

## Article

# Public Open Spaces Evaluation Using Importance-Performance Analysis (IPA) in Saudi Universities: The Case of King Abdulaziz University, Jeddah

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**Abstract:** Public open spaces (POSs) provide multiple services (such as facilities for physical activities and social interactions) to local people, and these services are important for the well-being of society and for improving the quality of life. Extensive research on POSs has been carried out in developed countries (such as the US and Australia, as well as European countries including Spain, France, and Germany). However, POSs in the Saudi Arabian context remain unexplored. This study aims to examine the importance and performance of public open spaces on King Abdulaziz University (KAU) campus, Jeddah city, Saudi Arabia, using importance-performance analysis (IPA). One-way ANOVA and Kruskal–Wallis tests were performed to identify differences in the importance and performance of POSs. It was observed that there are significant differences between the importance and performance of public open spaces on the KAU campus, as perceived by stakeholders. Therefore, this study may be helpful in understanding the importance and performance of public open spaces, allowing spaces to be prioritized to improve management and restore open spaces to achieve environmental sustainability at a local scale. In addition, this study suggests that decision-makers involved in campus planning should consider the contribution of public open spaces to education, recreation, and the environment, at the campus planning stage.

**Keywords:** Saudi Arabia; public open space; King Abdulaziz University; importance-performance analysis; discrepancies



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## 1. Introduction

A public open space (POS) can be defined as “an area or place that is open and accessible to all the citizens, regardless of gender, race, ethnicity, age or socio-economic level”. The prime function of a POS is to provide satisfaction to its stakeholders [1]. POSs are important not only for improving the quality of a city, but they also play a crucial role in the well-being of stakeholders [2,3]. The role of POS is also significant to environmental sustainability, and city planners and policy-makers must consider the contribution of POS to sustainable urban development [4]. Over the last few decades, rapid urban expansion, and land use and land change (LULC) have resulted in the substantial deterioration of POSs. Thus, many cities, particularly in developing countries, face difficulties in the sustainable management of POSs [5–7]. Apart from these difficulties, there are many barriers related to the protection and maintenance of POSs, which require the involvement of local authorities as well as inhabitants [5]. The United Nations (UN) developed sustainable development goals (SDGs), which include the need to address socio-economic and environmental dimensions of POSs and to interconnect POSs and balance these dimensions [8]. Target 11.7 sets a goal for 2030 for providing universal access to safe and inclusive POSs, particularly for children, older people, women and disabled people [8]. Many previous research studies have considered POSs in an urban context to improve the quality of life

of city dwellers, achieving social, environmental, health, and economic benefits [9–19]. Across the world, most of the studies examining the roles of POSs and stakeholder needs and perceptions have been carried out in other countries, particularly in Europe and the US [19,20]. However, few studies have been performed on POSs in the Saudi Arabian context [21], and no studies have assessed the importance and performance of POSs and the discrepancies between importance and performance.

Effective planning is necessary for the management and restoration of POSs, to deal with the allocation of a variety of land uses to ensure environmental sustainability [22,23]. Furthermore, the presence of POSs within the urban environment is important for improving the livability of urban dwellers [24]. Particularly in high-density urban environments, the provision of POS is necessary for maintaining a good quality of life and achieving sustainable development [25]. Recently, a lack of awareness and effective management and maintenance of POSs has resulted in their underutilization. The degradation of POSs due to poor management affects stakeholder focus on the creation and improvement of POSs, and so understanding the role of POSs (importance to stakeholders' daily lives) plays a key role in the management, maintenance, and proper planning of POSs. In particular, understanding the role of POS at a local level, such as a university campus, is crucial to enhancing education, the environment, and social cohesion. For this research, the King Abdulaziz University (KAU) campus in Jeddah city was selected, to examine the role of POS using importance-performance analysis (IPA) based on stakeholder perceptions, identifying differences between importance and performance that can inform planning strategies.

A review of previous studies revealed some notable gaps, and this inspired us to perform the present study. Firstly, most existing studies relate to developed nations (particularly Western cities), where POS has been given priority in order to enhance the resilience of cities and promote sustainable planning, thus improving the management of POSs [21,26–33]. However, in developing nations such as Saudi Arabia, POSs are still a work in progress, and limited attention has been paid to their effective management. Secondly, in the context of Saudi Arabia, most studies have examined people-spaces attachment and proposed planning changes to enhance POSs without addressing the differences between POS importance and performance and associated prioritization [34–36]. Thirdly, in previous research, POSs have been assessed on a city-scale in Saudi Arabia [21,32]; to the best of our knowledge, no studies have been conducted on a local scale (such as the university level). Considering these research gaps, the present study aims to evaluate the value of POSs as perceived by stakeholders, using IPA, at King Abdulaziz University, Jeddah city, Saudi Arabia.

IPA was developed to examine the satisfaction level of customers [37,38], and has been widely used in the fields of tourism management, healthcare services, education, and ecosystem services [39–45]. One of the main advantages of the IPA method is that it uses importance and performance to reveal satisfaction levels. Ratings for the importance and performance of POSs are crucial in determining management strategies. POSs with high importance but low performance require a relatively high priority in decision-making to enhance stakeholder satisfaction levels [46,47]. According to Larson et al. [48], IPA is a valuable technique in helping to improve environmental and natural resources management. Nonetheless, few empirical studies deal with the assessment of the perceived importance and performance of POSs in the context of Saudi Arabia, or examine the satisfaction level of stakeholders. To the best of our knowledge, no previous studies have examined the importance and performance of POSs at a local level. In this study, IPA has been used in a systematic analysis of the importance and performance of POSs at KAU. Apart from IPA, post-occupancy evaluation (POE) has also been applied to assess the satisfaction level of the stakeholders within the university campus. According to Baird [49] (2001), post-occupancy evaluation (POE) is defined as “a generic term for a variety of general programs and procedures as well as specific techniques for the evaluation of existing buildings and facilities”. Assessments of the performance of a building using POE are pervasive in green building development [50–52]. A systematic evaluation of the occupant's perception can be analyzed using POE [50]. Apart from architecture and buildings aspects [53–56], POE

