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A Spatial Statistical Approach Towards Independence of Informal Manufacturers' Psychographics from Town Planning Principles in Harare

SIMBARASHE SHOW MAZONGONDA[1], MACLEANS MZUMARA[2], RUMBIDZAI MPAHLO[3] AND BEATRICE HICKONICKO[4]

Abstract

This study tested for statistical significance of the association between informal manufacturers' psychographics and town planning principles. Health, safety and order amenity constructs were extracted from existing town planning principles and three vignettes encapsulated in psychographics (knowledge, perception and attitude) were captured in the digital questionnaire for each construct. With these constructs and vignettes, the collected data were analysed using the R language in Spatstat and tested for the independence of association using a chi-square test at a 0.05 level of significance. Study findings revealed that all three psychological vignettes studied have a very weak relationship with town planning principles. All studied relationships gave an r^2 value of at most 1.17%, implying that less than 2% of manufacturers' psychographics are explained by variations in their understanding of town planning principles. Therefore, planning education must be scaled up so that manufacturers gain a full understanding of the importance of town planning goals.

Keywords: spatiality, human behaviour, policy, planning, management

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INTRODUCTION

Understanding the psychographics of informal manufacturers because of town planning is fundamental in predicting their behavioural response to authorities' initiatives such as taxing the informal sector (Government of Zimbabwe (GoZ), 2014). Psychographics define psychological vignettes such as opinions, attitudes, values, knowledge and perception of individuals or groups of participants about a specified phenomenon (Azjen, 1991; Armitage and Conner, 2001). It is argued that "the relative importance of attitude, subjective norm and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations" (Ajzen, 1991, p 188). Accurate prediction of intentions and behaviour is, therefore, a function of understanding hard data on the importance of attitude, perception and knowledge. The questionable behaviour of informal operators has received considerable attention in the literature (Chirisa, 2007; Shabaneh, 2008; Yiftachel, 2009; Kanbur, 2009; Shah, 2012; Varley, 2013). Outside legally constituted markets, informal operators enjoy free riding, evade taxes and operate in violation of land use zoning laws (Kanbur, 2009; Dube and Chirisa, 2012; Keen and Kanbur, 2015). To this effect, dominating patterns of behaviour, noted over time, are that the informal sector is shy, resilient, resistant, messy and tax evasive. When the heavy hand of planning is visible and more active, the informal sector kind of hibernates and resurfaces at a later stage. This type of behaviour is something that has been described as resilience and resistance by Chirisa (2007) and Varley (2008), respectively.

Sookram, Watson and Schneider (2006) used the case study of Trinidad and Tobago to explain the perception and attitudinal characteristics of households that participate in the informal sector. The findings of this study are important in giving a general insight into how psychographics influence the behaviour of informal operators. However, discussions of issues surrounding these findings were limited only to socio-economic characteristics, mainly informal operators' perception of risk detection by the tax authorities. A somewhat similar study narrated how street vendors in Harare used their knowledge of town planning to escape development control (Chirisa, 2007). Chirisa's (2007) study revealed that the resilience of informal operators to the role of planning to restore order, capture

value and promote good citizenship is driven largely by poverty which pushes people into the streets. No doubt, this study played an important role in bringing to the fore the relationship between town planning principles and the psychographics of informal operators. Limited only to operators in tertiary production, the study did not capture the psychographics of operators in the primary and secondary levels of production. This study failed to report reliability statistics because it was limited in sampling.

As far as it can be ascertained, few studies analysed the psychographics of informal operators, e.g. Sookram, Watson and Schneider (2006) and Chirisa (2007). None of the accessible studies used hard data to explain the relationship between informal operators' psychographics and town planning principles. Drawing up solid conclusions and making inferences from a few published papers on the psychographics of informal operators is thus suspect on three counts of reliability, replicability and empirical backing. What appears open and straightforward to an ordinary eye might have hidden connotations. This, therefore, urges further research to provide hard data on the relationship between the psychographics of informal operators and town planning principles. Unless such kind of studies are carried out, issues inclined toward psychographics will continue to be discussed using facts devoid of empirical backing. The main objective of the present study is to use a spatial statistical approach to test if informal operators' psychographics depends on their understanding of town principles since psychographics "vary across behaviours and situations" (Azjen, 1991, p 188). Essentially, it seeks to find solutions to unanswered questions and challenge unquestioned answers. The hypothesis of this study is as follows: "Informal manufacturers' psychographics does not depend on their understanding of town planning principles".

