Identifying Smart Citizens in an Indian Context: A Study of Ambala Cantonment

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ABSTRACT

The concept of Smart Cities has remained in great hype in the whole world and literature emphasises that Smart Cities actually require Smart Citizens. So, this paper questions: whether or not Citizens are worthy of accommodating Smart Cities? Data of 300 citizens from Ambala Cantonment of Haryana State of India was collected on selected parameters of Smart Behaviour with certain socio-demographic attributes with the help of a questionnaire. With the analysis of data, two segments of citizens named sluggish and smart emerged based on citizens' level of Smart Behaviour. The interesting fact came out that except 'gender' no other socio-demographic attribute differentiated between the obtained segments. Based on findings, this paper calls for citizens' active involvement for developing Smart Cities. This can be better obtained by establishing a connection between citizens and policy makers. Besides, citizens' own willingness and participation is also needed.

Keywords: *Ambala, Cantonment, Smart Behaviour, Smart City, Smart Citizens, Smart Living*

INTRODUCTION

Background

The mission of Smart Cities has remained a matter of great excitement amongst Indians, since its launch on 25 June 2015 by the Central Government of India. It is one of the key missions in order to fulfill the vision of 'Smart Bharat'. Under it, a total of one hundred cities were to be converted into Smart Cities during the period from 2015-2016 to

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2019-2020 as per an evaluation by 'Ministry of Urban Development, Government of India' (Bhagat, 2015). Allied with this, as declared by 'Ministry of Defence, Government of India', seven cantonment areas were also to be converted into Smart Cantonments on the line of Central Government's Smart City project. These seven cantonments include: Delhi, Ambala, Ferozpur, Deolali, Pune, Meerut, and Secunderabad cantonments ("Government to Introduce", 2018).

Since the time of British rule in India, Ambala Cantonment is one of the most reputed cantonments, and this research focuses on Cantonment Board of Ambala (CBA)[1] which is the foremost authority for the conversion of Ambala into Smart Cantonment. As stated on CBA's official website, the board has been assigned with several municipal functions such as street lighting, building activity regulation, water supply, sanitation, health, primary education, public safety, and town planning. Besides these regulatory functions, Board also undertakes additional measures under public improvement schemes, and for upgrading the quality of services being provided to the general public. CBA has travelled a long way in accepting the challenges posed by increasing pressure on civic amenities and is making constant efforts to improve the quality of life.

CBA is doing well for making Ambala Cantonment smart, and many initiatives have been completed in this direction. Chaudhuri (2017) mentioned that in phase I, under the Smart Cantonment Project, CBA successfully completed the task to rejuvenate the 3.5-acre dried pond into a lake, and this lake is named Cantonment Board Ambala Lake or CBA Lake. Sharma (2019) further mentioned that under phase II, due to the efforts of CBA, a British era defunct water body on 8-acre land is also converted into a lake which is in use for water harvesting too. Both the works are done near a town of Ambala Cantonment named Topkhana Bazar[2]. Besides, facilities such as a walking plaza, lights, a garden, bio-toilets, outdoor gymnasium for children, open garden theater, outdoor music facility, and a floating fountain are too introduced near the lake areas. The phase III of the project is to integrate the above two water bodies (3.5-acre lake with the 8-acre lake). Also, CBA has established Parks and other facilities in Ambala Cantonment for the people to enjoy.

Smart Citizen

At the outset, it is important to mention that the literature in this field employs different terminologies for people, such as consumers, users, citizens, and stakeholders; however, in this discourse, the term 'citizens' is used. While talking about citizen-centric smart city initiatives, Cardullo and Kitchin (2017) said that the roots of these initiatives are

grounded in stewardship, civic paternalism, and neoliberal conception of citizenship for consumption choices of people to have common good. Shankar (2016) and BW Online Bureau (2019) attempted to define Smart Citizens as fully inclusive, innovative, and sustainable citizens. According to them, Smart Citizens must be law-abiding citizens with basic civic sense. They must obey traffic rules, drive within city speed limits, obey signals by not jumping them, and they respect pedestrians and senior citizens. Concerning parking, Smart Citizens must park at designated spots and not at random locations. Hygiene and cleanliness must be maintained not only at home but also outside. They must throw garbage only inside a bin and should also practice segregation during garbage disposal. Allied with this, BW Online Bureau (2019) also mentioned that Smart Citizens must make conscious use of resources such as water, heat, and electricity. They too use energy-efficient appliances and switch off all electric appliances when not in use. The website of 'bee smart city'[3] popularizes the term 'Smartivist'. According to them, this type of citizen can be defined as an individual who steps forward to actively support the process of creating a better place on a voluntary basis. He or she supports the creation of smarter cities as a single expert or by establishing initiatives (e.g. loose project consortiums, new legal entities such as non-profit organizations, associations) to address specific urban, societal or municipal challenges.

Smartness of citizens is amongst one of the prime requirements of a smart city. In this regard, Gupta and Garg (2017) mentioned about six components of smart city from Cohen (2012) in which Smart People are defined as a significant component. Bayar (2017) and Simonofski *et al.* (2017) also elaborate upon the importance of citizens' role in Smart Cities as in their words citizens will be the benefit seekers from Smart City assets and from all utilities that are improved by technological, social, and cultural aspects for a Smart Living. Shelton and Lodato (2019), and Manchester and Cope (2019) said that in response to the mounting criticism of emerging smart cities strategies around the world, a number of individuals and institutions have diverted from discussions of Smart Cities towards a focus on Smart Citizens. Bull (2016), Schuler (2016), Simonofski *et al.* (2017), Nadeem *et al.* (2019), Shelton and Lodato (2019), and Feher (2020) also stressed that smart city is the shared responsibility of Government and citizens, and implementation will be more impactful if citizens and Government envision together. So, owing to the importance of this person famous as 'Smart Citizen', this term has been demarcated next.

