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Article

Preferences for housing attributes in Saudi Arabia: A comparison between consumers' and property practitioners' views

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Abstract

Due to rapid urbanisation, population growth and limited supply of housing, the housing sector in Saudi Arabia is facing significant challenges. There have been attempts to provide large-scale housing projects to combat this issue. However, there are concerns that short-term policies to provide large quantities of housing can result in low-quality units which are underside by consumers. Therefore, understanding consumer preferences with regard to housing is crucially important if housing projects are to be successful in the long term. This paper explores consumer preferences for housing attributes in Saudi Arabia and compares these against the views of property professionals. Data was gathered via quantitative surveys from 752 housing consumers and 101 property practitioners from across Saudi Arabia. Descriptive analysis and the Mann-Whitney U test are used to determine the mean importance of the housing attributes and to compare the findings from each group. The results of the study provide an analysis on the importance of various housing attributes and highlights similarities and disparities in opinions. The analysis found significant differences between consumers' and property practitioners' views on what consumers believe are important housing attributes. Given this lack of alignment, the findings should offer housing providers with a better understanding of consumer preferences in the Saudi Arabia context**.**

1 Introduction

Saudi Arabia is suffering from an acute housing shortage (Al Surf *et al.,* 2013a). This problem is due to several factors. Firstly, the urban population has been growing at a rapid rate which has created a strong demand for housing, especially at the lower end of the market (PwC, 2014; Taleb & Sharples, 2011). The population in the Kingdom rose from around 7 million in 1974 to around 30 million currently (Al-Shihri, 2016). Saudi Arabia also has a relatively young demographic (over 60% are aged between 15 and 26), which increases housing demand because more young people are getting married and seeking to leave their parents' homes (Jeddah Economic Forum, 2013; PwC, 2014). These demographic changes are predicted to lead to a housing shortage that could exceed one million units in 2018 (PwC, 2014). These factors contributed to rapid increases in house prices and have meant that an increasing proportion of citizens are unable to afford to own a home. Only 30% of the population are said to own their own homes, compared to a worldwide average of 70% (JLL, 2015). Given the rapid urbanisation and population growth, rising demand, limited supply for housing and low

rates of ownership, the housing sector in Saudi Arabia faces significant challenges, most especially in providing adequate housing for middle- and low-income households.

In order to carter for the housing crisis, large-scale housing projects aimed primarily at low- to middle-income households have been planned over the past couple of years. The Saudi Arabian government began seeking to address the situation in 2011, when King Abdullah announced a SAR 250 billion (USD 67 billion) project designed to add 500,000 new homes to the market. Today the government's 'Vision 2030' strategy aims to provide more Saudis with the security of owning a home that matches their needs and financial capabilities. However, continuing low oil prices have resulted in inevitable cuts in public spending, which has in turn impacted negatively on funding for housing projects (JLL, 2017). The government has thus also introduced several reforms designed to encourage both local and foreign developers to build 1.5 million homes in the country by 2025 (JLL, 2017).

However, concerns have been raised that recent government programs will not be enough to meet escalating and evolving housing needs, and are unlikely to yield the socioeconomic gains the Kingdom needs (PwC, 2014). The rapid rate of urbanisation has previously led to the development of unplanned settlements all over the Kingdom, with a lack of infrastructure, schools, hospitals and safe areas (El-Batran, 2008). Al Surf *et al.* (2013b) postulate that, even when people managed to secure housing, it was often not sustainable or efficient in the provision of cultural needs of the occupants. Experience shows that short-term policies to provide large quantities of low-income units are often not sustainable and can result in a large stock of low-quality housing (PwC, 2014). For example, large numbers of low-cost housing units went unsold in large-scale master planned communities in southern Riyadh (CBRE, 2012). There are also several examples from across the globe where urban development has not been sensitive to lower and middle income housing priorities, and has therefore resulted in inappropriate living environments and, in some cases, the emergence of slums (Ellis and Roberts, 2015; Moghimi *et al.*, 2016; Tan, 2012a). It would therefore seem that the issue is not only supply of housing, but also getting the right type of housing in the right locations, in line with consumers' preferences.

Moghimi *et al.* (2016) argue that mass housing developments are often designed disregarding prospective users and their values. Kowaltowski & Granja (2011) attributed issues in social housing projects to a mismatch between values of consumers and designers. Knowledge of user preferences is therefore important in order to devise suitable housing solutions that create better quality living environments (Kauko, 2006). Housing solutions that are not consistent with consumer preferences are unlikely to help resolve housing problems or provide consumer satisfaction (Sirgy *et al.,* 2005).

1.1 Consumer preferences for housing attributes

Research on housing preferences has been developing over the last few decades (Rahadi *et al.,* 2015b) where researchers have sought to investigate the topic from different theoretical perspectives and using various methodologies (Coolen & Hoesktra, 2001). For example, researchers have focused on examining consumer preferences for particular housing attributes/characteristics (Opoku & Abdul-Muhmin, 2010) and satisfaction with current housing situation (Djebarni & Abed, 2000; Tan, 2012b). Others have investigated issues such as the role of demographics, socioeconomics and values in influencing housing preference (Coolen & Hoesktra, 2001; Rossi & Weber, 1996) and the relationship between housing preferences and house prices (Rahadi *et al.*, 2015b). Studies of housing preferences can also be

divided into studies on stated preferences and those on revealed preferences (Coolen and Hoekstra, 2001). Stated preferences are based on intended or hypothetical choices, whereas revealed preferences are based on actual housing choices made.

The conceptual framework for this study focuses specifically on stated 'preferences for housing attributes'. Preference is the relative attractiveness of a feature or object (Coolen, 2008) and is distinguished from choice (Ajzen & Fishbein, 1980). Choice is concerned with actual behaviour, but preference may guide choice (Coolen, 2008).

Based on a review of the international literature, various housing attributes (or characteristics) have been shown to be important to consumer preference. Several researchers have sought to classify such housing attributes into different categories when studying consumer preferences. For example, Louviere and Timmerman (1990) categorize attributes into four subsets which include: housing attributes, residential environment attributes, economic and social ties, and relative location. Whereas Cupchik *et al.* (2003) organise housing attributes into two main categories: internal [or intrinsic] housing variables and external [or extrinsic] housing variables. Intrinsic housing attributes include factors such as housing size, interior layout, design and functionality, space, number of rooms and internal design (Al-Momani, 2003; Bhatti & Church, 2004; Dale-Johnson & Phillips, 1984; Greene & Ortuzar, 2002; Tan, 2012a). Extrinsic attributes include factors such as exterior design and appearance, building quality and materials, and exterior space (Al-Momani, 2003; Bhatti & Church, 2004; Wang & Li, 2006). There are also location and environment attributes (Pasha & Butt, 1996; Yusuf & Resosudarmo, 2009). Huturbia *et al.* (2010) classify location attributes in to three categories: those related to land use, socio-economic considerations and transportation. Location attributes may include factors such as access to public transport, schools and other community facilities and services (Greene & Ortuzar, 2002; Kauko, 2007; Tan, 2011; Yusuf & Resosudarmo, 2009). Louviere and Timmerman (1990) also suggest that economic and social ties, such as distance to relatives, friends and work, may be important. Environment attributes can include factors such as neighbourhood quality, cleanliness, environmental pollution, safety and security, green space, width of roads and street layout (Pasha & Butt, 1996; Rojas & Greene, 1995; Tan, 2011; Wang & Li, 2006).