CONCEPTUALISATION: TRACING THE TOWN PLANNING IDEOLOGY

Tracing competition for space through a historical lens perhaps explains the planning thought and practice. Space is political and people can do anything within their means to control land and land-embedded resources (Elden, 2007). All activities happen in space regardless of the type of activity (social, economic, recreational or industrial). However, activities in space should not be allowed to take

course haphazardly but should be systemised. Thus, our key question is: what informs the orientation of activities in space? What is the rationale behind systematically arranging activities in space? How best can activities that mushroom in space be controlled? These and like questions are best answered by the planning ideology.

Planning principles can be traced back to the ancient Greek and Roman cities where the structure of settlements was designed to promote order, health, security and safety. Being agro-based cities, agricultural activities were separated from cultural and recreational land uses (Mumford, 1938). Another notable milestone in the history of town planning is the industrial revolution in Britain in the late 19th century. During this period, there was growth in manufacturing activities, leading to the over-concentration of industries and settlements adjacent to industrial sites. Serious health problems presented themselves and awakened planning authorities to consider separating industrial and residential land uses (McAuslan, 1980; Heap, 1996). Zoning laws were enacted to promote order and public health.

The promotion of planning principles is backed by planning law, regulations, statutory plans and planning standards in deciding settlement structures (Wekwete, 1989; Chaeruka, 2002). In Zimbabwe, layout plans, development plans and master plans are designed with the view of fulfilling the main object of the Regional, Town and Country Planning Act (RTCPA) of 1996. The Act stresses that standards contribute towards promoting health, safety, order, aesthetics, amenity, welfare, convenience, efficiency and public interests. Through part IV, the act provides for development control and how it should be exercised in the country. Despite the clarity of the planning framework in dealing with activities that violate the provisions of the planning ideology, the informal sector seems to be 'free riding' than anything, a mess and resilient to planning control (Chirisa, 2007; Dube and Chirisa, 2012). The next section gives a theoretical inquiry into the knowledge, attitude and perception of informal operators given town principles.

THEORETICAL FRAMEWORK

The meta-analytic review of the Theory of Planned Behavior (TPB) by Armitage and Conner (2001, p 471) revealed that "27% and 39% of the

variance in behaviour and intention, respectively" are accounted for by the TPB. This partly explains why the TPB has received mass support in literature as a useful tool for foretelling different behaviours and behavioural intentions (Van den Putte, 1991; Godin, 1993; Blue, 1995; Conner and Sparks, 1996; Godin and Kok, 1996; Hausenblas, Carron and Mack, 1997). Inspired by Armitage and Conner's (2001) meta-analytic review, the present study used the TPB to explain the interplay between informal operators' cognitive human factors (attitude, perception and knowledge) and town planning principles (order, safety, health and amenity). The TPB is premised on three primary building blocks; behavioural, normative and control beliefs (Azjen, 1991).

These primary building blocks feed into secondary building blocks: attitude, subjective norm and perceived behavioral control (PBC). All three secondary building blocks inform intention which then influences behaviour. However, PBC can directly influence behaviour in selected cases (Armitage and Conner, 2001). This summative descriptor of the TPB is best illustrated diagrammatically in Figure 1. It must be noted that this paper adapts only the secondary building blocks (highlighted in a dark shade) of the TPB to explain whether informal operators' psychographics depends on their understanding of town planning principles. Where other parts of the TPB are referred to, it will be to clarify certain issues or explain circumstances