The above discussion reveals that the citizens who can be designated as Smart need due consideration if an engaging, effective, and efficient Smart City is to be created, and understanding of factors

that impact citizens and shape their behaviour is important to study. Keeping this backdrop, the paper too emphasizes on this point and questions: when millions of rupees are spent, huge and massive efforts are put in, and cities are to be made smart for the people; are people smarter enough to preserve and maintain the standard which will be provided to them with the development of Smart Cities or Cantonments? The dream can become a reality only when the common citizens understand their responsibility and become active participant for the same. Accordingly, this paper is an endevour to target Smart Citizens at Ambala Cantonment.

The rest of the paper is organized under five main sections (allied with different sub-sections) namely, review of literature, research methodology, analyses and interpretations, conclusion and discussions, implications, and scope for further research.

REVIEW OF LITERATURE

In this section, research papers and articles which significantly incorporated the concept of Smart Citizens are reviewed, contently analyzed, literature gap has been identified, and objectives of this study have been defined. The mission of Smart Cities in India gained momentum in 2015, so literature from that year (2015) have been searched and are presented here.

Literature Comprehension

With the exploration of literature, it was seen that there is no dearth of literature in this field. However, the authors have confined themselves only to those studies which include concept of Smart Citizens and excluded those studies which only talk about Smart Cities.

Top-Down and Bottom-up Perspectives in Smart Cities

Capdevila and Zarlenga (2015) and Gooch *et al.* (2015) examined 'top-down and bottom-up' approaches related to smart city. Capdevila and Zarlenga (2015) by using case study and interview method analyzed four different smart city aspects: 'smart districts, open collaborative spaces, infrastructures, and open data', and suggested that the 'top-down and bottom-up' perspectives were complementary to each other and their combination could strengthen the association between different city stakeholders. It was also said that 'top-down and bottom-up' initiatives were not opposed forces; but, had a synergistic effect on the innovation capacity of the city. Similar to them, Gooch et al. (2015) while studying role of citizens' in urban innovation concluded that innovation is both

'bottom-up and top-down'. In their work, they too ensured and realized that 'validation comes not only from top-down expert assessment; but also, bottom-up from the local community'. Incidentally, Zandbergen and Uitermark (2020) mentioned that 'citizen sensing' is one of the prime fields which sustains the ideal of smart citizenship and said that 'smart citizens create a bottom-up antidote to otherwise top-down, controlling, surveilling and nudging forms of smart city techno-politics'.

Citizens' Role in Smart Cities

Certain authors including Bull (2016), Cardullo and Kitchin (2017), Simonofski *et al.* (2017), Calzada (2018), Nadeem *et al.* (2019), and Feher (2020) talked about citizens' role in building smart cities in one or the other form. In this line, Bull (2016) questioned about the role of ordinary citizen in smart cities and detailed the concept of smart citizens and smart citizen engagement. Schuler (2016) developed the similar perspective by working on the title 'Smart Cities + Smart Citizens = Civic Intelligence?' In the words of the author, the title introduced the relationship of three broad concepts in an algebraic way. The question mark at the end implied that this relationship might not be always true. The basic goal of taking algebra problem was to determine the value of the unknown variable, taken as smart citizens by using the concepts of civic intelligence and smart cities. The author said that 'it is the value of smart citizens that everybody must learn and then contemplate to ensure that the society has sufficient smart citizens'. Supplementing these views, Cardullo and Kitchin (2017) critically appraised citizens' participation in the smart city initiatives and demonstrated that 'stewardship, civic paternalism, and a neoliberal conception of citizenship' were the ground roots of citizen-centric smart city initiatives. By mentioning the importance of smart citizen, Simonofski *et al.* (2017) stressed that smart cities will not achieve their objectives unless the citizens (the end-users) are involved in their design. For the enforcement of their views, 'firstly, they performed a literature review from different research fields. Secondly, a framework to compare and evaluate smart cities as enablers of citizen participation is proposed. Finally, the framework was applied to the ongoing smart city design of Namur (Belgium), allowing drawbacks and flaws in citizens' participation to be discovered and improved'. Calzada (2018) too considered smart citizens as decision-makers instead of data providers. Further, Nadeem *et al.* (2019) stated that the citizens are the real stakeholders of smart cities and there is a challenge in maintaining the living standard of the citizens. They felt that citizen-centric approaches are in great hype in smart cities. Therefore, they emphasized on a need 'to explore the living standard of citizens of smart city, and the same should be done by using an

effective approach which may be based upon certain parameters like safety, health, education, quality of houses, and so on'.

Next in this line, Feher (2020) after analyzing a corpus of 150 documents (containing 'mainstream summaries, trend reports, white papers, and visions of business/ governmental/ universities/ research co-operations') confirmed the fundamental role of human factor in the making of smart cities. It was stressed that smart citizens should not be termed only datasets; but, they should be treated as active participants for making of smart cities' policies and plans. Certain other class of researchers bifurcated smart citizens from the ordinary citizens. Ferronato and Ruecker (2018) said that every citizen in a smart city cannot be considered as smart citizen. Shelton and Lodato (2019) proposed the two classifications that are 'the general citizen' and 'the absent citizen'. In this line, they argued that the participation of citizens in any democrative governance may be crucial; but, the discussions on smart citizenship often fails to articulate how citizens are actually talked about and linked in the making of policies.

'Course of Actions' for Planners of Smart Cities

A novel group of researchers and academicians provided guidelines for planners of smart cities who wanted to include citizens in the development of smart cities. In this regard, Thomas *et al.* (2016) attempted to draw attention on the perspectives of 'what a smart city should and could be'. It was suggested that citizens' viewpoints should be used for making resilient cities. Likewise, Manchester and Cope (2019) highlighted a need of a unique model for the same and stressed on the point of citizen learning. They also tried to make the case for smart city initiatives and offered critical and creative learning opportunities. Also, it has previously been mentioned in section one that smart cities can become a reality only after engagement of citizens in decision-making by the planners and policy makers (Bull, 2016, Schuler, 2016, Simonofski *et al.*, 2017, Nadeem *et al.*, 2019, Shelton and Lodato, 2019, and Feher, 2020).