The relative importance of such attributes to consumers has been a popular topic of investigation (Kauko 2006; Opoku & Abdul-Muhmin, 2010, which has created interesting debate and variable findings between countries. Table 1 provides a summary of some existing findings in various countries. Deeper discussion on more specific findings from existing research is offered within section 3, where comparisons between previous studies and the present one are made. It is apparent from the literature examined that consumer preferences can vary from country to country where social and cultural considerations can impact the relative importance/preference for different housing attributes.

It has been stated that the culture in Saudi Arabia is extremely different compared to many other countries with regard to housing preference (Bahammam, 2001). For example, in Middle Eastern countries, social values and religion have an impact on housing preferences and significantly affect consumers' choice of housing attributes. Privacy in the Middle East is of great importance as part of Islamic requirements, such as the strict separation required between males and females who are non-family members (Berween, 2002) and having distance between guests' outdoor space and the outdoor family entertainment space (Al-Kurdi, 2002). Accordingly, the design of the home is often in several parts, including a males' section, females' section and family section (Bahammam, 2001). Therefore, while there is an existing

body of literature on consumer preferences for housing attributes, this may not apply in the same way in the Saudi Arabian context. Furthermore, due to social and cultural changes in Saudi Arabia, it has been suggested that consumers are beginning to have different housing preferences and priorities (Opoku & Abdul-Muhmin, 2010). Understanding consumer preferences will therefore be a key aspect to solving the housing problem.

Table 1. Existing literature findings on housing attribute preferences

Area	Country (and Author)	Key findings on consumer attribute preferences
Europe	**Finland & Netherlands** (Kauko, 2006)	Location (accessibility and pleasantness) was more important than the housing itself (quality and spaciousness) in Finland (Helsinki). Contrastingly, functionality and spaciousness of housing was more important than location in the Netherlands (Randstad).
	Belgium, Netherlands & Luxembourg (Molin & Timmermans, 2003)	Housing and neighbourhood attributes were more important than location accessibility attributes.
	Netherlands (Molin, 1999)	Housing attributes were more important than location attributes.
	UK (Whitbread, 1978)	Housing attributes (such as quality) were more important than environment attributes.
Americas	**Mexico** (Fierro et al., 2009)	Housing attributes were more important than neighbourhood location attributes.
	Chile (Greene & Ortuzar, 2002)	Housing attributes (type of dwelling and building material) were more important than location.
Middle East	**Saudi Arabia** (Opoku & Abdul-Muhmin, 2010)	Intrinsic housing attributes (living space and aesthetics) were more important than location and environment (proximity to relatives, outdoor space, street location).
	Jordan (Al-Momani, 2000)	Intrinsic housing attributes (space, privacy and design) were generally most important. Type of community and location (proximity to services) were less important.
Asia	**Malaysia** (Kam et al., 2018)	Neighbourhood (cleanliness and safety) and location accessibility attributes were most important.
	Malaysia (Thaker & Sakaran, 2016)	Neighbourhood and location attributes were more important than structural housing attributes and home amenities.
	Malaysia (Moghimi & Jusan, 2015)	Intrinsic housing attributes were more important than external ones (and greater importance was given to functionality than aesthetical attributes).
	Indonesia (Rahadi et al., 2015b)	Location attributes were more important than housing attributes (such as housing design and quality).
	Malaysia (Tan, 2012a)	In terms of structural housing attributes, number of bedrooms and sustainable living features were most important. Neighbourhood environment and accessibility (access to schools, work, safety, cleanliness) were also important.
	Australia (Ratchatakulpat et al., 2009)	Interior design, maintenance and neighbourhood (standard of the neighbourhood, amenities, security and noise) were most important. Affluence and prestige/quality of the area were less important.

China (Jim & Chen, 2007)	Intrinsic housing attributes were more important than extrinsic ones.
China (Beijing) (Wang & Li, 2004)	Location and environment (such as accessibility, public services, environmental quality) were more important than housing attributes.

1.2 Consumer versus practitioner opinion

Tan (2012b) emphasise that housing developers should regulate their housing activities to suit households' needs and wants. Rahadi *et al.* (2015a) suggest that practitioners in the property industry have recognised the importance of understanding preference attributes relating to their products. For example, housing developers will have an improved reputation and brand if they can interpret what customers need (Rahadi, 2013). However, while there is a large body of research on the housing preferences of consumers themselves (as shown in the literature above), there is very limited research that compares the perception/preferences of consumers (who demand housing) with those of real estate practitioners (who are involved in the supply side). Rahadi *et al.* (2012) stress that studies on developer perceptions in residential products in general are considered rare. Thus, while housing practitioners may suggest they recognise the importance of understanding consumer preferences, empirical research would assist in testing whether the views of the two groups are actually aligned.

Some studies have begun to emerge in the international literature that compare professional and consumer opinion on issues related to this topic; for example, on the housing valuation process (Daly *et al.*, 2003; Naderi *et al.*, 2012) and on attributes that influence housing prices (Rahadi *et al*, 2015). While not specifically focused on housing attribute preference, Daly *et al.* (2003) compare the attitudes of the consumers and valuers (in UK, Ireland and Australia) to determine whether the valuation methods used by valuers account for buyer behaviour accurately. They found that this was not the case; they concluded that, although valuers believe buyer behaviour is an important part of the valuation process, they do not consider buyer preferences in practice. Aluko (2007) supports a similar view in the sphere of valuation practice. Naderi *et al.* (2012) also found inconsistencies between buyers/consumers and professional appraisers' views regarding the valuation appraisal of housing in Iran. They emphasise that the lack of conformity may result in consumers paying a higher price for amenities that may not be considered crucial from their perspectives. Naderi *et al.* (2012) stress that there are limited studies examining both demand- and supply-sides of the housing market simultaneously. This is particularly true with regards to preferences for housing attributes. Rahadi *et al.* (2015a) claim to be one of the first investigations to compare housing consumers' and property practitioners' views with regards to attributes that influence housing prices. In examining the relationship between housing preference factors and price, Rahadi *et al.* (2015a) found some discrepancies between residential consumers' and property practitioners' views. Overall, the study found housing consumers to be more concerned with the physical quality attributes of housing, while property practitioners were more concerned with location attributes (Rahadi *et al.*, 2015a). However, two populations placed similar emphasis on the attributes with the highest and lowest mean values, indicating there was also some alignment in their opinions (Rahadi *et al.*, 2015a).

1.3 Purpose

The aforementioned literature emphasises the importance of government, policy makers and developers/designers to understand and take account of consumer preferences with regard to housing provision. Rahadi *et al.* (2015) highlight that there is a need for further research to examine preference compositions for housing in other major cities and countries and also stress that it would valuable to develop further research on consumer and producer behaviour theories in the residential housing context. Furthermore, Naderi *et al.* (2012) emphasise that that there are limited studies examining both demand-side (consumer) and supply-side (practitioner) of the housing market simultaneously. It is apparent from the literature that research that specifically examines and compares the perception of property practitioners with consumers, with regard to housing attribute preference, is limited.