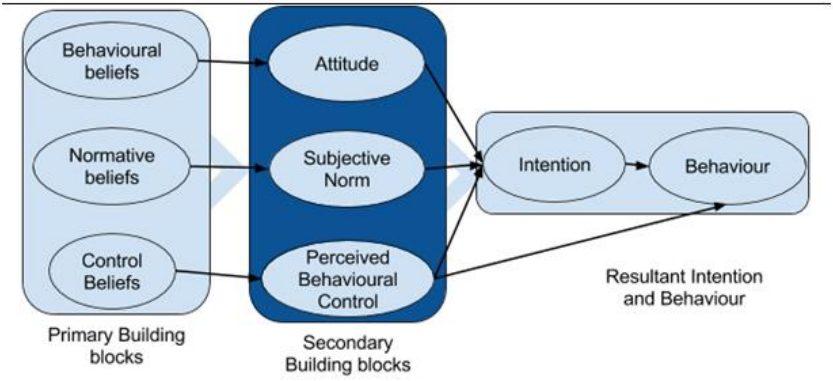

Figure 1: Theory of Planned Behavior (Adapted from Armitage and Conner, 2001)

Attitude refers to a person's evaluation of a given phenomenon. Attitude can either be positive or negative (Azjen, 1991). Where the attitude towards a specific behaviour is more positive, "the stronger the individual's intention to perform it" (Armitage and Conner, 2001, p 474). Whether positive or negative, attitude depends on behavioural beliefs, that is, the assumed cost or benefit of acting in a certain way. In cases where the assumed benefits outweigh the costs, individuals are more likely to develop a positive attitude toward something and vice versa. Subjective norm is defined as 'an individual's perceptions of general social pressure to perform (or not perform) the behaviour" (*ibid*.). The intention to act in a particular way depends on one's perception or knowledge that some significant others will approve or disapprove of the intended act. In the context of informal operators, general social pressure is likely to come from other operators who are likely to motivate the approval or disapproval of certain behaviour. The fundamental feature of the TPB, which differentiates it from the Theory of Reasoned Action (TRA) is the inclusion of PBC (Azjen, 1991; Conner and Sparks, 1996; Godin and Kok, 1996). PBC defines a set of potential constraints on the action as perceived by the actor. It is argued that PBC feeds from control beliefs which explain the perceived power of inherent factors to facilitate or inhibit the performance of the behaviour (Ajzen, 1991).

The underlying infrastructure of TPB's secondary building blocks (that is, attitude, subjective norm and PBC) are corresponding beliefs explained in the foregoing. These basic factors are widely known in psychological circles as the underlying cognitive structure or human factors (Azjen, 1991; Van den Putte, 1991; Godin, 1993; Blue, 1995; Armitage and Conner, 2001; Adjibolosso, 2013). Arguably, the quality of human factors is paramount (Adjibolosso, 2013; Chirisa, Mavhima, Matamanda, 2018). In this case, human factors are concerned with understanding the interaction of informal manufacturers and town principles. Dabengwa (1998: p 198) quoted in Chirisa, Mavhima, Matamanda (2018, p 52) has noted that "human factors must be directed towards developing the character content of the human beings who carry out the economic development of their society".

Realising optimum human factor quality is envisioned to promote livable working environments devoid of accidents, noise and pollution. It has been noted that "the relative importance of attitude,

subjective norm and perceived behavioural control in the prediction of intention is expected to vary across behaviours and situations" (Ajzen, 1991: 188). Armitage and Conner (2001: 471) concluded that the subjective norm construct is generally "a weak predictor of intentions" as compared to PBC and attitude. Ajzen's (1991) meta-analysis of the TPB found a multiple correlation coefficient of attitude, subjective norm and PBC, with an intention of $r = 0.71$, signifying a very strong positive relationship. In the present study, we wish to determine how human factors (specifically, attitude, knowledge and PBC) of informal operators vary in the context of town planning principles.

RESEARCH METHODOLOGY

The study was carried out in the Harare Metropolitan Province of Zimbabwe as shown in Figure 2.