Indeed, in spite of this elaborative work, certain research gaps have been identified which need to be addressed. Next section details about the same and these become the foundation for this research.

Research Gaps and Objectives

A literature comprehension reveals that amongst Smart City literature, the focus and discussions turned towards Smart Citizens as they are the end-users, and researchers do talk about their role in Smart Cities. Authors from literature are also of the view that every citizen cannot

be termed as smart. However, efforts for identifying Smart Citizens are missing in the literature. There are no researches to empirically investigate the segments of these citizens and their profile. It can be a common sense appeal that some citizens may act smartly and others may not, and there may be reasons behind their actions; but on a practical ground, it is necessary to distinguish smart group from the remaining. Further, Indian context is minimally studied in Smart City literature. Accordingly, these two are the significant research gaps. Like so, this paper objectively works in this direction. Specifically, three objectives are worked upon. First objective is to describe citizens' behaviour on the parameters of smartness. Second objective is to present segments of citizens based on the level of smart behaviour. Third objective is about displaying a profile of smart/not-smart citizens according to their specific characteristics.

Reasoning behind first objective is the appeal that all citizens can't behave similar for all types of behaviours. One behaviour may be highly preferred whereas other may not be. Then, owing to behavioural dissimilarities different segments of consumers may be operative which needs to be identified. Lastly, if different segments exist, their distinguishing features can be identified in terms of profile. Now, next section entails on research methodology used to achieve these objectives.

RESEARCH METHODOLOGY

This section is divided into four sub-sections. At the outset, it is shown how smart behaviour is measured. Then, sections for sampling, sample profile, and statistical techniques have been fabricated.

Measurement of Smart Behaviour and Questionnaire Preparation

The measurement of smart behaviour is done keeping in view the meaning of Smart Citizen as already been defined previously. The ground for the measurement of smart behaviour is the responsible actions which are expected to be incorporated into daily actions/ decisions by the citizens to have positive or less negative influence on society and environment. In this way, six types of behaviours were measured, and measuring statements were created by the researchers. These statements along with certain socio-demographic features were integrated in the form of a short questionnaire. A five point measurement from 'five to one' is used for the response anchors of 'always true to never true'. The measuring statements with statement identifiers and distribution of responses are shown in Table 1 which reveals that

TABLE 1: MEASUREMENT OF SMART BEHAVIOUR

Statements	*Statement Identifier*	*Always True*		*Often True*		*Seldom True*		*Rarely True*		*Never True*		*Total*	
		N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
On a railway crossing I remain in my lane to make way for others.	Lane	119	39.7	83	27.7	55	18.3	19	6.3	24	8.0	300	100
After using a product I put the waste into the dustbin.	Waste	130	43.3	69	23.0	69	23.0	24	8.0	08	2.7	300	100
I ensure that my music system should not disturb others.	Music	153	51.0	58	19.3	47	15.7	32	10.7	10	3.3	300	100
While parking I make efforts not to block others' way.	Parking	141	47.0	97	32.3	29	9.7	24	8.0	09	3.0	300	100
While driving I do not use horn unnecessarily.	Horn	87	29.0	86	28.7	63	21.0	25	8.3	39	13.0	300	100
I buy energy efficient products or those products which are safe for the environment.	Energy	152	50.7	72	24.0	39	13.0	18	6.0	19	6.3	300	100

Source: Primary Survey Conducted by authors during April to June 2021.

responses of respondents inclined towards 'always true' category for all the statements. More than 50 per cent respondents perform smart behaviours as highlighted by identifiers 'Music' (% = 51.0) and 'Energy' (% = 50.7). Least percentage (% = 29.0) perform behaviour shown by identifier 'Horn'.

Sample Size and Sampling

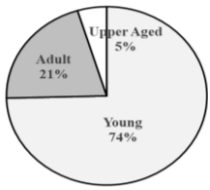
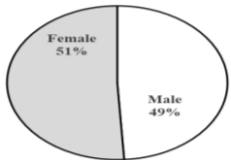
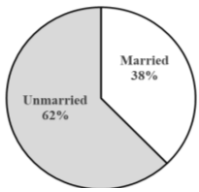
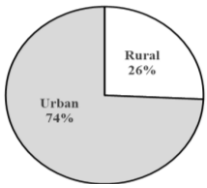
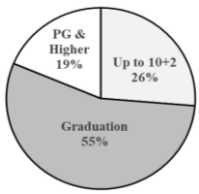
Ambala Cantonment is situated in Haryana State of India. This Cantonment has relevance since the British rule in India and was established in the year 1843. It contains a significant proportion of Indian Army and Air Force. Further, it is an important centre for manufacturing of scientific and surgical instruments and is famous as 'Science City' (Gupta and Garg, 2018).

The study being exploratory, a sample size of three hundred people is considered reasonable (Almanza *et al.*, 1994); likewise, data from three hundred respondents are collected on six parameters (identified earlier). The selection of any respondent in the sample is based on Snowball Sampling Method. As selection was not a problem, any individual could become the part of the sample. In this way, sample is constituted of the residents of Ambala Cantonment itself and also residents from its nearby areas. This composition seemed fruitful because facilities and amenities in a Smart City are not only consumed by residents of a city but also residents of its surrounding areas, villages, and towns, and their behaviour can matter a lot for the maintenance of a city's smartness. In view of this backdrop, profile of sample respondents is analyzed and presented in Table 2 in next section.