Given this research gap, and the severity of the housing crisis in Saudi Arabia, the purpose of this paper is to explore and determine customers' preferences for housing attributes and compare these with the views of property practitioners. The research question is therefore to assess whether the views of consumers and property practitioners in Saudi Arabia are aligned with regard to the importance of various housing attributes. This research will be the first to do so, contributing theoretically to the identified knowledge gap (Naderi *et al.*, 2012; Rahadi *et al.*, 2015) that exists internationally. Moreover, Rahadi *et al.* (2015a) emphasised that a limitation of their study was that it was limited to housing consumers and property practitioners in only one region (the Jakarta Metropolitan Region) of a country (Indonesia), whereas the present study will gather a broader range of views from several regions across a country (Saudi Arabia). Developing understanding in this regard should assist housing providers in planning and designing their products in line with the preferences consumers in order to create better quality homes and neighbourhoods that are successful in the long term.

2 Methodology

The study utilised a quantitative survey approach to collect primary data from consumers in Saudi Arabia regarding their preferences for housing attributes. A similar survey was also distributed to property professionals in order to gather their views on what they perceive housing consumers preferences to be and to allow contrast between the two groups' opinions. A survey approach was utilised as it is considered the fastest and most economical method of gaining statistical opinions and is able to address a large number of participants (Saunders *et al.*, 2012). Furthermore, their anonymity can encourage honesty and openness in responses (Murdoch *et al.*, 2014).

Two similar surveys (one for consumers and one for property professionals) were created using Bristol Online Surveys (BOS) and distributed electronically. The surveys proposed a mixture of nominal and ordinal questions. The consumer survey asked background questions including gender, age, income, region and current housing situation. The professional survey asked background questions on job role and region of employment. Respondents in both surveys were then presented with the same range of housing attributes and asked to indicate how important each is to housing consumers (i.e. consumers were indicating their own preference, while professionals were indicating what they perceived consumer preferences to be). A 5-point scale was used to rate the housing attributes from least important (=1) to most important (=5). A total of 33 housing attributes, established through literature review, were presented to participants and can be found in Appendix.

2.1 Analysis tools

The primary purpose of the data analysis was to calculate descriptive statics (e.g. mean rating of importance for each of the housing attributes) and also to identify if any significant differences in opinion on housing attribute importance exist between consumers and professionals. Exiting studies which have also sought to determine statistically significant differences (or similarities) between groups' opinions were consulted in order to verify an appropriate analysis tool to adopt. For example, when looking to compare consumer and property appraisers' views on the valuation of housing, Naderi *et al.* (2012) utilised the non-parametric Mann-Whitney U test. Whereas Aluko (2007) utilised the parametric ANOVA test to examine whether there were differences between estate surveyors and valuers in their interpretation of importance of property features to property value.

In order to select the appropriate statistical test to examine differences between groups in this study, it was therefore essential to establish if the data follows a normal distribution (Mulliner & Maliene, 2015). If so then parametric tests are appropriate for analysis. However, if data is not normally distributed then non-parametric tests are advised (Pallant, 2016). The Kolmogorov-Smirnov test was utilised to determine normality of the distribution of scores in the surveys (Field, 2009). The significance value for each variable in the surveys was $p<0.05$, indicating that data are not normally distributed and thus non-parametric tests had to be used for analysis. Accordingly, the Mann-Whitney U test was utilised to identify if any significant differences exist between consumers' and professionals' opinion on housing attribute importance.

3 Results and discussion

752 consumers and 101 practitioners completed the surveys. The demographic background data obtained from the surveys is displayed in Table 2. This reveals that 64% of consumers were male and 36% were female. Opoku & Abdul-Muhmin (2010) indicate that it can be more difficult to get females in Saudi Arabia to respond to questionnaires because of cultural issues, therefore it is not surprising that a lower response was obtained from females. A large proportion of the respondents were young (47% were under 30 years old), however this is representative of the population as over 60% are aged between 15 and 26 (Jeddah Economic Forum, 2013). The result shows that 68% of respondents earn less than SAR 12,500 (£2,100) monthly income. This result was expected as many Saudi Arabians are said to work in public administration jobs, education, health and public utilities, under the umbrella of the public sector, where they earn less than SR8,000 a month (about £1,300) (Samba Financial Group, 2010). Furthermore, the housing crisis in Saudi Arabia is more acute for low- and middle-income households therefore gathering the preference of such consumers is important. Practitioners with relevant expertise and experience in the housing sector were invited to participate. Senior roles and those with experience of at least 3 years were targeted. Practitioners working in the following areas of employment were targeted in order to gather a range of professional views:

- Real estate office (real estate agents)
- Development company (housing developers)
- Construction and design (contractors and architects)
- Government (those working in planning/housing departments)

Table 2 indicates the proportion of respondents from each group and reveals that a reasonable balance of responses was obtained from each employment role.

In terms of the region of both groups of respondents, the majority of the consumers and practitioners surveyed came from the main cities in Saudi (see Fig. 1 and 2 respectively). This is considered a representative sample since more than 80% of the population live in urban areas (Al-Shihri, 2016).