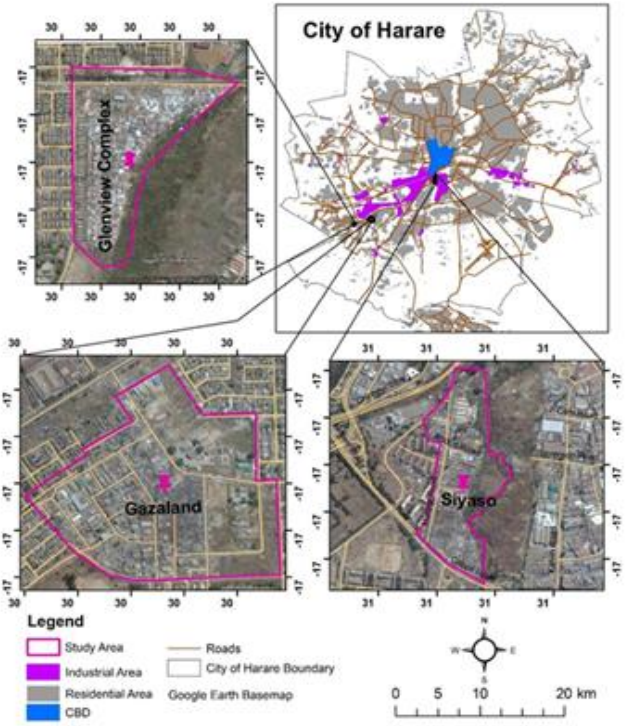

Figure 2: Location of Study Areas (Google Maps, 2016)

The study was designed using the multiple case study of three sampling windows (study sites), that is, Siyaso, Gazaland and Complex Home Industries in Harare, Zimbabwe.

Within the multiple case study of three home industries, only the embedded case of informal manufacturing was studied. Informal manufacturing, in the secondary level of production, was purposively selected because it accounts for a larger proportion of activities in terms of both the level and value of trade. Informality in Zimbabwe and elsewhere is cross-sector visible, found in the primary, secondary and tertiary levels of production (Chirisa, 2009; Miraftab, 2009; Varley, 2009; Dube and Chirisa, 2012; Majumdar and Borbora, 2012; Shah, 2012). In comparison to other levels of production, the secondary level of production generates large volumes of activity and employs a substantial number of people (Hart, 1973; Despres, 1988; Sparks and Barnett, 2010; Majumdar and Borbora, 2012). The diagrammatic illustration of the multiple-embedded case study design adopted for this study is shown in Figure 3.

Drawing up experiences from three different cases, arguably, guaranteed conclusive power (Johnson and Onwuegbuzie, 2004; Creswell, 2005; Yin, 2006; Saunders, Lewis and Thornhill, 2009). This strategy helped in tracing similarities, congruencies and variations in patterns of behaviour and assumed a positive correlation between operators working in neighbouring areas. Within the multiple-embedded case study, a sample survey was used to gather data from the informal manufacturers. That survey helped in mapping the spatial distribution of informal manufacturing activities in home industries.

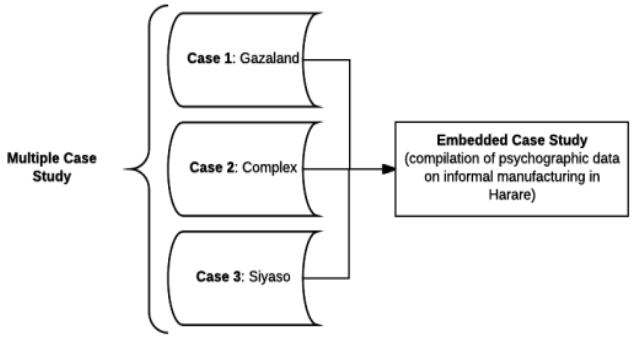

Figure 3: Multiple-Embedded Case Study Strategy (Adapted from Johnson and Onwuegbuzie, 2004; Yin, 2006)

A customised android mobile geo-application, based on Geographic Position System (GPS), was developed by a data scientist specifically for use in data collection for the survey of informal manufacturing in Harare.

Snowball sampling made it easy to utilise the spatial setting and assumed a positive correlation between manufacturers in establishing the trade flow network connecting informal operators.