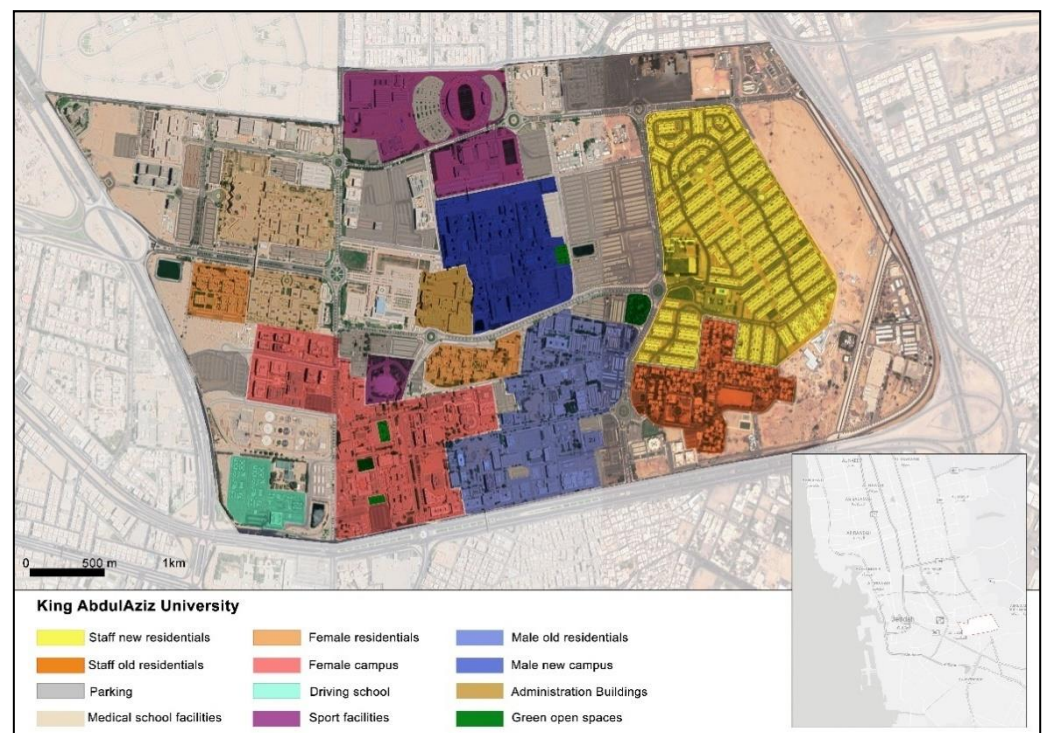
methods have been widely applied in the fields of residential satisfaction, housing facilities and thermal environmental assessment [53–55,57–59]. However, although POE methods have been widely used, no studies have been performed to assess the satisfaction level of public open spaces (POSs) for the sustainable management as well as restoration of POSs.

The objective of this paper is to determine satisfaction with POSs among university stakeholders (students, faculty members, non-teaching staff, and visitors) in their daily lives within the KAU campus. Based on respondent perceptions, importance and performance scores for each POS were calculated.

## 2. Materials and Methods

### 2.1. Study Area

KAU was established in 1967 and has an area of 9 km<sup>2</sup> (2224 acres), extending between 21°29' N and 21°30' N latitude and 39°14' E and 39°16'0 E longitude. The university buildings were developed from natural stone, bricks, and concrete at the time of its establishment. Over time, new buildings have been constructed to improve the educational facilities and accommodate students. The university comprises faculty buildings, classrooms, administrative buildings, a university hospital, a central library, and labs, as well as sports and equestrian facilities (Figure 1). According to Addas et al. [60], there are eight major gardens in KAU, of which five are located on the female campus and three on the male campus. POSs account for 0.62% of the total area of the campus.



**Figure 1.** Location map of the study area showing the main land use patterns of King Abdulaziz University.

### 2.2. Methods

#### 2.2.1. Identification and Classification of Public Open Spaces

People perceive the importance of a POS in different ways, such as from recreational, environmental, or educational perspectives. The perceived value of a POS may vary over time, based on its importance as well as its performance. In this study, a social preference approach (SPA) was used to evaluate POSs at the university. SPA is a cumulative method that can assist in understanding the social value of spaces used by individuals and society, considering perception, individual knowledge, and attachment to the POS.

POSS were identified in a direct field survey and by direct observation. As shown in Table 1, POSS were classified into seven types; namely gardens (G\_dn), plazas (Pl\_z), corridors (C\_dr), sports fields (S\_rts), un-built spaces (UB\_Ss), the executive management plaza (Ex\_plz), and Academic Square nodes (Ac\_nds).

**Table 1.** Description of public open spaces examined in this study.

Acronyms	POSS	Descriptions/Functions
G_dn	Garden	This type of POSS refers to the campus spaces that design and have rich planting materials and other landscape elements such as seating area, shading spots and open grass area.
Pl_z	Plaza	Refers to the spaces located between buildings and different types of uses. This type has less vegetation and is usually paved with other types of landscape elements such as seating area, direction signs, and other facilities.
C_dr	Corridors	These are the paths that link faculty, administrative buildings and other facilities. Usually paved, with planting pots and limited seating area, and shaded by the surrounding building.
S_rts	Sport fields	These are the locations designed and planned to host various sports activities such as football, tennis courts, and so forth. In addition, the campus includes an indoor gym building.
UB_Ss	Un-built spaces	These are the areas with empty spaces and where no construction is in process.
Ex_plz	Executive management plaza	This is the area around the executive management building, which is classified as a restricted area (for students). It is the ceremonial entrance for VIP visitors.
Ac_nds	Academic Square nodes	These are the spaces located in Academic Square, which is the new male campus. These nodes spaces are the linkage between the underground parking and the central platform of the campus.