Sample Profile

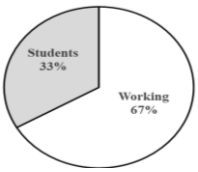
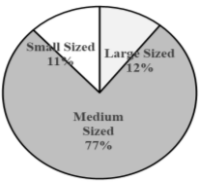
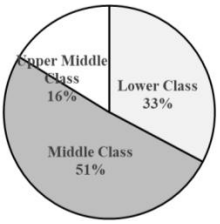
The profile of the sample has been shown in Table 2 in which pie-charts are also visible for getting the percentage shares of different categories. Age wise, sample ranges high for young category. Majority of the respondents are unmarried and belong to urban areas. From educational point of view, the percentage is higher for the graduates. Academic field shows that people from business and management are high in proportion as compared to the fields of social sciences and arts. As far as profession is concerned two-third are working. In size of the family, it is the medium size and middle class families who are high amongst their counterparts. These socio-demographic variables are further utilised in analysis part for gaining the profile of smart citizens.

TABLE 2: SOCIO-DEMOGRAPHIC ATTRIBUTES OF SAMPLE RESPONDENTS

Socio-Demographic Variables	*Variables' Categories*	*Bar Charts showing Percentage Shares*
Age	Young (Aged between 15 to 30)	
	Adult (Aged between 31 to 45)	
	Upper Aged (Aged between 46 to 60)	
Gender	Male	
	Female	
Marital Status	Married	
	Unmarried	
Residential Area	Rural Residents	
	Urban Residents	
Educational Qualifications	Up to 10+2	
	Graduation	
	Post-Graduation and Higher	
Academic Field	Business and Management	
	Science and Technical	
	Arts and Social Sciences	

(contd.)

(Table 2 contd.)

Profession	Working	
	Students	
Family Size	Small Sized (Up to 3 members)	
	Medium Sized (4 to 6 members)	
	Large Sized (Above 6 members)	
Family Status	Lower Class (Family Income up to ₹10000 p.m.)	
	Middle Class (₹10001 to ₹50000 p.m.)	
	Upper Middle Class (Above ₹50000 p.m.)	

Source: Primary Survey Conducted during April to June 2021.

Statistical Techniques

For attaining objective 1, descriptive statistics (mean, standard deviation, coefficient of variation) and inferential statistics (z-test for difference between two means) have been used. For objective two, cluster analysis (hierarchical and non-hierarchical: k-means clustering method), inferential statistics (z-test for difference between two means), discriminant analysis and its allied statistics have been calculated. For objective three, contingencies tables are prepared, proportionate shares have been calculated, Chi-Square test, Cramer's V, and z-test for difference between two proportions have been applied. Besides, diagrammatical presentations have been done wherever deemed suitable. All analyses are completed with SPSS version 20; besides, manual calculations too are done.

ANALYSES AND INTERPRETATIONS

Allied with three objectives, three sub-divisions come under this section.

Description of Smart Behaviour

Table 3 displays statements designed to measure smart behaviour in the first column with the statement identifier in the second column.

TABLE 3: DESCRIPTION OF SMART BEHAVIOUR

Statements	*Statement Identifier*	*Mean* ($\bar{X}$)	*Standard Deviation (S.D.)*	*Variance*	*Coefficient of Variation (CV)*	*Standard Error of Mean (S.E.)*
On a railway crossing I remain in my lane to make way for others.	Lane	3.85	1.239	1.535	32.18%	0.072
After using a product I put the waste into the dustbin.	Waste	3.96	1.107	1.226	27.95%	0.064
I ensure that my music system should not disturb others.	Music	4.04	1.182	1.397	29.26%	0.068
While parking I make efforts not to block others' way.	Parking	4.12	1.070	1.145	25.97%	0.062
While driving I do not use horn unnecessarily.	Horn	3.52	1.335	1.782	37.93%	0.077
I buy energy efficient products or those products which are safe for the environment.	Energy	4.07	1.203	1.447	29.56%	0.069

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

Descriptive statistics can be noted in the form of mean, standard deviation, variance, coefficient of variation, and standard error. The high mean value has been obtained for 'Parking' followed by 'Energy, Music, Waste, and Lane'. A lowest mean value has been obtained for 'Horn'. The coefficient of variation shows highest variations in 'Horn' (which has least mean value) and lowest variations in 'Parking' (which reflected highest mean amongst all behaviours). However, to know the significance/insignificance of mean differences, z-statistic for difference between two means is also visible in Table 4.

TABLE 4: MATRIX FOR MEAN DIFFERENCES AND Z-TEST FOR DIFFERENCE BETWEEN TWO MEANS

Statement Identifiers	*Statistics*	*Lane*	*Waste*	*Music*	*Parking*	*Horn*	*Energy*
Lane	M.D.	0	-	-	-	-	-
	$S.E._{M.D.}$						
	z						
	Sig.						
Waste	M.D.	0.110	**0**	**-**	**-**	**-**	**-**
	$S.E._{M.D.}$	0.096					
	z	1.146					
	Sig.	0.126					
Music	M.D.	0.190	0.080	**0**	**-**	**-**	**-**
	$S.E._{M.D.}$	0.099	0.094				
	z	1.920	0.851				
	Sig.	0.027	0.197				
Parking	M.D.	0.270	0.160	0.080	**0**	**-**	**-**
	$S.E._{M.D.}$	0.095	0.089	0.092			
	z	2.842	1.800	0.870			
	Sig.	0.002	0.036	0.192			
Horn	M.D.	0.330	0.440	0.520	0.600	**0**	**-**
	$S.E._{M.D.}$	0.105	0.100	0.103	0.099		
	z	3.143	4.400	5.049	6.061		
	Sig.	0.001	0.000	0.000	0.000		
Energy	M.D.	0.220	0.110	0.030	0.050	0.550	**0**
	$S.E._{M.D.}$	0.100	0.094	0.097	0.093	0.104	
	z	2.200	1.170	0.309	0.538	5.288	
	Sig.	0.014	0.121	0.379	0.296	0.000	

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.
Note: M.D. denotes mean difference, $S.E._{M.D.}$ denotes the standard error for mean difference.