Table 2. Demographic Survey Data

	Consumers	Professionals
No. of responses	752	101
Gender		
Male	64%	
Female	36%	
Age		
18-30	47%	
31-40	36%	
41-50	10%	
+50	7%	
Marital status		
Married	58%	
Single	36%	
Monthly income (SAR)		
Up to 7,000	37%	
+7,000-12,500	31%	
+12,500-20,000	23%	
+21,000	9%	
Current housing type		
Flat	50%	
Detached house	11%	
Semi-detached house	39%	
Current housing tenure		
Owner occupier	46%	
Rented	54%	
Professional role		
Real estate office		30%
Development company		25%
Construction and Design		25%
Government		20%
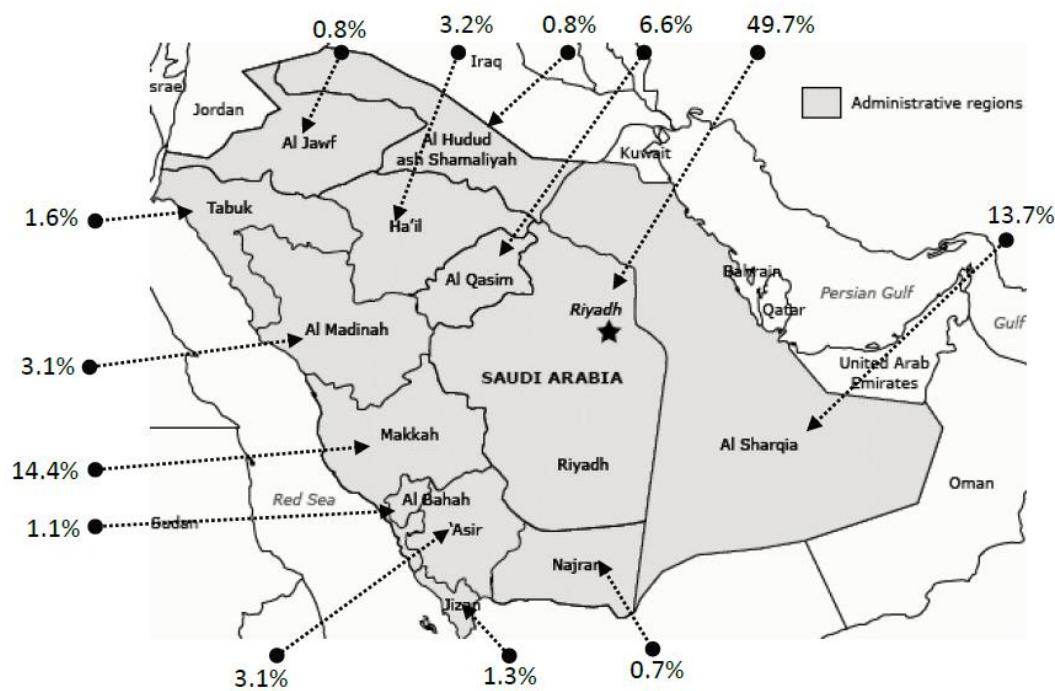
Fig. 1. Region of consumer respondents
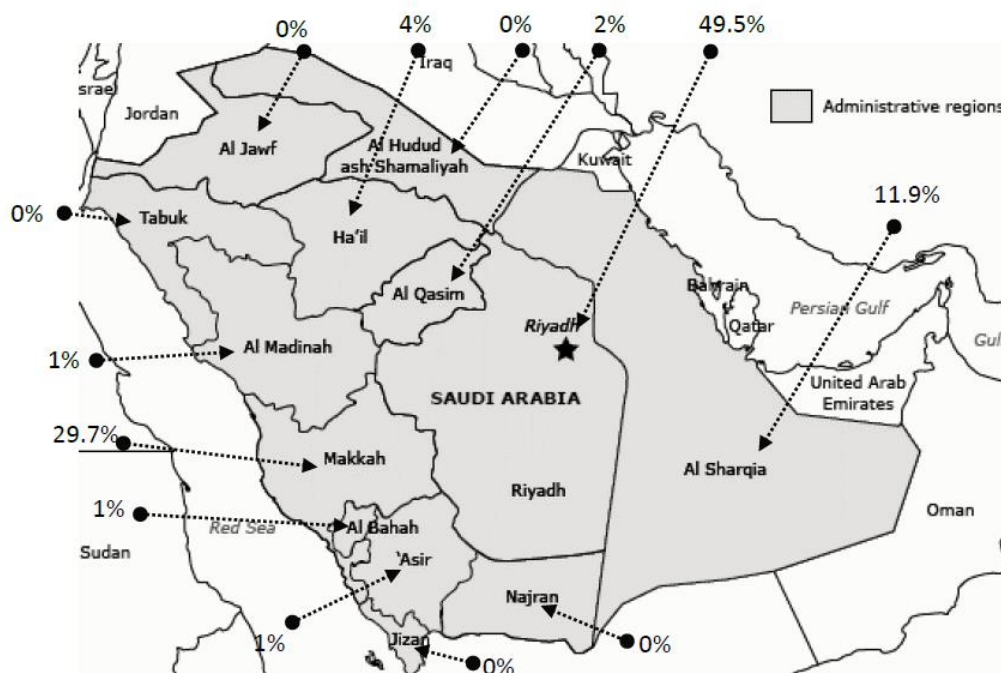
Fig. 2. Region of practitioner respondents

3.1 Analysis of housing attribute importance

Descriptive statistics were used to determine the average rating of importance given to each of the 33 housing attributes shown in the Appendix. Table 3 shows the mean rating of importance

that the consumers and professionals gave for each housing attribute. A higher score indicates a higher level of importance by the respondents; where 1 equals least import and 5 equals most important attribute. Results are arranged in overall rank order of importance based on the consumers' ratings (while professional ratings are shown for comparison, but not ordered). Based on the mean figures and rank order (which has also been colour coded), the differences and similarities between the views of housing consumers and professionals are illustrated.

From looking at the results in Table 3 it is evident that, on average, for the overwhelming majority of the attributes consumers gave higher ratings of importance than the professionals. It is also apparent that there is less diversity in the consumers' mean ratings of importance between the attributes ranked in highest and in lowest place; the mean scores range from 3.8 (rank 1) to 2.44 (rank 27). In contrast there was much more variation in the professionals' ratings of importance, which ranged from 3.32 (rank 1) to 0.99 (rank 29). This indicates that, on average, consumers place higher importance on many more housing attributes than the professionals think they do.

Extrinsic attributes

The **quality of the building and materials** used was the most important attribute overall to consumers, ranking in first place of all 33 attributes. Professionals also rated this attribute highly, but ranked slightly lower in four place overall. In terms of other extrinsic factors, consumers also placed high importance on the **quality of the exterior finishing** (rank five overall). This echoes other research conducted in Chile (Greene & Ortuzar, 2002) and Jordan (Al-Momani, 2003) that identified building materials used for the exterior as one of the most important variables for housing consumers. Building quality was also found to be important to consumers in Indonesia (Rahadi *et al.,* 2015b)**.** Chia *et al.* (2016) suggest that house features such as construction quality can have a significant relationship with house purchase intention, and that this could be due to the fact that it is tangible and easy for consumers to evaluate upon buying a house.

The **age of the building** was then ranked in seventh place overall by consumers. While ranked in similar position by professionals, the mean level of importance they assigned to this attribute was lower. The high importance placed on this attribute by consumers may be linked to perceptions of better quality buildings and materials in newer properties. For example, newer housing stock generally means better heat insulation (and hence lower heating costs) and less maintenance work (Hurtubia *et al.,* 2010). While, Tan (2011b) suggests that older properties are generally inferior in quality. Researchers have found that negative relationships exist between house prices and property age (Hui *et al.,* 2006; Jim & Chen, 2009).

The overall **lot size** was the next most important attribute to consumers in this category (but rank 14 overall). Tan (2012a) suggests that lot size is one of the most common structural characteristics that can affect home-buying preferences. Clark *et al.* (2006) suggest that most households wish to increase the size of their housing lot as it symbolizes more luxury, and is also a symbols of a person's status or position in society (Aldossary *et al.,* 2015). Moreover this provides opportunities for expansion in the future (Bahammam, 2001). In Pasha & Butt's (1996) study in Pakistan, plot size was ranked more highly than in this study; it was in top three most important attributes influencing housing choice. In contrast, Greene & Ortuzar (2002) concluded that size was not a particularly important attribute to homebuyers in Chile. Interestingly, the **aesthetics/appearance** of the house was given a similar mean rating of importance by both consumers and professionals, yet it ranked in much higher order with the

later (rank 3 for professionals and rank 17 for consumers). Al-Momani (2003) found exterior appearance to be a key influencing factor for Jordanian homebuyers. Other studies have also found exterior aesthetics and design to be very important to consumers (Bhatti & Church, 2004; Danko *et al.,* 1990; Opuku & Abdul-Muhmin, 2010).