The POSS types selected reflect three perspectives. First, the recreational perspective, which in KAU centers particularly on the gardens, plazas, and corridors that are used for recreational purposes. Stakeholders from the university spend time with friends and gather together for enjoyment, and so the POSSs provide various cultural services. Second, the environmental perspective considers POSSs with environmental functions, such as air quality regulation and cooling effect. Assessments of the environmental aspects of POSSs play a significant part in understanding their environmental value. For example, gardens (green spaces) located within a university make a great contribution to providing various ecosystem services (such as air quality regulation, cooling effect, air temperature regulation). Third, the educational perspective considers the ability of POSSs to enhance the educational value of the institution. Stakeholders (particularly students and faculty members) can spend time in a POSS for mental refreshment and single or group study. It is important for KAU, as an educational institution, to provide POSSs with educational value to stakeholders. In KAU, the corridors and executive management plaza play dominant roles from the educational perspective.

The three perspectives have been interpreted in this research to help us understand the overall importance and performance of POSSs. In the questionnaire, these three perspectives were used to examine the importance and performance of POSSs.

### 2.2.2. Questionnaire Survey and Data Collection

Both a direct field survey with respondents and a web-based online survey were used to collect data. The questionnaires for this study were developed using the IPA framework. For the questionnaire, seven POSS types were selected based on the landscape pattern of the university. Respondents were asked, "Do you think POSSs are important for the stakeholders on the university campus to enhance recreational, educational and environmental value?" The perceived importance of POSS types was recorded using a 5-point Likert scale ranging from 1 (very low importance) to 5 (very high importance). Similarly, to assess the performance of POSS types, the respondents were asked, "Do you agree the performance of POSSs is satisfactory on the university campus to enhance recreational, educational and environmental value?" Thus, the performance of POSSs was assessed on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Respondents were also asked if they agreed with the statement, "POSSs within the university

can enhance the quality of life of stakeholders” to examine the importance of POSs in terms of quality of life. Again, a 5-point Likert scale was used, from 1 (strongly disagree) to 5 (strongly agree).

### 2.2.3. Direct Interviews and Observations

POS types were selected on the basis of the landscape pattern of the university, with advice from experts in the field. Those experts include academics from the landscape architecture and urban and regional planning departments, and specialists from the field of urban landscape planning, with one from Egypt, two from the US, and two from Saudi Arabia. The respondents were selected randomly from users of the different types of POS within the university campus, and asked to complete a pre-tested questionnaire. A total of 100 respondents were surveyed face-to-face from users of the selected POS types within the university campus during November and December 2020. The interview stopped after reaching 100 interviewees. This is because we figured out that the information given starts to be reduplicated from previous interviews. Interviews with the respondents and focus group discussions were also major sources of information used in this study. Due to the outbreak of COVID-19 and the lockdown, the number of respondents surveyed through direct interview for this study was limited.

### 2.2.4. Online Questionnaire

An online questionnaire (Figure 2) was used to investigate the perceived importance and performance of POSs on the KAU campus. The online survey was created using an online survey tool, Google Forms (Google LLC, Mountain View, CA, USA). The survey links were posted on the author’s website and then removed after a certain period of time (2 weeks), and also distributed on different social media pages. Links to the questionnaire were also sent to the users by email using the institution portal. Instructions were provided on the front page of the site to aid in understanding the objective of information. A total of 304 respondents (Table 2) were surveyed using the online questionnaire.

Questionnaire survey for Importance-Performance Analysis (IPA) for Public Open Spaces (POSs) Assessment, King Abdulaziz University (KAU)				
Date:	Time:	Location:		
Gender:	Age:	Educational level:	Type of residency:	
<b>Importance reassessment of POSs</b>				Provide your responses (based on 5 point Likert scale)
Do you think role POSs is important for stakeholders on university campus to enhance recreational, educational and environmental value				
Garden				Provide your responses (based on 5 point Likert scale)
Plaza				
Corridors				
Sport Fields				
Un-built spaces				
Executive management plaza				
Academic Square nodes				
<b>Performance assessment of POSs</b>				
Do you agree the performance of POSs is satisfactory on the university campus to enhance recreational, educational and environmental value.				
Garden				
Plaza				
Corridors				
Sport Fields				
Un-built spaces				
Executive management plaza				
Academic Square nodes				
Remarks	1	Very low importance/ Highly disagree	2	Low importance/ Disagree
	3	Importance/Agree	4	High importance/Highly agree
			5	Very high importance/ Very highly agree

**Figure 2.** Questionnaire for the assessment of Importance-Performance Analysis( IPA) for Public Open Spaces (POSs) in King Abdulaziz University (KAU).

**Table 2.** Profile of the sampled respondents.

Domains and Dimensions		Number of Respondents (n = 304)	Percent %
Gender	Male	155	51
	Female	149	49
Educational level	High school	20	6.58
	Bachelor	102	33
	Master	26	8.55
	PhD	129	49
	Diploma	7	2.30
Type of residency	Student	55	18
	Faculty	155	51
	Technical Staff	32	11
	Visitor	26	10
	Administrative Staff	33	10
Age	<24	36	11.84
	25–34	44	14.48
	35–44	88	28.94
	45–54	68	22.36
	55–60	24	7.89
	>60	44	11.84

### 2.2.5. Importance-Performance Analysis of Public Open Spaces

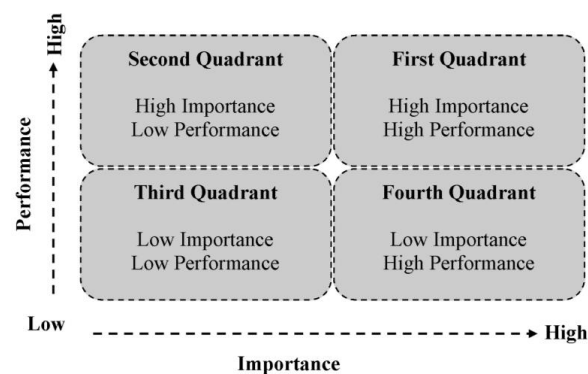
IPA techniques are widely used to examine the quality of services. IPA emerged in business and marketing as a means of understanding customer satisfaction based on the performance of services [38]. Since then, IPA has been used in multiple disciplines, such as tourism, health services, green practices, and education [37–44]. IPA is a method that allows the easy assessment of the discrepancies between the importance and performance of any service. In this study, IPA was used to examine the importance and performance of various POS types and to assess the satisfaction level of the social groups served by the POSs on the university campus.