With the help of a data scientist, Python scripts were used for data cleaning through the removal of null responses and erroneous (illegal values) due to typing mistakes by enumerators, e.g. an age value of more than 360 or less than five years. The cleaned and normalised data were analysed first in R language's Spatstat package to find measures of average and spread. Further analyses were done in R language using chi-square tests to determine whether the psychographics of individual operators depend on their understanding of town planning principles. Where there was dependence, the relationship was quantified using regression analysis and the strength of association was calculated using Pearson Product Moment Correlation Coefficient (PMCC). Complementary to the statistical analysis is a force field analysis which was used to systematically analyse the restraining and driving forces surrounding this complex town planning and urban informality impasse.

ANALYSIS OF STUDY RESULTS

The results are classified according to the psychographic-town planning principle nexus per study site. Results for all statistical tests were carried out at a 5% level of significance. On one end, collective results were determined using a chi-square threshold value of 15.507 corresponding to 8° of freedom and 0.05 level of significance, While n the other, site-specific results were determined using a chi-square threshold value of 9.488 corresponding to 4° degrees of freedom and a 0.05 level of significance. Any chi-square value above the threshold value led to the rejection of the null hypothesis in favour of the alternative hypothesis and vice versa. Semi-processed data, which led to the synthesised results in this section. Such data was captured using scenario-based questions crafted with hidden meaning as explained in the materials and methods section.

KNOWLEDGE-TOWN PLANNING RELATIONSHIP

A detailed quantitative investigation of the relationship between knowledge of informal manufacturers and each of safety, order, amenity and health is discussed in this sub-section. Table 1 shows a detailed summary of this relationship.

Table 1: Knowledge-Town Planning Relationship (Study Findings, 2017)

Relationship	Collective (N=642)		Gazaland (N=189)		Siyaso (N=242)		Complex (N=211)	
	χ^2	r^2	χ^2	r^2	χ^2	r^2	χ^2	r^2
Knowledge-Safety	32.38	0.001 613417 6	31.613	0.0011 04191 7	6.294	0.0013 187531	9.164	$2.7291\ 837e^{-5}$
Knowledge-Order	23.155	0.000 481191 2	21.128	0.000 86718 94	7.54	$8.4711\ 278e^{-5}$	5.286	0.000 36394 53
Knowledge-Amenity	23.941	0.0012 09329 83617 6	19.154	$8.6725\ 33827\ 0007e^{-7}$	11.784	0.003 52499 75734 56	4.593	0.003 86361 45
Knowledge-Health	26.65	0.003 73634 99779 76	17.337	0.003 96132 77912 46	5.732	0.001 90338 49328 4	16.155	0.000 25781 89145 44

Overall, informal manufacturers' knowledge depends on their understanding of all town principles (safety, health, order and amenity). This is supported by collective chi-square values which are above the cut-off value of 15.507 for all four relationships (see first column of Table 1). Despite the existence of positive relationships, collective results suggest that all relationships are very weak, with less than 1% of their knowledge explained by the variation in understanding of the town planning ideology (all collective r^2 values are below 0.001). The greater percentage, more than 99%, of the variation in this dependence is explained by other factors, other than human factors under study, sampling error included.

This overall interpretation is influenced largely by Gazaland whose contribution outweighs other sampling windows. This is probably because, informal as it is and disorderly as it appears, the degree of orderliness in Gazaland is far much better when one compares it with Siyaso and Complex. Such higher quality of orderliness promotes safety and health practices for both the manufacturers and the environment. Just like the collective results on the knowledge-town planning principle relationship, all chi-square values for Gazaland are above the threshold value of 15.507. This signifies that informal manufacturers' knowledge depends on their understanding of town planning principles. They have some knowledge of town planning principles, but their knowledge is, to a larger extent, clouded by the profit motive and probably a general lack of training on such issues.