Several other studies have found exterior space and gardens to be very important for home buyers (Al-Momani, 2003; Bhatti & Church, 2004; Tan, 2012a). Studies from countries in Europe and North America indicate that availability of garden or green spaces is now evolving into a crucial housing attribute and households are willing to pay more for this (Luttik, 2000; Tajima, 2003; Tan, 2012a). However, in the present study, a lower preference was found for **garden space** in comparison to other attributes by consumers (rank 22). This attribute received the same rank order by professionals, but again the mean rating of importance by this group was significantly lower. This echoes other research in Saudi Arabia and China that found housing consumers have a lack of concern for exterior space (Jim & Chen, 2007; Opuku & Abdul-Muhmin, 2010). As suggested by Opuku & Abdul-Muhmin (2010), this could be because of the extremely hot summer temperatures in Saudi Arabia which mean that there is less desire to be outside. The **number of building stories** received the same mean rating and ranking by consumers as garden space did, but an even lower rating by professionals. In contrast, having a single-story house was identified as one of the top ten most important attributes for Jordanian consumers (Al-Momani, 2003). The **number of parking spaces** was the lowest rated attribute in this category by both consumers and professionals. This is surprising given the high car dependency in Saudi. However, in contrast to some other counties (such as the UK and US) where planning policy often seeks to reduce car use and encourage public transport, this has not necessarily been the case in Saudi Arabia (Al-Fouzan, 2012). Al-Fouzan (2012) also suggests that there is no effective parking policy or parking management practices in place in Saudi. Thus, consumers may not be particularly concerned with problems related to a lack of parking spaces.

Intrinsic attributes

Kauko (2006) and Jim & Chen (2007) found that intrinsic attributes were more important than extrinsic ones to housing consumers in Holland and China. This finding is not replicated in this study as more of a mixture of extrinsic and intrinsic factors were identified in the top ranking attributes. In terms of intrinsic aspects, the results indicate that consumers thought **HVAC (heating, ventilation, air-con)** was the most important attribute in this category (ranked in third place overall). This was at variance with the rating of importance given by professionals, which was significantly lower (and ranked in 22nd overall). Given the very hot and aggressive environment in Saudi, there is a need for mechanical ventilation and air-conditioning in particular (Aldossary *et al.,* 2015). Aldossary *et al.* (2015) looked into energy consumption patterns in Saudi Arabia and found that over 73% of respondents in their study used air conditioning between 10 and 24 hours a day. Therefore, given the high reliance on this, it is not surprising that consumers found this to be a particularly important attribute. Following this, consumers thought a **functional and spacious layout** was the next most important attribute in this category (ranked sixth overall). Professionals also rated this attribute highly; in fact they ranked it as the most important overall. Other research has also identified the functionality and spaciousness of a home to be an important attribute to consumers (Al-Momani, 2003; Kauko, 2006).

Table 3. Comparison of consumer and professional preferences for housing attributes

Attribute	Attribute category	Consumer		Professional		Significant difference (Mann-Whitney)
		Mean	Rank order	Mean	Rank order	
Building quality and materials used	Extrinsic	3.8	1	3.18	4	Yes = Con >Prof
Neighbourhood safety	Location and environment	3.7	2	2.57	11	Yes = Con >Prof
HVAC	Intrinsic	3.54	3	1.36	22	Yes = Con >Prof
Cleanliness of neighbourhood	Location and environment	3.53	4	2.36	14	Yes = Con >Prof
Quality of exterior finishing	Extrinsic	3.52	5	2.91	6	Yes = Con >Prof
Neighbourhood quality	Location and environment	3.52	5	2.58	10	Yes = Con >Prof
Functional and spacious layout	Intrinsic	3.51	6	3.32	1	Yes = Con >Prof
Age of building	Extrinsic	3.47	7	2.79	8	Yes = Con >Prof
Insulation	Intrinsic	3.46	8	1.71	20	Yes = Con >Prof
Land not flood prone	Location and environment	3.41	9	1.24	24	Yes = Con >Prof
Air quality	Location and environment	3.39	10	1.34	23	Yes = Con >Prof
Privacy	Intrinsic	3.34	11	2.54	12	Yes = Con >Prof
Natural light/ brightness	Intrinsic	3.32	12	1.22	25	Yes = Con >Prof
Private spaces for family	Intrinsic	3.23	13	2.20	15	Yes = Con >Prof
Overall lot size	Extrinsic	3.19	14	2.79	8	Yes = Con >Prof
Number of bedrooms	Intrinsic	3.18	15	2.76	9	Yes = Con >Prof
Number of bathrooms	Intrinsic	3.13	16	2.06	17	Yes = Con >Prof
House size	Intrinsic	3.12	17	2.09	16	Yes = Con >Prof
Aesthetics/ appearance	Extrinsic	3.12	17	3.20	3	No
Distance to schools	Location and environment	3.06	18	2.02	18	Yes = Con >Prof
Distance to shopping and leisure services	Location and environment	3.02	19	3.31	2	Yes = Prof >Con
Modern internal design	Intrinsic	2.87	20	2.99	5	No
Sustainability of the building	Intrinsic	2.87	20	1.18	26	Yes = Con >Prof
Distance to family	Location and environment	2.86	21	2.86	7	No
Garden space	Extrinsic	2.79	22	1.48	21	Yes = Con >Prof

Number of stories	Extrinsic	2.79	22	1.93	19	Yes = Con >Prof
Neighbourhood prestige	Location and environment	2.75	23	2.44	13	Yes = Con >Prof
Size of windows	Intrinsic	2.62	24	1.12	27	Yes = Con >Prof
Space for visitors	Intrinsic	2.61	25	2.57	11	No
Number of parking spaces	Extrinsic	2.6	26	1.06	28	Yes = Con >Prof
Access to public transport	Location and environment	2.44	27	1	29	Yes = Con >Prof

Rank order colour key

1-5	6-10	11-15	16-20	20-25	26+

Insulation was then ranked in eighth place overall by consumers. Albeit this was at variance with the rating and ranking given by professionals which were significantly lower (rank 20). Thermal insulation can be used to protect buildings from excessive heat during peak summer time in Saudi. Therefore, like with HVAC, consumers appear to place high importance on their thermal comfort in the home. Spetic *et al.* (2005) also found that consumers in Canada were willing to pay for house materials which promote better insulation.

Privacy (e.g. from neighbours and visitors) and **private spaces for family** were ranked in positions 11 and 13 respectively by consumers. The issue of privacy and private living space has previously been found to be very important in housing preferences in Islamic environments (Abu-Gazzeh, 1995, Djebarni & Al-Abed, 2000; Opoku & Abdul-Muhmin, 2010; Tan, 2012a). This is linked to Islamic tradition and religion which prohibits socialization of both genders in one place. Homes are therefore often designed in several parts, including separate sections for males, females, the family and guests (Aldossary *et al.*, 2015; Bahammam, 2001). **Access to natural light/brightness** was ranked in 12th place by consumers, but significantly lower by professionals (rank 25). Other studies in Asian countries have identified ample levels of sunlight penetration to be a primary factor influencing housing preferences (Tse & Love, 2000; Wang & Li, 2006). Spetic *et al.* (2005) found that consumers in Canada were also willing to pay for house materials which promote natural light.