For the assessment of the importance of POSs as perceived by stakeholders, an improvement index for POSs was developed:

$$I_{\text{pos}} = \frac{IS_{\text{pos}} - PS_{\text{pos}}}{RI_{\text{pos}}} \quad (1)$$

$$RI_{\text{pos}} = \frac{IS_{\text{pos}} - IS_{\text{pos\_min}}}{IS_{\text{pos\_max}} - IS_{\text{pos\_min}}} \quad (2)$$

where  $I_{\text{pos}}$  is the improvement index for a POS type;  $IS_{\text{pos}}$  is the importance score;  $PS_{\text{pos}}$  is the performance score;  $RI_{\text{pos}}$  is the relative importance of a POS;  $IS_{\text{pos\_max}}$  and  $IS_{\text{pos\_min}}$  are the maximum and minimum importance scores of a POS, respectively. A higher value of the index indicates a high discrepancy between importance and performance, and suggests an urgent need to improve the corresponding POS (Figure 3).

**Figure 3.** The POS IPA grid [38].

### 2.2.6. Measuring Discrepancies

Assessing the importance and performance of a POS type is not enough. It is essential to use this information to prioritize POS types and enhance the overall POS system on the university campus. In addition, identifying discrepancies between importance and performance is crucial to achieving better management of POSs and promoting the well-being of stakeholders. In this study, an attempt has been made to examine these discrepancies, which are influenced by factors such as availability, accessibility, and dependency of stakeholders on each POS type.

### 2.2.7. Focus Group Discussion and Post-Occupancy Evaluation

Post-occupancy evaluation (POE) was used to derive satisfaction levels for POS types on the KAU campus. In this context, focus group discussions are very useful for the assessment of a complex socio-technical framework [61]. However, the POE method has not previously been used to examine satisfaction levels for POSs. In this study, the POE method was used to assess the satisfaction level as perceived by the stakeholders, using a 5-point Likert scale ranging from very satisfied (5) to very dissatisfied (1).

Focus group discussions were carried out to collect additional qualitative information from stakeholders, after research problems were identified through the questionnaire. The focus groups comprised stakeholders from different occupations as well as educational levels (such as students, faculty members, staff and visitors). The stakeholders were selected on the basis of (i) those who know the university (particularly stakeholders), and (ii) those who have knowledge of POSs on the KAU campus. Two experts from the Department of Architecture participated in the focus group discussions, which started with an explanation of the functions of POSs to aid the understanding of the objectives of the study. At the conclusion of the discussion, the participants were asked to verify the summary.

### 2.2.8. Statistical Analysis

Statistical analyses were performed to gain a better understanding of stakeholder attachment to each POS type within the campus. Cronbach's alpha was calculated to assess the internal consistency of the data and was found to be about 0.70. A non-parametric test (Kruskal–Wallis) and a one-way ANOVA were used to understand significant differences in the importance and performance of each POS type.

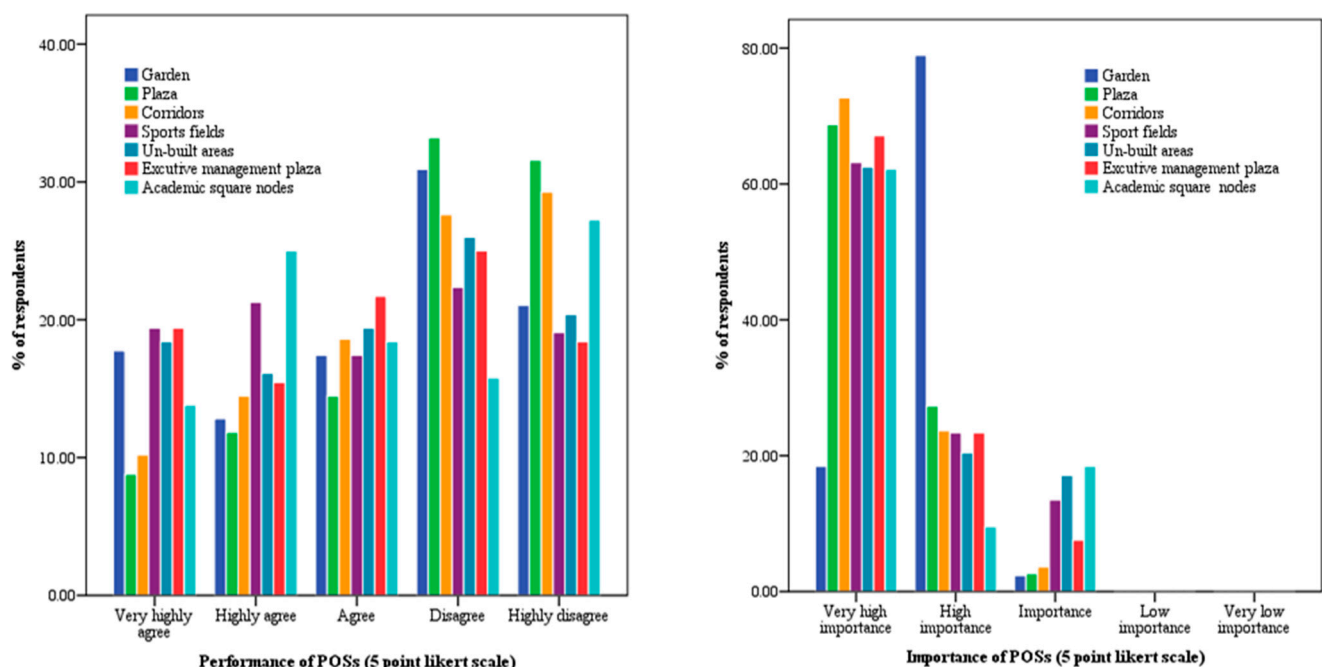
In this study, both field surveys and on-line surveys were performed for data collection. The importance and performance analysis (IPA) method has been used to examine the perceived importance and perceived performance of POS. Discrepancies between perceived importance and performance have been calculated to prioritize the POSs. Focus group discussion and post-occupancy evaluation (POE) were also conducted to examine the satisfaction level of the stakeholders. Lastly, non-parametric tests have been used to find out the significant difference in importance and performance perceived by the stakeholders. Thus, all the methods used in this study have immense scope to understand the importance and performance level of POSs, based on which effective strategies can be implemented. These methods can also be applied to any services to identify the discrepancies and to build sustainability.