For Siyaso, manufacturers' knowledge does not depend on their understanding of the safety, order and health principles given their chi-square values which are all below the 9.448 threshold value. Only, the knowledge-amenity relationship for Siyaso explains some form of dependence given the chi-square value of 11.784 which is above the threshold value. Even for a knowledge-amenity relationship where there is dependence, the degree of dependence is very weak ($r^2 = 0.00352$) with only 0.352% of the variation in their knowledge

explained by the relationship between knowledge and amenity principle. Knowledge of manufacturers working in the Complex does not depend on their understanding of safety, order and amenity ideology, giving their chi-square values of 9.164, 5.286 and 4.593 respectively which are all below the 9.448 threshold value. For the manufacturers in the Complex, the relationship between knowledge and health principle generated a chi-square value above the threshold value (16.155) implying that manufacturers' knowledge is, to some extent, explained by their understanding of health practices.

Whether knowledge of manufacturers working in the Complex depends on their understanding of town planning principles, the coefficient of determination for the four relationships studied is all less than 0.01, implying that more than 99% of manufacturers' knowledge is explained by other variables other than their understanding of safety, order, health and amenity principles. Thus, informal manufacturers' knowledge of town planning principles differs from site to site, though there is an insignificant difference across the three sites studied. Because of this insignificant difference, all relationships proved to be weak. So, the variation in informal manufacturers' knowledge is, to a lesser extent, explained by their understanding of town planning principles. This implies that the quality of the interaction of manufacturers' knowledge and town planning principles is very low.

ATTITUDE-TOWN PLANNING RELATIONSHIP

Informal manufacturers' attitudes toward town planning principles, which can either be positive or negative (Armitage and Conner, 2001), produced the results as summarised in Table 2.

Table 2: Attitude-Town Planning Relationship (Study Findings, 2017)

Relationship	Collective (N=642)		Gazaland (N=189)		Siyaso (N=242)		Complex (N=211)	
	χ^2	r^2	χ^2	r^2	χ^2	r^2	χ^2	r^2
Attitude-Safety	35.668	$5.0372704e^{-5}$	17.019	0.00057267 07	2.9894	0.0001116678	32.47	0.001164302
Attitude-Amenity	36.548	0.00189774 98	12.558	0.00051854 99	8.649	0.00896690 25	33.21	0.0143500274
Attitude-Health	2.4244	0.00201453 49	1.0036	0.0011 09669 9	1.8554	0.0021 80744 3	0.8346	0.0003409788
Attitude-Order	11.731	0.004 11814		0.0011 2682		0.005 83323		0.0021 3692

Attitude-safety and attitude-amenity relationships for Gazaland and the Complex resulted in chi-square values above the threshold value implying, that the attitude of informal manufacturers depends on their understanding of safety and amenity principles. This positive attitude towards safety and amenity shown by manufacturers working in Gazaland and the Complex partly explains why the collective chi-square values for these two relationships attitude-safety and attitude-amenity) is also above the cut-off value of 15.507. These results cloud the chi-square values for the same relationships for manufacturers working in Siyaso. Generally, manufacturers in Siyaso have a negative attitude (signifying poor human factor quality) towards safety, amenity and health. This is explained by chi-square values of 2.984, 8.469 and 1.8554, respectively, which are all below the threshold value of 9.448. The fact is that there are poor-quality human factors as far as health and safety are concerned. Thus, their negative attitude partly explains why they are dotted haphazardly in space without concern for the health and safety implications associated with over-concentration. In the long run, the existence of low-quality human factors will expose manufacturers and people residing in neighbourhoods surrounding sampling windows to health risks. Negative externalities such as health risks have more geographically concentrated impacts.

Shockingly, for all three sampling windows, manufacturers' attitude towards health is negative because of chi-square values which are all below the cut-off value. They seem not to care about health implications associated with land compartmentalisation practices within home industries, leading to a complex mixture of land uses. For example, an observed reality in all the home industries is that grinding dust circulates freely in the air finding its way to food being prepared adjacent to manufacturing activities. Such poor-quality human factors concerning public health could be a potential health hazard because some of the grinding dust may contain toxic substances with long-term negative effects.

