source: Author's field work (2019)

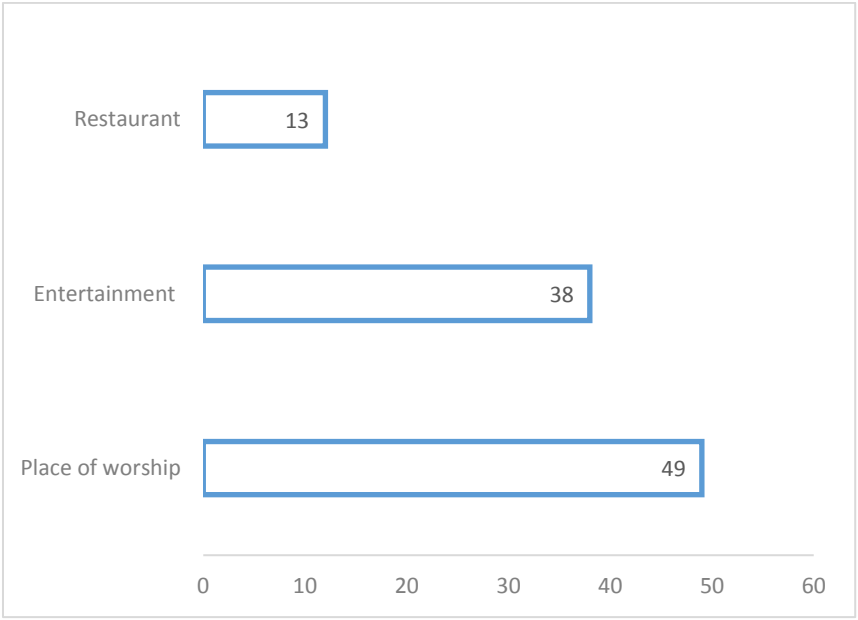

Figure 3: Crowd attractors

Source: Author's field work (2019)

5.0 CONCLUSION AND RECOMMENDATION

The study has revealed that, the provision of spatial crowd control features is given little consideration in most of the train terminals assessed. It was observed based on the user's perception, that combined table booking has high preference which results in high traffic in the train terminals. The inadequate spacing between facilities such as, place of worship, entertainment areas and restaurant constitute factors in crowd congestion within the train terminal. The research recommends that spaces that attract crowd should be placed far away from each other and the introduction of a booking gallery should be incorporated in the design of train terminals. Furthermore, crowd control features should be considered as an integral aspect in the design of train terminals.

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