## 3. Results

### 3.1. Valuation of Public Open Spaces by Campus Users

Of the seven types of POS, plazas, corridors and gardens (in both male and female campuses) were rated as being of the highest importance due to the strong attachment and high use of these spaces. The field survey showed that more than 70% of respondents were aware of the benefits of the POSs within the university campus. Most of the POSs within the university campus are used for exercise (65% of respondents), study (15%), gathering with friends (15%), meditation and stress relief (around 5%).

Figure 4 shows the perceived importance and performance of each POS type in KAU. It can be seen that importance ranges from very important (5) to important (3,) and performance ranges from very highly agree (5) to highly disagree (1). With importance, corridors (73%) were rated as being of “very high importance” by stakeholders, followed by plazas (69%), the executive management plaza (67%), sports fields (63%), Academic Square nodes (62%), and gardens (18%). Among all the POSs, “high importance” was assigned to gardens (79%), followed by plazas (27%), corridors (24%), the executive management plaza (23%), sports fields (23%), un-built spaces (20%), and Academic Square nodes (10%). On the other hand, most respondents were not satisfied with the performance of the POSs on the KAU campus; one-fourth of the total respondents were not satisfied. Most of the stakeholders disagreed or strongly disagreed with the statement concerning the performance of gardens (31% and 21%), plazas (33% and 32%), and corridors (28% and 29%). Only 15% and 17% of the stakeholders “very strongly agreed” or “strongly agreed” with the statement on the performance of POSs in KAU. Thus, from the overall analysis, it is clear that proper management strategies are required to enhance the open spaces system on the KAU campus.



**Figure 4.** Distribution of importance and performance (%) scores, as perceived by stakeholders (based on 5-point Likert scale).

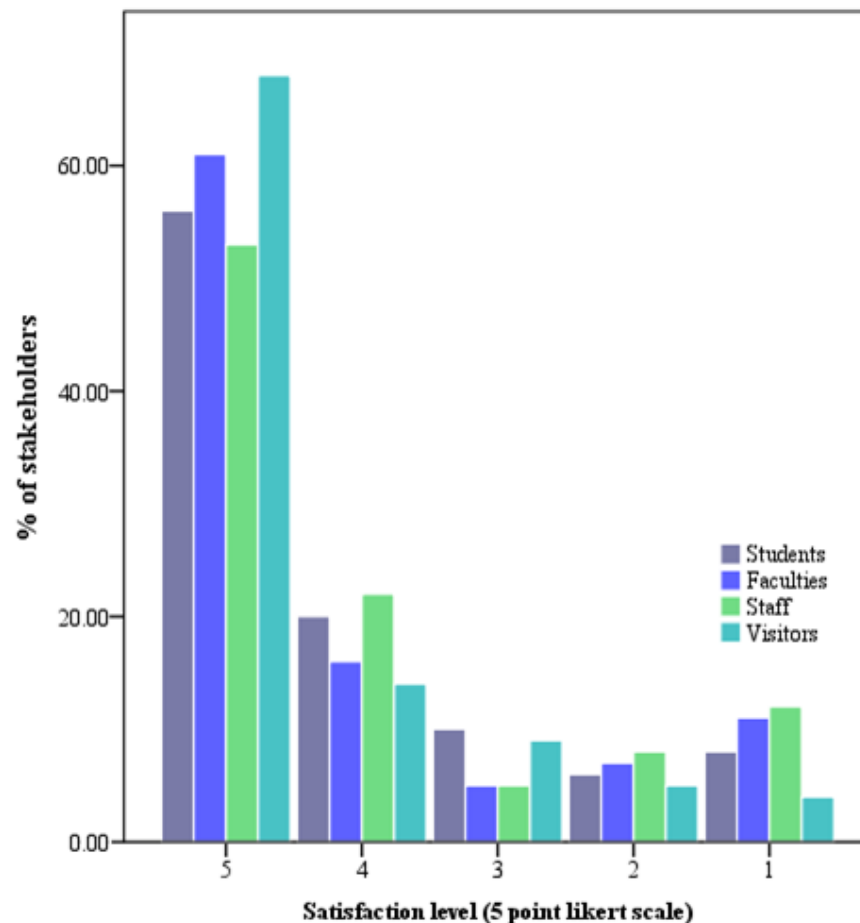
### 3.2. Differences in The Importance and Performance of Public Open Space Types

It was observed that among all the POS types, the highest importance rating was given to gardens (4.8), followed by corridors (4.7), plazas (4.6), un-built spaces (4.5), sports fields (4.5), Academic Square nodes (4.5), and the executive management plaza (4.4). The gardens and corridors were most highly rated because stakeholders spend a lot of time in these spaces for exercise and study purposes, and they also gather with their friends. On the other hand, sports fields were rated most highly for performance (2.9), followed by the executive management plaza (2.9), un-built spaces (2.9), Academic Square nodes (2.8), and gardens (2.8). Thus, there are discrepancies between the importance and performance of POS types, which clearly show that stakeholders are not satisfied with the performance of the POSs on the KAU campus.