Next in importance in this category were the **number of bedrooms** and **number of bathrooms** which received similar mean ratings of importance by consumers (and ranked in 15th and 16th place respectively). In contrast, professionals placed more importance on the number of bedrooms (rank 9) than bathrooms (rank 17). In Pakistan the number of bathrooms was ranked more highly, being one of the top three most important attributes influencing housing choice (Pasha & Butt, 1996). Tan (2012a) also suggests that the number of bedrooms and bathrooms are two of the most common structural characteristics that can affect home-buying preferences. Research in Malaysia and Saudi Arabia suggests that consumers place high importance on the number and size of bedrooms and bathrooms because they relate to improvements in privacy (Omar *et al.,* 2012; Opoku & Abdul-Muhmin, 2010). It has been suggested that most consumers want a large number of bedrooms in their homes (Al-Otaibi, 2004). While Opoku & Abdul-Muhmin (2010) found the number of bedrooms to be a critically important factor for housing consumers in Saudi, their study did not investigate this further to establish how many or what size bedrooms consumers prefer. The research suggested that collecting more specific data on this is crucially important for effective housing design in Saudi Arabia (Opoku &

Abdul-Muhmin, 2010). Consequently, the survey in the present study asked additional questions in order to establish more specific preferences for attributes such as bedrooms number and size (Table 4). In the present study, 66% of consumers selected a preference for at least five bedrooms. This is not surprising when looked at in conjunction with the average family size of six persons in Saudi Arabia (Salam *et al.,* 2014). However, contrastingly, the higher majority of professionals thought that consumers would prefer fewer (three or four) bedrooms. With regard to the size of bedrooms, most professionals (68%) thought buyers prefer a size of 4*4m. However, the most popular size preference selected by the consumer respondents (38%) was for a lager room size of 4*5m.

Table 4. Bedroom and house size preference

	Consumer %	Professional %
House size (m²)		
Up to 200	3	12
250-300	10	48
350-450	37	32
500-700	43	8
+700	7	0
Number of bedrooms		
1	0	0
2	0	5
3	5	55
4	29	32
5	35	8
+5	31	0
Bedroom size (m)		
3*3	2	1
3*4	10	12
4*4	24	68
4*5	38	16
5*5	20	3
+5*5	6	0

House size was then ranked in similar position by consumers (rank 17) and professionals (rank 16), but consumers still placed a significantly higher mean level of importance on this attribute. In many other studies, size of space has been identified as a key attribute for homebuyers (Al-Momani, 2003; Hurtubia *et al.,* 2010; Kowaltowski & Granja, 2011; Pasha & Butt, 1996; Tan, 2012a). However, Greene & Ortuzar's (2002) study in Chile found that, in general, size did not appear to be an important attribute to consumers. As with number and size of bedrooms, the surveys also asked an additional question in order to establish more specific preferences for house size (Table 4). The most popular preference by consumers (43%) was for an overall house size of between 500-700m², whereas far fewer indicated a preference for dwellings of less than 300m². However, this was in contrast with professionals who mostly (48%) indicated that they though consumers would prefer smaller houses of 250-300m². However, around a third of both consumers and professionals selected 350-450m²as the preferred house size.

The issue of sustainability is becoming ever more important in many housing markets around the world (Choguill, 2008; Mulliner & Maliene, 2011; Taleb & Sharples, 2011; Tan, 2011a). A study in Canada found that consumers are willing to pay for house materials which promote energy efficiency (Spetic *et al.,* 2005) and Rahadi *et al.* (2015a) found a high preferences for a 'green concept' by consumers in Indonesia. However in this study, the **sustainability of the building** was ranked 20th by consumers and even lower (26th) by professionals. It has been suggested that the issue of energy efficiency is not generally given serious consideration with regard to building design in Saudi Arabia (Taleb & Sharples, 2011). There is said to be limited acceptance of sustainable buildings due, in part, to the low price of electricity and lack of an energy regulatory framework for the built environment in Saudi Arabia (Aldossary *et al.,* 2015; Aldossary & Rezgui, 2017). This may thus lead to lack of information and awareness about the benefits that green buildings can provide to consumers, which consequently reduces their demand in the market (Bahammam, 2001; Patel & Chugan, 2013). Despite this, it is interesting that consumers rated **insulation** and **natural light** with higher importance and these factors are often linked to energy efficiency and, consequently, sustainability. Al-Shihri (2016) suggests that it is crucial to educate housing stakeholders and the general population in Saudi Arabia about the benefits of sustainable urbanisation.

Modern internal design received a similar mean rating of importance by both professionals and consumers, but it ranked in very diverse positions by each group (rank 20 by consumers and rank 5 by professionals). It appears that professionals rated aspects related to design and aesthetics more highly than they rated many other housing attributes. While the design and location of windows in a home could be linked to access to natural light, consumers placed less importance on the **size of windows** (rank 24 overall) and professionals rated this even lower again (rank 27). This could be linked to issues of privacy from neighbours if consumers have perceived windows to perhaps reduce it. Finally, **space for visitors** was rated with similar mean ratings of importance, but diverse rank orders, by consumers (rank 25) and professionals (rank 11). However, consumers found this attribute to be less important than private spaces for the family, whereas professionals found it to be slightly more important than private space for the family.

Location and environment

In terms of the location and environment related attributes, **neighbourhood safety** was considered to be the most important attribute to consumers (and the second highest ranked attribute overall). Research in China also found some neighbourhood and location attributes to be more important to consumers than intrinsic dwelling attributes (Wang & Li, 2006). This finding is also echoed by Tan (2011a; 2013) and Kam *et al.* (2018) who found that safe and secure neighbourhoods were particularly important to Malaysian consumers. Consumers then rated **cleanliness of the neighbourhood** and **neighbourhood quality** in overall rank order 5 and 6 respectively, indicating a high level of importance for these attributes. Al-Momani (2003) also found that a high quality neighbourhood was one of the top ten attributes for Jordanian housing consumers. Studies in Turkey (Dokmeci *et al.,* 1996) and Malaysia (Kam et al., 2018; Tan, 2013) also found consumers to be concerned with the cleanliness of the neighbourhood. Consumers then placed similar levels of importance on **land not being flood prone** (rank 9) and on the **air quality** in the environment (rank 10). Yusuf & Resosudarmo (2009) also found air quality to be important to households in Indonesia. Previous studies have found environmental factors to be important determinants of householders' purchase decisions (Opoku & Abdul-Muhmin, 2010; Razak *et al.,* 2013; Tan, 2011a). Tan (2011a) suggests that households are willing to pay more for a house in a neighbourhood with good environmental

qualities. However, in comparison to the consumers, the professionals in this study rated the aforementioned environment attributes with much lower mean ratings of importance.

Several researchers have identified location as one of the most important factors for housing consumers' (Adair *et al.,* 1996; Daly *et al.,* 2003; Kauko, 2006; Sengul *et al.,* 2010) and this is often related to accessibility to various amenities and facilities (Wang & Li, 2004; 2006). In contrast, Greene & Ortuzar (2002) found the location of the building to be one of the least important attributes to consumers in Chile. Huturbia *et al.* (2010) make comparisons between the preferences of consumers in Europe and the United States in this regard. They suggest that the higher density and smaller housing units observed in European cities may mean that access to amenities, services and parking lots have a stronger effect in the attractiveness of a location in contrast to the US. In this study, attributes related to accessibility of the location were rated slightly lower by consumers than the environment related attributes noted above. **Distance to schools** (rank 18) and **distance to shopping and leisure services** (rank 19) were rated and ranked very closely in terms of importance by consumers. However, professions rated access to schools with a much lower level importance, despite the overall rank order being similar to that of consumers. Distance to shopping and leisure was actually the only attribute that professionals placed a statistically significantly higher rating of importance on in comparison to consumers; in stark contrast, this was ranked as second most important attribute by professionals. This was followed by **distance to family**, which was given the same mean rating of importance by both consumers and professionals. However, despite this, the overall rank order of importance was remarkably different (rank 21 for consumers and rank 7 for professionals). Similarly, Opoku & Abdul-Muhmin (2010) found that proximity to relatives was one of the less important factors to low-income Saudi Arabian consumers. This contrasts with other studies, such as in Turkey and Indonesia, which found that a location close to family to be an important attribute to consumers (Dokmeci *et al.*, 1996; Hurtubia *et al*., 2010; Rahadi *et al.,* 2015b).