Table 4 has been prepared in a matrix form. The diagonal values are put to zero because mathematically mean differences of one variable with itself is zero, and other statistics in that case become reluctant. Analysis is relevant for mean differences of one variable with another. Significant mean differences are noted for the pairs 'Lane-Music, Lane-Parking, Lane-Horn, Lane-Energy, Waste-Parking, Waste-Horn, Music-Horn, Parking-Horn', and Horn-Energy. Likewise, as variable 'Parking' has highest mean value ($\overline{X}$ = 4.12) followed by 'Energy' ($\overline{X}$ = 4.07), and their mean difference is insignificant, it can be interpreted that both the behaviours are performed by citizens at a similar level. Mean difference of 'Music' and 'Energy' is also inconsiderate; hence, these two are also performed identically. Due to the highest mean values in order, behaviours shown by 'Parking', 'Energy', and 'Music' are the highest preferences of people. Mean difference of 'Waste' and 'Lane' are also not significant, so, these two behaviours can also be termed as similar. Variable 'Horn' has lowest mean ($\overline{X}$ = 3.52), and its mean is significantly different from all other behaviours. Accordingly, it can be said that this kind of behaviour is not frequently performed by the citizens, compared to other behaviours.

Thereby, lowest-to-highest mean values, and significant mean differences fulfill first objective, and concludes that certain behaviours may be highly performed by citizens, while others may be least desired. Owing to this behavioural dissimilarity, next analysis is performed for objective two.

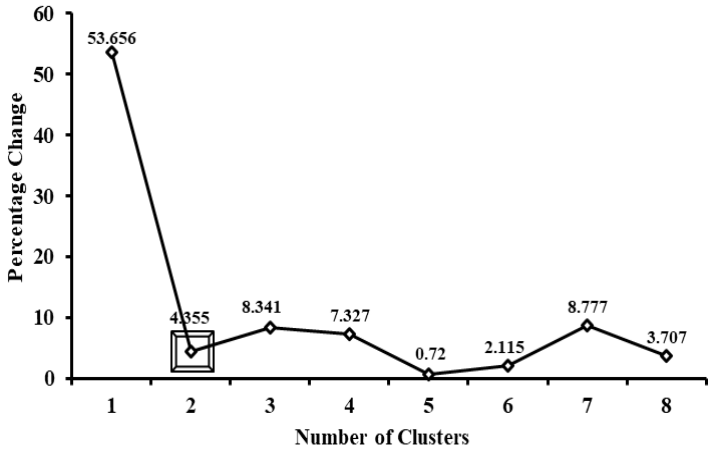
Objective Two – Segmenting Citizens based on Smart Behaviour

Here, at the outset, hierarchical cluster analysis is performed for getting the number of segments. Thereafter, non-hierarchical cluster analysis is used for describing the segments.

Outcome of Hierarchical Cluster Analysis for Number of Clusters

To know the number of clusters, agglomeration schedule (Table 5) and elbow plot (Fig. 1) have been prepared. There were one to 299 stages in agglomeration schedule as there were 300 respondents. But for ease and deciding the number of clusters, last ten stages are shown in Table 5. Column named 'cluster combined' depicts the respondents that are being grouped to make a cluster. As can be seen in stage 291, respondent 1st and respondent 11th are grouped as one in this stage, and similarly in other stages the process continued. 'Stage cluster first appears' displays that before stage 291, respondent 1st was also grouped in stage 290, and respondent 11th was grouped in stage 273. 'Next stage' shows that after stage 291 one amongst 1st or 11th respondents is again

Figure 1: Elbow Plot for Number of Clusters



Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

TABLE 5: AGGLOMERATION SCHEDULE FOR NUMBER OF SEGMENTS

Stage	*Cluster Combined*		*Coefficients*	*Stage Cluster First Appears*			*Next Stage*
	Cluster 1	*Cluster 2*		*% Change*	*Cluster 1*	*Cluster 2*	
291	1	11	19.775	--	290	273	293
292	41	106	20.508	3.707	283	282	295
293	1	39	22.308	8.777	291	289	294
294	1	12	22.780	2.115	293	288	297
295	41	91	22.944	0.720	292	276	296
296	7	41	24.625	7.327	269	295	297
297	1	7	26.679	8.341	294	296	298
298	1	10	27.841	4.355	297	285	299
299	1	148	42.779	53.654	298	0	0

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

grouped in stage 293. In this way, the process continued till 299 stages. 'Coefficients' are the distance between clusters from which 'Percentage Change' is calculated to take a decision regarding number of clusters. This 'Percentage Change' is used to make an 'elbow plot'. As an answer to the first objective, a clear cut division of two clusters emerged from Agglomeration Schedule and Elbow Plot. A square has been marked at the elbow point in the figure which shows that after this point the line starts flattening. Accordingly, a two cluster solution can be claimed based on agglomeration schedule and elbow plot.

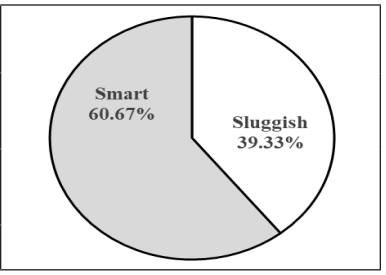
Naming and Description of Clusters

For naming the clusters, given a two-cluster solution, k-means clustering method under non-hierarchical cluster methods is utilized, and its' outputs in Table 6 and 7, and Figure 2 are interpreted. Table 6 and Figure 2 exhibit that first of the cluster contained 118 (% = 39.33) respondents, and second 182 (% = 60.67) respondents. For describing the clusters, mean and standard deviation is calculated for each of the variable, and z-test for difference between two means is utilized as inferential statistics (Table 7). It can be seen from the mean values that cluster 1 attained low mean values than their counterpart (cluster 2) on all the measurements except 'Horn'. However, z-test further infers that cluster 1 differs from cluster 2 on all the parameters except 'Horn' (where the difference is found statistically insignificant). On this premise, first cluster is named *Sluggish* and second is designated as *Smart*.