The statistical analysis showed that there are no significant discrepancies between the importance and performance of (green) POSs, but there are significant differences in the



importance of POSs on the campus, with varying stakeholder perceptions. The POE result showed that around 60% of stakeholders were very satisfied (5) with the performance of POSs. Among all the stakeholders, visitors (68%) were very highly satisfied with the performance of POSs, followed by faculty members (61%), students (56%), and staff (53%). On average, around 9% of stakeholders were very dissatisfied with the performance of POSs (Figure 5).



**Figure 5.** Satisfaction level of the stakeholders (5-point Likert scale).

### 3.3. Measuring Discrepancies between Importance and Performance

There is a significant difference between the importance and performance of POSs, as perceived by stakeholders. Understanding these differences is essential for the good management of POSs as well as their restoration. Overall, the importance rating (4.56) was higher than the performance rating (2.71), which suggests that the performance of the POSs is not satisfactory. The importance rating (ranging from 4.43 to 4.76) for all POS types is higher than the performance rating (ranging from 2.33 to 2.91). The standard deviation shows a relatively higher degree of dispersion (0.22) with performance as compared to importance (0.12). This finding shows clearly that respondents consistently recognized the importance of POSs, but there were discrepancies when comparing importance with performance.

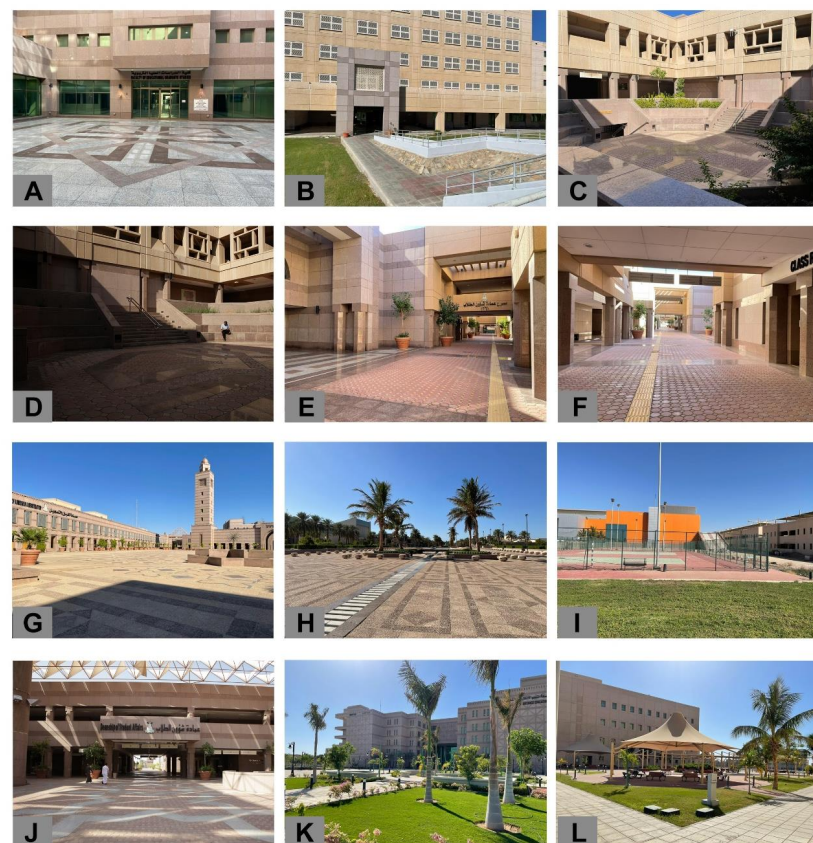
Looking at the discrepancy between importance and performance, the highest value was for plazas (−2.26), followed by corridors (−2.20), gardens (−2.01), un-built spaces (−1.67), Academic Square nodes (−1.62), the executive management plaza (−1.57), and sports fields (−1.56) (Table 3).

**Table 3.** Results of importance and performance ratings for POSs.

POSs	Importance	Performance	Discrepancy
Garden	4.76	2.75	−2.01
Plaza	4.6	2.33	−2.26
Corridors	4.69	2.48	−2.20
Sport fields	4.48	2.91	−1.56
Un-built spaces	4.53	2.85	−1.67
Executive management plaza	4.43	2.86	−1.57
Academic Square nodes	4.45	2.82	−1.62

### 3.4. Mapping of Importance-Performance Analysis Plots and Prioritization of Public Open Space Types

From the IPA plot (Figure 6) and improvement index (Table 4), it can be seen that the perceived value of POS types improves their satisfaction level as well as their prioritization. The IPA plot shows that all the POS types are located in quadrant II (high importance and low performance). Thus, it can be clearly seen from the poor performance of POSs that they are unable to fulfill the requirements of stakeholders. This poor performance may also be due to a lack of proper understanding of the contribution of POSs. In particular, plazas can influence the well-being of people on the university campus and must be prioritized as they ranked first, followed by corridors (second), and gardens (third). On the other hand, although sports fields (ranked 7), the executive management plaza (ranked 6), and Academic Square nodes (ranked 5) are located in quadrant II (high importance and low performance), these should not be highly prioritized (Table 4). Therefore, more attention needs to be paid to plazas, corridors, and gardens, to enhance overall satisfaction among university campus stakeholders.