The lowest rated housing attribute overall for both consumers and professionals was for **access to public transport.** This reflects the lack of public transport use in Saudi Arabia. The current public transport system is said to be very limited with poor quality services so there is thus a high dependency on private car use; less than 2% of the urban population use public transport services (Al-Fouzan, 2012). Other studies have found access to public transport to be much more relevant in areas where public transport is better quality and there are fewer parking spaces (such as in European cities) (Hurtubia *et al*., 2010).

The high car dependency in Saudi Arabia may also be a reason why the consumers did not place higher levels of importance on accessibility to other amenities and facilities, since there is less desire to be able to reach these on foot or via public transport, as is the case in some other counties (e.g. see Wang & Li (2006)) where the accessibility of the location is found to be particularly important to consumers. Furthermore, car operating costs in Saudi are low by global standards, along with very low fuel prices and car tax (Al-Fouzan, 2012). These factors may contribute to meaning the consumers have less regard for travel distance to amenities and facilities in comparison to consumers in some other countries. This supports suggestions made by Molin & Timmermans (2003) who posit that, as long as people are able to afford flexible means of transport, accessibility does not have significant influence on housing choice behaviour.

3.2 Mann-Whitney U test: Consumer versus professional preferences

The Mann-Whitney U test was utilised to determine if the differences between consumer and professional ratings of housing attribute importance were statistically significant. Table 3 indicates weather a significant difference was found between the groups for each attribute and indicates which group placed higher importance than the other (represented by the ">" symbol). There were no statistically significant difference found between consumer and professional ratings of importance with regards to four of the housing attributes: 'distance to family', 'exterior aesthetics/appearance', 'modern internal design' and 'space for visitors'. This indicates that both consumers and professionals placed similar levels of importance on such attributes. However, and more strikingly, there was a statistically significant difference found between consumer and professional ratings of importance for all other housing attributes. For the remaining 27 attributes the Mann-Whitney test yielded a significance value of $p=.000$, indicating the views of consumers and professionals differ in a statistically significant sense. For '*access to shopping and leisure services*' professionals gave a significantly higher rating of importance than consumers. However, with regard to the other 26 remaining attributes that yielded a significant Mann-Whitney result, the consumers gave statistically significantly higher ratings of importance than professionals did. This indicates that, on average, consumers placed significantly higher importance on many more housing attributes than the professionals think they do.

4 Discussion and conclusion

The purpose of this study was to investigate consumer preferences for various housing attributes in Saudi Arabia and to compare these to the views of property practitioners, in order to identify whether opinions are aligned. As evidenced by the literature, delivering housing that matches user preferences is essential for providing quality and successful housing projects. Given the severity of the housing crisis in Saudi Arabia at present, gaining deeper understanding of consumers' preferences for housing attributes is important in assisting to devise appropriate housing solutions that are successful in the long term.

A quantitative survey, conducted with 752 consumers and 101 property practitioners across Saudi Arabia, was utilised to gather the data. Respondents rated 33 housing attributes based on their perceived importance to the housing consumer. The findings suggest quite significant discrepancies between consumers' and property practitioners' views on what consumers believe are important housing attributes. According to the analysis, for 27 of the housing attributes, consumers and professionals gave diverse mean ratings of importance (in a statistically significant sense). Consumers placed statistically significantly higher importance on 26 housing attributes in comparison to the ratings given by professionals; the reverse was true for only one attribute. The general feeling of importance was higher for consumers than professionals for many housing attributes, as reflected by higher mean score and less diversity in the consumers' ratings between the most and least important attributes.

Consumers placed most importance on attributes related to building quality and exterior finishing, thermal comfort, and aspects related to the surrounding environment. Consumers appeared less concerned with external space and location attributes that related to accessibility and distance to services, family and public transport. The high importance given to building quality and exterior materials to consumers supports previous findings in Chile, Jordan and Indonesia (Al-Momani, 2003; Greene & Ortuzar, 2002; Rahadi *et al.*, 2015b). The findings are also consistent with previous studies in China and Malaysia which indicate that neighbourhood quality attributes (such as safety and cleanliness) are particularly important to consumers (Kam *et al.*, 2018; Wang and Li, 2004). However, in contrast to these two studies and others (Tan,

2012a; Thaker & Sakaran, 2016), consumers in Saudi Arabia had less regard for location attributes that related to access/distance to amenities and public transport. The findings in the present study are more in line with research conducted in the Middle East, Mexico, Chile and the Netherlands, which found locational accessibility attributes to be less important to consumers (Al-Momani, 2000; Greene & Ortuzar, 2002; Fierro *et al.,* 2009; Molin & Timmermans, 2003; Opoku & Abdul-Muhmin, 2010). This study appears to support the view that accessibility is not as significant in housing preferences where consumers are able to afford flexible means of transport (Molin & Timmermans, 2003) and where public transport is not of high quality (Hurtubia *et al.,* 2010). This study is also consistent with other research in the Middle East and Asia, which found consumers to have less concern for exterior space (Jim & Chen, 2007; Opoku & Abdul-Muhmin, 2010).

In contrast to consumers, practitioners in this study placed highest importance on internal layout and design, access to services, building quality and exterior finishing. Professionals were much less concerned with factors such as access to public transport and parking, and attributes related to sustainability and thermal comfort. Therefore, whilst building quality and exterior finishing were of high importance and public transport was of low importance to both groups, their preferences for many other attributes varied significantly. This is consistent with some of the findings by Rahadi *et al.* (2015a) who indicate some discrepancies in the views of the two groups with regard to housing price preferences in Indonesia; they similarly found that practitioners were more concerned with location attributes in comparison to housing consumers, whereas consumers were more concerned with physical housing quality attributes. However, Rahadi *et al.* (2015a; 2015b) also suggests that some strong connections exist between the preferences of each group. In contrast to the present study, it appears that Rahadi *et al.* (2015a) found more similarity between the two groups in their study when analysing the attributes with the highest and lowest mean values/importance. While the other existing comparative studies between housing consumers and practitioners (such as on housing valuation) are not specifically focused on housing attribute preferences, the present findings do draw some similarities with such studies in that they generally concur that consumer views are not necessarily well reflected in the view of practitioners (Aluko, 2007; Daly *et al.,* 2003; Naderi *et al.,* 2012). Since there are a very limited number of studies internationally which specifically compare consumer and practitioner perception with regard to housing attribute preferences, the lack of alignment between the two groups in this study is significant.