TABLE 6: CLUSTER DIVISION

Clusters	*Naming*	*N*	*%*
Cluster 1	Sluggish	118	39.33
Cluster 2	Smart	182	60.67
Total		300	100

Figure 2: Pie-chart for Cluster Division



Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

TABLE 7: STATISTICS FOR DIFFERENCES BETWEEN CLUSTERS

Statement Identifier	*Segments*	$\bar{X}$	*S.D.*	*S.E.*	*Mean Difference*	$S.E_{\bar{X}}$	*z-value*	*Sig.*
Lane	Sluggish	3.03	1.294	0.119	1.34	0.090	14.927	0.000
	Smart	4.37	0.862	0.064				
Waste	Sluggish	3.14	1.072	0.099	1.35	0.076	17.880	0.000
	Smart	4.49	0.749	0.056				
Music	Sluggish	3.25	1.198	0.110	1.30	0.084	15.407	0.000
	Smart	4.55	0.837	0.062				
Parking	Sluggish	3.36	1.196	0.110	1.26	0.077	16.364	0.000
	Smart	4.62	0.590	0.044				
Horn	Sluggish	3.52	1.115	0.103	0.07	0.106	0.659	0.510
	Smart	3.55	1.462	0.108				
Energy	Sluggish	3.49	1.286	0.118	0.95	0.093	10.165	0.000
	Smart	4.44	0.983	0.073				

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

Sluggish: The word 'sluggish' points to non-alertness, slow respond, and inactiveness of people. Cluster 1 is designated as *Sluggish* because of low mean values on the parameters used to measure Smart Behaviour. So, this segment can be said as a composition of people who are careless, lethargic and inactive. It is good from society's viewpoint that these people are less in proportion (N = 118; % = 39.33).

Smart: The word 'smart' is not unique nowadays and implies having or showing a quick-witted intelligence. Cluster 2 is well named as *smart* since it contains smart people who are energetic, enthusiastic, and lively in their responsible actions. The same is confirmed by their high mean values and significant difference from *sluggish*. Here, welcomed and worth-mentioning point is that smart people are in major proportion (N = 182; % = 60.67).

Validation of Segments

Further, discriminant Analysis is applied to validate the cluster solution (Table 8). One discriminant function has been obtained since dependent variable entails two categories (two segments). Eigenvalue, Wilks' Lambda, and Canonical Correlation have been shown. Since the p-value for Wilks' Lambda is less than 0.05 and Eigenvalue is well above 1.00, it can be said that the corresponding function explains the group membership well. Canonical correlation is also noteworthy.

TABLE 8: EIGENVALUE AND WILKS' LAMBDA STATISTICS FOR DISCRIMINANT ANALYSIS

Eigenvalue			*Wilks' Lambda Statistics*			
Eigenvalue	*% of Variance*	*Canonical Correlation*	*Wilks' Lambda*	*Chi-square*	*Degrees of Freedom*	*Sig.*
2.315	100.0	0.836	0.302	353.542	6	0.000

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

From Table 9, it can be seen that 98.7 per cent (N = 296) respondents are correctly classified in two clusters; 97.5 per cent respondents (N = 115) in *sluggish* group and 99.5 per cent respondents (N = 181) in *smart* group. Correspondingly, 3 of the respondents from *sluggish* group (% = 2.5) and one out of *smart* group (% = 0.5) are not classified correctly. Hence, these four respondents are not considered and struck out from 'SPSS data view' to enquire the third objective, and further analysis of obtaining the profiles of clusters is completed on 296 respondents.

TABLE 9: VALIDATING CLUSTER MEMBERSHIP WITH DISCRIMINANT ANALYSIS

	N	*Cluster Number of Case*	*Predicted Group Membership*		*Total*	*Correct-Classification*
			Sluggish	*Smart*		
Original	N	Sluggish	115	3	118	N = 115+181 = 296
		Smart	1	181	182	
	%	Sluggish	97.5	2.5	100.0	% = 296/300 = 98.7%
		Smart	0.5	99.5	100.0	
Cross-Validated	N	Sluggish	113	5	118	N = 113+181 = 294
		Smart	1	181	182	
	%	Sluggish	95.8	4.2	100.0	% = 294/300 = 98.0%
		Smart	0.5	99.5	100.0	

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

Objective Three — Profiling of Segments

For finding out the association of demographic variables with the two segments of citizens (as obtained by previous analysis), Table 10 is visible with Chi-Square as inferential statistics. Along with Chi-square, Cramer's V establishes degree of association. The table is divided into five main columns. First column 'variables' displays the socio-demographic attributes according to which analysis has been done. Second column shows the 'division categories'. As Chi-Square analysis is performed on observed and expected frequencies, these are shown in third column for two segments. Fourth column portrays 'percentage share'. These are important to calculate in order to obtain consumer profiles. Because total numbers of consumers are unequally distributed in categories, the observed frequencies cannot be used for profiling. However, these percentages are fully analyzed in Table 11. Last column shows statistical values of Chi-Square and Cramer's V statistics. Where the variables involve two categories, a 2×2 classification can be seen such as gender, marital status, residential status, and profession. As other variables are categorized into three, contingencies tables with 3×2 classification can be seen.

Fifth column reveals that except gender, all other demographic variables are insignificantly associated with obtained segments. However, gender has highly significant association with segment categories. This significance/insignificance can also be judged with a quick examination of observed and expected frequencies in the third column of the table. Accordingly, it can be said that citizen membership in the *sluggish* and *smart* segments notably differs with regard to their gender. Indeed, the calculated percentages portray a different picture