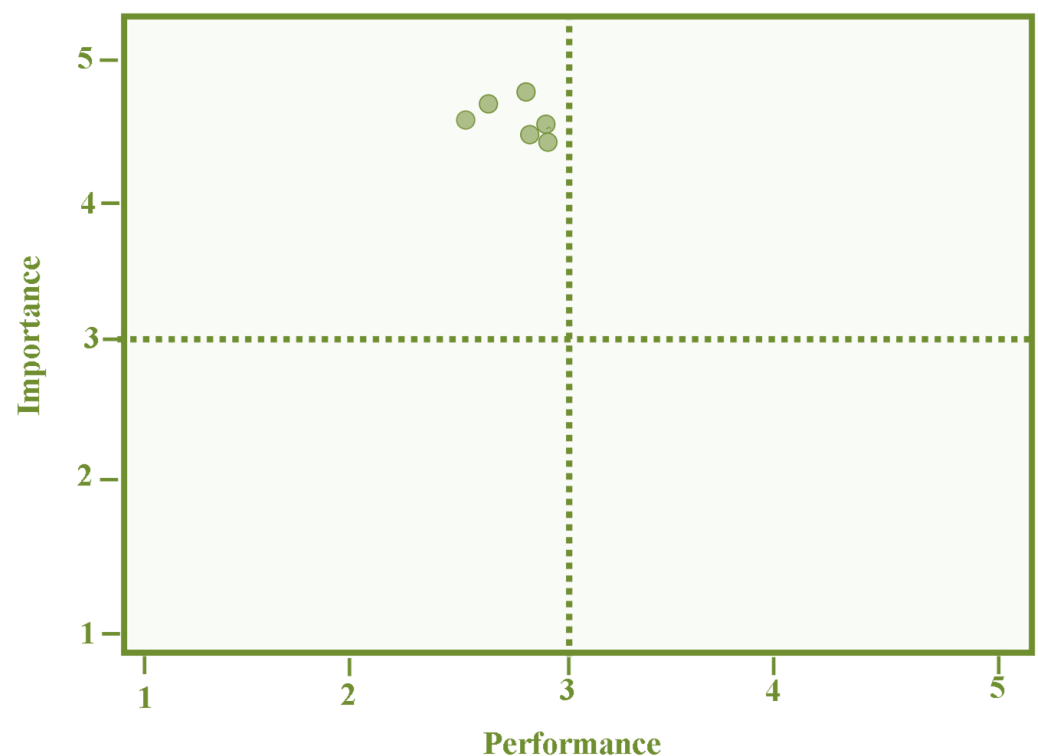
**Figure 6.** POS examples within the university campus: building entrance (A,B), Academic Square (C,D), corridors (E,F), executive management plaza (G,H), sports fields (I), plaza (J), and garden (K,L).

**Table 4.** Prioritization of POSs provision (improvement index for POSs).

POSs	Ies	Rank
Garden	0.51	3
Plaza	1.00	1
Corridors	0.84	2
Sport fields	0.00	7
Un-built spaces	0.14	4
Executive management plaza	0.03	6
Academic Square nodes	0.11	5

### 3.5. Statistical Analysis

A Kruskal–Wallis test and one-way ANOVA were performed to examine the differences between importance and performance for the POS types at a <0.05 level of significance. The  $p$ -value was < 0.05 ( $p$ -value is 0.00175 for the Kruskal–Wallis test and <0.00001 for the one-way ANOVA) for both tests. This result shows clearly that there are significant differences between the importance and performance of POS types as perceived by the respondents. Thus, the results demonstrate clearly that there is a significant gap between the importance and performance of all POS types on the university campus (Figure 7).

**Figure 7.** Scatter IPA plots for seven POS types in KAU.

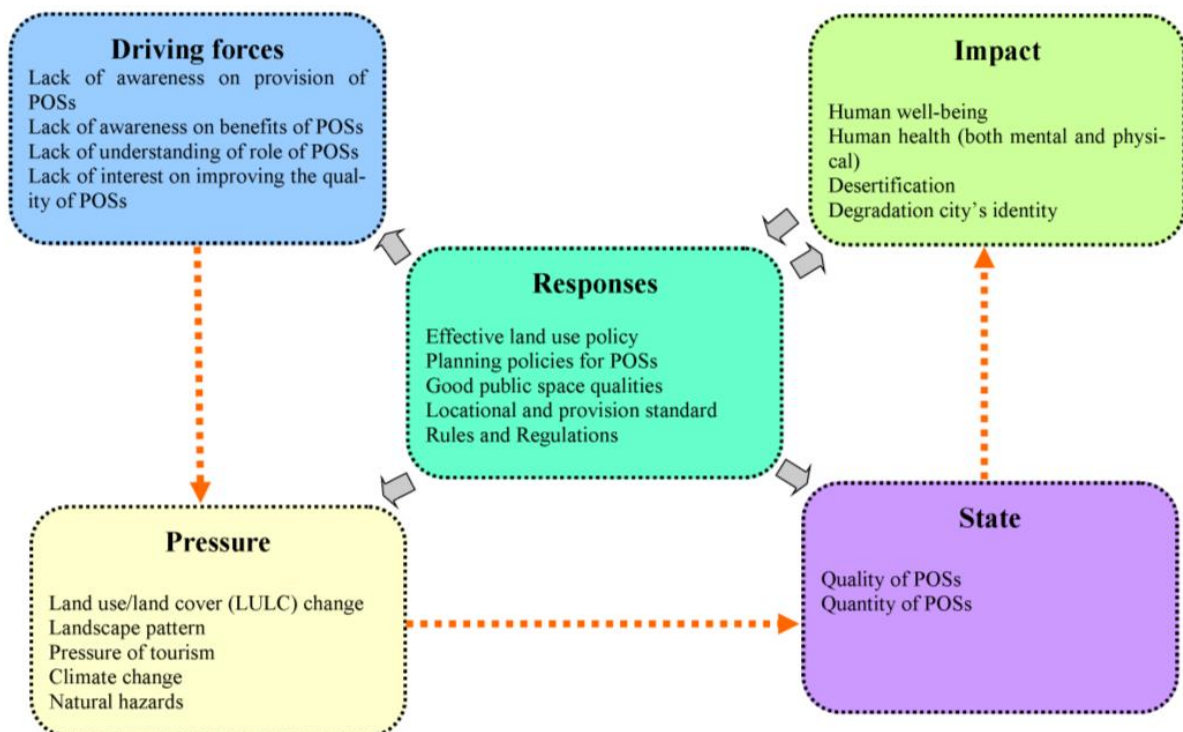
## 4. Discussion

More than 90% of the respondents are directly linked with KAU (i.e., students, faculty members, and staff), and 85% of respondents use the university campus daily. Those living near to open spaces are more likely to use them [15,62]. There is a positive relationship between POSs and improvements in physical, mental and social health, as well as well-being outcomes [63]. This study found that most of the POS types within the university campus are used for exercise (65% of respondents), study (15%), gathering with friends (15%), and meditation and stress relief (around 5%). In many previous research studies, a similar pattern of activities has been reported [15,64,65]. The results showed that more than 70% of respondents “strongly” (4) to “very strongly” agree (5) that POSs contribute to