PERCEPTION-TOWN PLANNING RELATIONSHIP

Findings relating to the perception of informal manufacturers towards town planning principles are presented in Table 3. Gazaland and Complex have comparable levels of dependence on manufacturers' perception of safety, order and amenity principles (all chi-square values are above the 9.448 threshold value). These perceptive results suggest that individual controlling beliefs in these two sites are shaped by their concern for safety, order and amenity practices. Such a positive concern is explained by good quality human factors towards town planning principles.

Table 3: Perception-Town Planning Relationship (Study Findings, 2017)

Relationship	Collective (N=642)		Gazaland (N=189)		Siyaso (N=242)		Complex (N=211)	
	χ^2	r^2	χ^2	r^2	χ^2	r^2	χ^2	r^2
Perception-safety	20.265	8.6991791e-5	10.497	2.9882393e-5	1.2381	0.0001112571	18.004	3.1117163e-5
Perception-order	22.023	0.00248675 96	18.031	0.00876782 97	2.8781	1.7470728e-5	11.182	0.00905671 98
Perception-amenity	43.45	0.00161862 91	37.07	0.00845387 02	5.196	0.0003532971	20.928	0.0117950895

Siyaso generated results that are contrary to other sites. For each of the three relationships perception-safety, perception-order and perception-amenity, the controlling beliefs of individual manufacturers are not shaped or influenced by their understanding of town planning principles (χ^2 is less than the threshold value of 9.448). The perception-amenity relationship for the Complex is peculiar because the controlling beliefs of individual manufacturers contribute 1.17% to the variation in their amenity practices. Contrary to this, in all other relationships, regardless of sites, individual manufacturers' controlling beliefs contribute less than 1% variation in their practice of town planning principles.

DISCUSSION

Collective results of the three study sites revealed that informal manufacturers' knowledge, that is, human factor quality, depends on their understanding of each of safety, health, order and amenity (see first column of Table 1). Despite the existence of positive relationships, collective results suggest that all relationships are very weak, with less than 1% of their knowledge explained by the variation in understanding of the town planning ideology (all collective r^2 values are below 0.001). This finding is supported by Armitage and Conner's (2001) meta-analytic review of the TPB which concluded that the subjective norm construct is generally "a weak predictor of intentions" as compared to PBC and attitude. On the same note, Chirisa (2007)'s post-2005 Harare study of informality revealed that street vendors used their knowledge of town planning principles to escape development control. However, Chirisa's (2007) conclusion did not indicate whether this relationship is weak or strong because it was devoid of quantitative backing. It must be noted that the revealed weak relationship cannot be generalised across different sites since it differs between sites. It is also critical to note that collective and site-specific results of the perception-town planning principle and attitude-town planning relationships were found to be generally weak. All three vignettes encapsulated in cognitive human factors (knowledge, perception and attitude) revealed a very weak relationship with town planning principles. This is explained by coefficients of determination of at most 1.17% for all studied relationships. This is contrary to the conclusion by Armitage and Conner (2001) that the knowledge

vignette is generally a weak predictor of behaviour as compared to PBC and attitude.

CONCLUSION AND RECOMMENDATIONS

The foregoing paragraphs have revealed the relationship between three cognitive human factors (knowledge, attitude and perception) of informal manufacturers and each of the four constructs (health, order, safety and health) embedded in town planning principles. Of the 12 expected relationships per study site, one relationship was dropped at the data cleaning and reduction stage. Results of the final 11 relationships revealed that there is a generally weak relationship between informal manufacturers' cognitive human factors and town planning principles with varying degrees of weakness. Therefore, it is recommended that planning education must be scaled up with the view of improving informal manufacturers' knowledge, attitude and perception toward planning principles. It is envisioned that this will go a long way in changing their psychographics toward town planning principles. It is also important for future researchers to consider a deep dive into other factors that can predict the intentions and behaviours of informal manufacturers. Human factors are significant in understanding how the moral, aesthetic and human capital components must be improved, articularly, in changing the attitudes of manufacturers to be more positive, power-packed with faith, hope and love based on principles regarding what is wrong and right and having a deep sense of and love for order and the knowledge and acquired skills. This will go a long way in promoting order, health, safety and amenity, thereby sustaining livable environs.

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