TABLE 10: SEGMENT MEMBERSHIP ACROSS SOCIO-DEMOGRAPHIC VARIABLES

Variables	*Variables' Categories*	*Observed (O) and Expected (E) Frequencies (Fe)*				*Percentage (%)*			*Inferential Statistics (Chi-Square: χ^2)*
		Fe	*Segments*		*Total*	*Segments*		*Total*	
			Sluggish	*Smart*		*Sluggish*	*Smart*		
Age	Young	O	86	134	220	39.1	60.9	100	$\chi^2 = 0.105$ df = 2 p = 0.949 Cramer's V = 0.019
		E	86.2	133.8					
	Adult	O	25	37	62	40.3	59.7	100	
		E	24.3	37.3					
	Upper Aged	O	5	9	14	35.7	64.3	100	
		E	5.5	8.5					
Gender	Male	O	67	78	145	46.2	53.8	100	$\chi^2 = 5.874$ df = 1 p = 0.015 Cramer's V = 0.139
		E	56.8	88.2					
	Female	O	49	102	151	32.5	67.5	100	
		E	59.2	91.8					
Marital Status	Married	O	42	70	112	37.5	62.5	100	$\chi^2 = 0.216$ df = 1 p = 0.642 Cramer's V = 0.027
		E	43.9	68.1					
	Unmarried	O	74	110	184	40.2	59.8	100	
		E	72.1	111.9					
Residential Area	Rural Residents	O	35	42	77	45.5	54.5	100	$\chi^2 = 1.714$ df = 1 p = 0.190 Cramer's V = 0.076
		E	30.2	46.8					
	Urban Residents	O	81	138	219	37.0	63.0	100	
		E	85.8	133.2					

(contd.)

(Table 10 contd.)

Education	Up to 10+2	O	28	49	77	36.4	63.7	100	$\chi^2 = 2.389$ df = 2 p = 0.303 Cramer's V = 0.089
		E	30.2	46.8					
	Graduation	O	70	93	163	42.9	48.1	100	
		E	63.9	99.1					
	Post-Graduation and Higher	O	18	38	56	32.1	67.9	100	
		E	21.9	34.1					
Academic Field	Business and Management	O	43	59	102	42.2	57.8	100	$\chi^2 = 1.304$ df = 3 p = 0.521 Cramer's V = 0.068
		E	39.4	62.6					
	Science and Technical	O	26	51	77	33.8	66.2	100	
		E	29.7	47.3					
	Arts & Social Sciences	O	38	60	98	38.8	61.2	100	
		E	37.9	60.1					
Profession	Working	O	77	121	198	38.9	61.1	100	$\chi^2 = 0.023$ df = 1 p = 0.880 Cramer's V = 0.009
		E	77.6	120.4					
	Students	O	39	59	98	39.8	60.2	100	
		E	38.4	59.6					
Family Size	Small Sized	O	13	18	31	41.9	58.1	100	$\chi^2 = 0.903$ df = 2 p = 0.637 Cramer's V = 0.055
		E	12.1	18.9					
	Medium Sized	O	87	143	230	37.8	62.2	100	
		E	90.1	139.9					
	Large Sized	O	16	19	35	45.7	54.3	100	
		E	13.7	21.3					
Family Status	Lower Class	O	42	54	96	43.8	56.2	100	$\chi^2 = 2.448$ df = 2 p = 0.294 Cramer's V = 0.091
		E	37.6	58.4					
	Middle Class	O	53	99	152	34.9	65.1	100	
		E	59.6	92.4					
	Upper Middle Class	O	21	27	48	43.8	56.3	100	
		E	18.8	29.2					

Source: Authors' own Statistical Analysis on Data Collected through Primary Survey.

about citizen membership into segments, and answers about the socio-demographic characteristics of two segments. For example, percentages for 'age' highlight that with 64.3 per cent people from upper-aged category, they can be termed as *smart*. Due to high percentage of adult category in *sluggish* segment, adults can be termed as part of it. But statistically, the variable does not associate significantly, and without knowing the significant/insignificant difference in proportions, one category cannot be favoured over other for membership into segments. So for clearer understanding, z-test for difference between two proportions is also completed for which Table 11 is prepared and analyzed.

TABLE 11: INFERENTIAL STATISTICS FOR VALIDATING SEGMENT MEMBERSHIP

Variables	*Variables' Categories*	*Proportions*		*Inferential Statistics (z-test: |z|)*	
		Segments		*Segments*	
		Sluggish	*Smart*	*Sluggish*	*Smart*
Age	Young	0.391	0.609	|z| = 0.171 p = 0.865	|z| = 0.171 p = 0.865
	Adult	0.403	0.597		
	Young	0.391	0.609	|z| = 0.253 p = 0.803	|z| = 0.253 p = 0.803
	Upper Aged	0.357	0.643		
	Adult	0.403	0.597	|z| = 0.318 p = 0.749	|z| = 0.318 p = 0.749
	Upper Aged	0.357	0.643		
Gender	Male	0.462	0.538	|z| = 2.413 p = 0.016	|z| = 2.413 p = 0.016
	Female	0.325	0.675		
Marital Status	Married	0.375	0.625	|z| = 0.462 p = 0.646	|z| = 0.462 p = 0.646
	Unmarried	0.402	0.598		
Residential Area	Rural Residents	0.455	0.545	|z| = 1.314 p = 0.190	|z| = 1.314 p = 0.190
	Urban Residents	0.370	0.630		
Education	Up to 10+2	0.364	0.637	|z| = 0.956 p = 0.337	|z| = 0.956 p = 0.337
	Graduation	0.429	0.481		
	Up to 10+2	0.364	0.637	|z| = 0.515 p = 0.610	|z| = 0.515 p = 0.610
	Post-Graduation and Higher	0.321	0.679		
	Graduation	0.429	0.481	|z| = 1.422 p = 0.156	|z| = 1.422 p = 0.156
	Post-Graduation and Higher	0.321	0.679		

(contd.)

(Table 11 contd.)