This study therefore extends the existing theoretical knowledge on housing attribute preference studies. Despite the vast amount of research on housing preferences, most empirical studies in the international literature only investigate consumer preferences (demand side) for housing attributes; there seems to have been relatively little attention given to comparing these to the views of real estate practitioners who are involved on the supply side of the products. This study therefore contributes theoretically to this identified knowledge gap by comparing the views of these two groups. Based on this study, Fig 3. presents a framework to represent this idea, where preferences from both sides (consumer and practitioner) are examined in order to determine whether final housing products are likely to meet consumer needs and contribute to housing satisfaction in the future. This research is the first to compare housing consumers' and property practitioners' preferences for housing attributes in Saudi Arabia and it contributes to the fairly limited research in the Kingdom on consumers' housing preferences generally. In Fig.3 the top raking housing attributes in the Saudi Arabian context are highlighted, helping to indicate were gaps in opinion may needs to be addressed. While this represents findings from Saudi Arabia, it presents opportunities for further research to use this framework elsewhere.
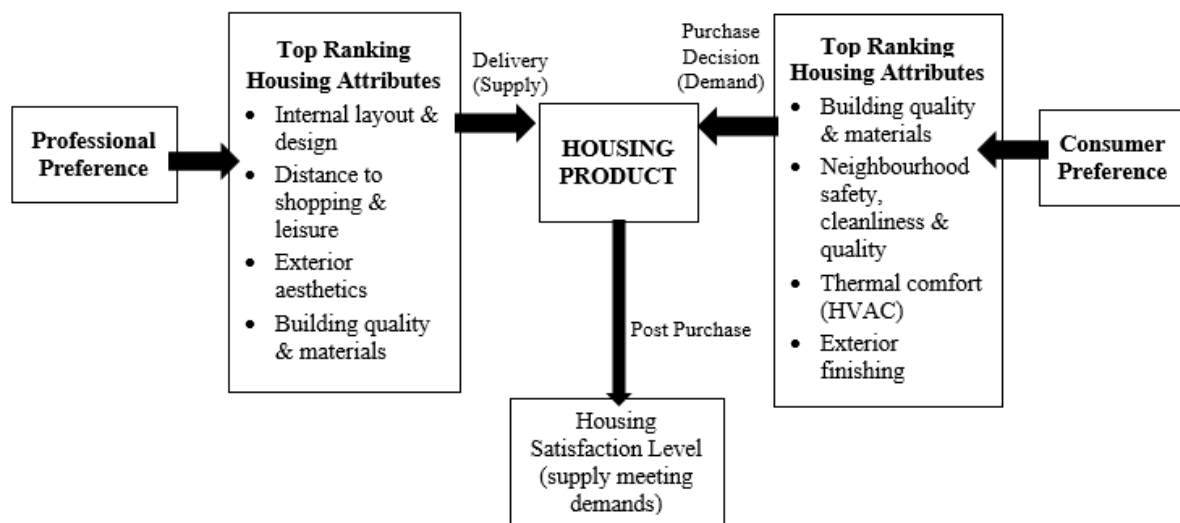
Fig. 3. Consumer and Practitioner Housing Preference Framework

It would be beneficial if further research was conducted in other countries to gain a broader understanding of whether consumer and practitioner views and preferences for housing attributes are better aligned elsewhere. From a theoretical and methodological stance, this study could be replicated in other counties or regions so that the conclusions in this study can begin to be compared and a broader understanding of this issue internationally can be obtained. Subsequently, such findings could be linked with post-occupancy consumer satisfaction studies in order to identify whether consumers are more (or less) satisfied with their housing products within countries/regions where consumer and practitioner views are well (or not well) aligned with regard to stated housing preferences.

Form a practical perspective, the findings in this study are expected to contribute to housing practice by providing key housing stakeholders in Saudi Arabia (such as government, real estate developers and designers) with the necessary information to better understand consumer preferences for housing attributes and to make more informed decisions concern housing. At present it seems that the views of the two are not well aligned. Thus, the results should be valuable in identifying and bridging the gaps between the views of the two groups (see Fig. 3), and to help create a more effective user-oriented housing delivery system. This information should assist in some way in helping providers devise more appropriate housing solutions/projects. It is important that housing developments are sensitive to consumers' housing priorities in order to avoid the creation of inappropriate living environments and, potentially, slums.

Appendix A

ATTRIBUTES	REFERENCE
Location & Environment	
Distance to family	Kauko (2006); Opoku & Abdul-Muhmin (2010)
Neighbourhood quality	Adair *et al.* (1996); Al-Momani (2003); Kauko (2006); Parkes *et al.* (2002); Tan (2011a); Yusuf & Resosudarmo (2009); Zabel & Kiel (2000)
Neighbourhood safety	Adair *et al.* (1996); Jabareen (2005); Karim (2008); Tan (2011a)
Cleanliness of neighbourhood	Dokmeci *et al.* (1996); Tan (2011a)
Distance to school	Clark *et al.* (2006); Pasha & Butt (1996); Tan (2011b)
Distance to retail & leisure services	Bahammam (2001); Tan (2011b); Greene & Ortuzar (2002); Yusuf & Resosudarmo (2009)
Access to public transport	Tan (2011b); Greene & Ortuzar (2002); Pasha & Butt (1996); Yusuf & Resosudarmo (2009)
Neighbourhood prestige	Earnhart (2002); Bahammam (2001)
Air quality	Hofman *et al*. (2006); Zabel & Kiel (2000); Yusuf & Resosudarmo (2009)
Land not flood prone	Earnhart (2002)
Extrinsic attributes	
Building quality & materials used	Greene & Ortuzar (2002); Opoku & Abdul-Muhmin (2010); Dokmeci *et al*. (1996)
Quality of finishing	Dokmeci *et al*. (1996)
Aesthetics /appearance	Bahammam (2001); Danko *et al.* (1990) ; Opoku & Abdul-Muhmin (2010)
Age of the building	Dale-Johnson & Phillips (1984) ; Hofman *et al*. (2006); Tan (2011b)
Overall lot size	Bahammam (2001); Clark et al. (2006); Opoku & Abdul-Muhmin (2010); Pasha & Butt (1996); Tan (2012a)
Number of stories	Al-Momani (2003)
Garden space	Bhatti & Church (2004); Hurtubia *et al*. (2010); Tan (2012a)
Number of parking spaces	Fontenla et al. (2009); Hofman et al. (2006)
Intrinsic attributes	
House size	Bhatti *et al.* (2004); Clark *et al.* (2006); Dale-Johnson & Phillips (1984); Pasha & Butt (1996)
Functional and spacious layout	Al-Otaibi (2004); Greene & Ortuzar (2002); Kauko (2006); Opoku & Abdul-Muhmin (2010)
Modern internal design (e.g. open plan)	Al-Otaibi (2004)
Privacy (e.g. from neighbours and visitors)	Al-Kurdi (2002); Djebarni & Al-Abed (2000); Opoku & Abdul-Muhmin (2010)
Number of bedrooms	Al-Otaibi (2004); Dale-Johnson & Phillips (1984); Hurtubia *et al*. (2010); Kauko (2006); Tan (2012a)

Number of bathrooms	Al-Otaibi (2004); Hurtubia *et al.* (2010); Kauko (2006); Pasha & Butt (1996); Tan (2012a)
Private spaces for family	Al-Kurdi (2002); Bahammam (2001); Parkes et al. (2002)
Space for visitors	Berween (2002); Parkes et al. (2002)
Size of windows	Parkes et al. (2002)
Access to natural light/brightness	Spetic *et al.* (2005); Dokmeci *et al.* (1996)
HVAC (heating, ventilation, air-con)	Aldossary *et al.* (2015); Bitter *et al.* (2007)
Insulation	Spetic et al. (2005)
Sustainability of the building	Spetic *et al.* (2005); Dokmeci et al. (1996)

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