improving their quality of life within the university campus. The respondents also asserted that POSs play a key part in promoting an active lifestyle on campus. Activities such as exercise and meditation are strongly associated with health benefits and have a positive impact on mental health [64–68]. In addition, POSs have emerged as spaces that encourage exercise and help build strong social cohesion among respondents [69].

In previous research studies on Jeddah city in Saudi Arabia [34,36], it was recognized that POSs failed to meet expected satisfaction levels or attain international standards. In the present study, there were substantial discrepancies between the importance and performance of POSs, which clearly shows that the POSs within the university fail to meet the needs of stakeholders. Thus, the findings of the study show that there is a lack of POS provision as well as proper understanding of the importance and performance of POSs; this finding is similar to that of another study performed by various researches [21,36]. In addition, the main scope is to examine the spatial planning of POS in the selected cities. Furthermore, it focuses also on the POS per capita and accessibility, which is different in the current study.

Thus, it is clear that attention is urgently needed by the effective management and restoration of POSs to ensure they satisfy stakeholders (Figure 8). In addition to examining the importance and performance of POS types, this study identified the possible reasons for their poor performance. It was found that there is a lack of proper planning, lack of maintenance, poor execution quality, and lack of knowledge regarding the contribution of POSs, all of which amount to a lack of planning and policies for the management and restoration of POSs. In Saudi Arabia, there is a substantial lack of national strategies for the effective planning of POSs [70–72]. Thus, planners and policy-makers need to integrate POSs in a decision-making framework for the better management of public spaces to meet the needs of the stakeholders [73–76].



**Figure 8.** Framework for the development of POSs adopted from United Nations Development Programme (UNDP) (2015).

Figure 8 reveals the framework regarding the restoration as well as management of POSs. It is crucial to understand the factors based on which effective planning and policies can be implemented. In Saudi cities, the per capita availability of POSs fails to meet the need as compared to international standard. Therefore, understanding the impact of POSs,

its drivers, and causes of degradations and deteriorations is very important for the better restoration and management of POSs. Apart from this, local authorities, planners and policy-makers must implement proper strategies to manage POSs for the better quality of life of the people. As such, this study that was performed on a very small scale, i.e., the university, as shown in Figure 8, may be very helpful for planners and policy-makers of the university to understand development as well as management strategies related to POSs within the university campus.

This is the first study in a Saudi Arabian context that assesses the importance and performance of POSs at a local scale, and thus it has immense applicability in helping to understand the discrepancies based on which effective strategies can be implemented easily. In spite of this great contribution, the study has several limitations. Firstly, during this research, the entire world was passing through a serious public health threat due to the outbreak of COVID-19 [77], and therefore few respondents were surveyed through direct field surveys and face-to-face interactions. In addition, the examined sites in Figure 5 have limited users due to the COVID-19 lockdown. Instead, an online survey was used for data collection. Therefore, there may be a lack of reliability in the responses due to understanding of the questions. Secondly, in Saudi Arabia, few studies have been performed on POS systems, and there is insufficient understanding of the importance and performance of POSs and their impact on well-being and quality of life. Despite these limitations, to the best of our knowledge, this is the first study carried out in the context of Saudi Arabia assessing POSs using the IPA technique in a university campus setting. Therefore, this study has a crucial role to play in helping university authorities to understand the discrepancy between importance and performance, and to so prioritize action and improve management at a local scale. This study may also be helpful in understanding the role of POSs in enhancing quality of life and well-being. Future research must deal with the spatial mapping of POSs to perform a better assessment and aid in the management of POSs.

## 5. Conclusions

This study is an attempt to evaluate POSs on the KAU campus using IPA. A direct field survey and an online survey were used to examine the importance and performance of POS types, as perceived by users. Seven POS types were selected in consultation with experts, on the basis of the landscape pattern. Statistical analysis was performed to examine the differences in perception of importance and performance. Notable findings are as follows:

- (i) Among all POS types on the university campus, the highest importance has been given to gardens (4.8), followed by corridors (4.7) and plazas (4.6). More than 70% of stakeholders are aware of the benefits of POSs. Most of the POS types are used for exercise (65%), followed by study (15%), and gathering with friends (15%);
- (ii) There were significant differences between the importance and performance of POS types as perceived by stakeholders. The average importance and performance scores ranged from 4.43 to 4.76, and 2.33 to 2.91, respectively;
- (iii) The results show that there are significant discrepancies between importance and performance. The highest discrepancy was recorded for plazas (−2.268), followed by corridors (−2.204) and gardens (−2.01);
- (iv) All POSs are located in quadrant II of the IPA plot, indicating low performance and high importance. Thus, it is clear that POSs are unable to meet the needs of stakeholders;
- (v) The improvement index ( $I_{pos}$ ) showed that plazas must be prioritized (as they rank first), followed by corridors (ranked second), and gardens (ranked third), to enhance the satisfaction level of stakeholders on the university campus.

Thus, from the results, it can be concluded that there is an urgent need for effective planning and management strategies, to enhance the contribution of POSs on the university campus and improve the quality of life of stakeholders. Policy-makers and planners must consider the role of POSs and integrate POS management strategies into decision-making frameworks for the better performance of POSs.

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