Academic Field	Business and Management	0.422	0.578	$\|z\| = 1.143$ p = 0.254	$\|z\| = 1.143$ p = 0.254
	Science and Technical	0.338	0.662		
	Business and Management	0.422	0.578	$\|z\| = 0.490$ p = 0.624	$\|z\| = 0.490$ p = 0.624
	Arts and Social Sciences	0.388	0.612		
	Science & Technical	0.338	0.662	$\|z\| = 0.682$ p = 0.497	$\|z\| = 0.682$ p = 0.497
	Arts and Social Sciences	0.388	0.612		
Profession	Working	0.389	0.611	$\|z\| = 0.149$ p = 0.880	$\|z\| = 0.149$ p = 0.880
	Students	0.398	0.602		
Family Size	Small Sized	0.419	0.581	$\|z\| = 0.441$ p = 0.660	$\|z\| = 0.441$ p = 0.660
	Medium Sized	0.378	0.622		
	Small Sized	0.419	0.581	$\|z\| = 0.311$ p = 0.757	$\|z\| = 0.311$ p = 0.757
	Large Sized	0.457	0.543		
	Medium Sized	0.378	0.622	$\|z\| = 0.893$ p = 0.373	$\|z\| = 0.893$ p = 0.373
	Large Sized	0.457	0.543		
Family Status	Lower Class	0.438	0.562	$\|z\| = 1.404$ p = 0.162	$\|z\| = 1.404$ p = 0.162
	Middle Class	0.349	0.651		
	Lower Class	0.438	0.562	$\|z\| = 0$ p = 1	$\|z\| = 0$ p = 1
	Upper Middle Class	0.438	0.562		
	Middle Class	0.349	0.651	$\|z\| = 1.113$ p = 0.267	$\|z\| = 1.113$ p = 0.267
	Upper Middle Class	0.438	0.562		

Source: Authors' own Statistical Analysis on Collected Data through Primary Survey.

Table 11 strengthens the above findings that only 'gender differences' are notable, and difference between variable categories for all other variables are not considerable. Here, z-statistic for difference between two proportions is only found relevant for variable 'gender'; so, where *sluggish* comes out as the segment of males, *smart* is the segment of females.

CONCLUSION AND DISCUSSIONS

All in all, it can be concluded for first objective that citizens are not similar on all measurements of smart behaviours. Behaviour related to variable 'Parking' is highly executed while behaviour associated with variable 'Horn' is least performed. In response to second objective, two segments of citizens exist as per performance of smart behaviour. Here, one segment is *sluggish*, and people of this group ignore ethical standards of behaving at public places and in society. It means they are ignorant people and not sensitized to sense that their actions have an impact on environment and society. In this way, they cannot be termed as Smart. On the other hand, second segment of people which itself is named *smart* accumulates those people who behave appropriately and ethically for society and environment. However, sample analysis provides a good indication because *smart* segment is composed of majority of people if compared with its counterpart *sluggish*.

An interesting finding came out that socio-demographic profile of the two segments may be same; however, gender of a person affects his/her membership in *sluggish* or *smart* segment. Where, Sluggish segment contains large number of males, *smart* is the segment of majority of females. Amongst all the socio-demographic characteristics only gender comes out with significant influence. Females in India actually are brought up with the teachings of being compassionate and caretaker of the family; may be this kind of teaching is vigilant for their membership into *smart* segment. Hence, third objective is abided by identifying two statistically different segments of citizens.

So, at the beginning, we have questioned: whether citizens are smarter enough to accommodate the facilities which are being provided to them with the formation of smart cities, the answer probably is Yes, because large number of people originate as caretakers and stewards of society. Indeed, ignorants too exist; but, in least proportion.

IMPLICATIONS

Based on the findings, one implication is for the public policy makers that they can provide infrastructure and other facilities under Smart City or other mission/projects; but, a class of careless people does exist who first needs education on the ethical and civic issues of the society. Their conscience needs to be aroused so that they too start turning into smart people. Certain kinds of awareness programmes, campaigns, shows, etc. can be organized for the same. Involvement of citizens in the decision-making is a sign of good and transparent governance. The citizens who make decisions about what Smart Cities should look like are far less in

number than citizens who actually will utilize the offerings of a Smart City. However, common citizens are disconnected from the plans being made by companies and even Governments on their behalf. Because of no/less involvement of common citizens, plans and policies many a times result into failure. Hence, for Government and policy makers, there is an urgent need to start working with everyday citizens. Visionary questions should be invited from citizens' side and solutions should be developed for the problems they raise. As majority of females perform Smart Behaviour, they should be targeted for spreading awareness and motivating the sluggish citizens. They should also be included in decision making processes for realizing smart cities. Also with this paper, common citizens are being motivated to work smartly with the active involvement in order to make the vision of 'Smart Bharat' a reality.

SCOPE FOR FURTHER RESEARCH

The study has been conducted on Ambala Cantonment with limited measures of Smartness and the population defined is only the Ambala Cantonment and its nearby areas. So, the results cannot be generalized to a larger extent on all the cities or cantonments. However, where the sample characteristics match with this study, the results can be contrasted. This paper offers several guidelines for further research. Gender came out the noteworthy influencer of citizens' behaviour, it points towards the issue of 'gender differences'. So, further studies can be conducted in this area. One agenda for further studies may be: how the people who actually are sluggish can be converted into smart? Also, different parameters of measuring the smart behaviour may be taken and results can be contrasted. A large sample with enhanced measurement scales can further give more embellished results. In this paper, smart behaviour is measured to the ground level and only with the basic and simple behaviours. This may be a restriction for generalization of results. Future studies can be operative toward developing the scales to measure smart behaviour. In this way, external validity of research findings can too be enhanced. Large and country-wide samples can be utilized in further studies.

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Endnotes

1. Cantonment Board of Ambala (CBA) has been active in Ambala since pre-Independence period specifically 1843, and is a statutory body under the

Cantonment Board Act, 2006. The official website of CBA is: http://cbambala.org.

2. Topkhana Bazar was developed in British period, and today it is one of the main areas covered under CBA. It is also known as R.H.A or R.A. Bazar, enunciated as Royal Horse Administrators Bazar.

3. *bee smart city* is 'the leading global smart city network and community with more than 15,100 members from 170 countries, featuring 710+ smart city solutions implemented in over 1,000 cities and communities across the globe. Its mission is to empower smart sustainable cities by facilitating the global exchange of best practice solutions and lessons learned'. Its official website is: https://www.beesmart.city/.