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PERCEPTIONS OF TREE SURVIVABILITY AMONG LANDSCAPE ARCHITECTS: A CROSS-SECTIONAL ANALYSIS OF PROFESSIONAL MATURITY

**Khalilah Hassan¹, Nor Diyana Mustapa², Yeo Lee Bak³,
Siti Nuratirah Che Mohd Nasir⁴, Najah Md Alwi⁵**

*^{1,2,3,4}Sustainability, Urban Design, and Wellbeing Research Group,
Faculty of Architecture and Ekistics,
UNIVERSITI MALAYSIA KELANTAN*

*⁵The Centre for Building, Construction & Tropical Architecture (BuCTA),
Faculty of Built Environment,
UNIVERSITI MALAYA*

Abstract

The perception that retained trees are unlikely to survive continues to influence decision-making in urban development, often leading to their removal. This study examines the relationship between professional maturity, measured by years of field experience, and perceptions of tree survivability among landscape architects in Malaysia. A cross-sectional survey was conducted involving 265 practitioners. Data were analyzed using descriptive statistics (mean and standard deviation) and one-way analysis of variance (ANOVA) to compare responses across different experience groups. The results show significant differences in skepticism across years of professional experience ($p < 0.05$). Practitioners with 1–5 years of experience recorded the highest agreement with the statement that retained trees are unable to survive ($M = 4.21$), whereas those with more than 21 years of experience reported lower agreement ($M = 3.04$). The findings indicate that experience is associated with differences in perceptions of tree retention outcomes. This may be attributed to the accumulation of practical knowledge and exposure to varied site conditions over time. The study suggests that differences in perception across experience levels should be addressed through knowledge sharing and continuous professional development to support more informed decision-making in tree retention practice.

Keywords: Urban Tree Retention, Risk Perception, Professional Maturity, Tree Survival, Urban Development.

¹ Corresponding author. Email: khalilah.h@umk.edu.my

INTRODUCTION

A persistent concern in urban development is the perception that retained trees are unlikely to survive following construction activities. This assumption often influences decision-making processes, leading to the removal of trees at the early stages of site development (Suchocka et al., 2023). Generally, urban environments are unfavorable for tree growth due to multiple stressors such as impermeable surfaces, restricted root space, and mechanical damage. Among these, soil compaction acts as a primary driver of decline by reducing aeration and the availability of water and nutrients required for healthy root expansion. Consequently, many trees in cities follow a "live fast and die young" trajectory, often failing to reach their full biological potential (Smith et al., 2019).

In Malaysia, tree protection is supported through regulatory mechanisms such as the Tree Preservation Order under Act 172, although previous studies have highlighted the need to strengthen its implementation and effectiveness (Nik Mohamed Sukri et al., 2017). In planning practice, perceptions of retained tree survivability are relevant because they may influence development control decisions, landscape approval processes, tree preservation requirements, and construction site protection measures. When retained trees are perceived as unlikely to survive, development decisions may favour removal and replacement rather than in situ protection. Therefore, understanding how landscape architects perceive tree survivability is important for strengthening urban greening policy, tree preservation implementation, and evidence based landscape planning practice. Previous research in the Malaysian context has also shown that tree removal in development areas is influenced by differences in professional perception and decision-making among landscape professionals (Hassan et al., 2023). However, empirical evidence examining how professional experience shapes perceptions of retained tree survivability remains limited, particularly among landscape architects in Malaysia.

Therefore, this study aims to examine the relationship between professional maturity, measured by years of field experience, and perceptions of tree survivability among landscape architects in Malaysia. Specifically, the objectives of this study are to examine differences in perceptions of tree survivability across different levels of professional experience among landscape architects and to determine whether professional maturity significantly influences these perceptions. By focusing on professional maturity, this study contributes to urban tree retention research by highlighting practitioner perception as an important dimension alongside biological and technical considerations.

LITERATURE REVIEW

Urban tree survivability is strongly influenced by site conditions before, during, and after construction. Existing literature on urban tree mortality suggests that trees subjected to construction-related disturbances may experience a gradual decline in health due to altered growing conditions. Soil compaction, root disturbance, restricted rooting space, and changes in water availability can weaken tree vitality and reduce long-term survival potential. Suchocka, Błaszczyk, et al. (2019) noted that tree vitality is an important consideration in tree evaluation processes and may influence decisions regarding tree retention or removal when long-term survival is uncertain. Recent studies also show that established urban trees are increasingly exposed to environmental pressures such as urban heat island effects and extensive impervious surfaces, which can restrict oxygen and water movement in the soil (Gaur & Singh, 2024). However, urban tree response is not always straightforward. Cybula et al. (2026) found that impervious surfaces did not necessarily have a detrimental impact on tree crown growth, even when below-ground root morphology showed changes. Their findings suggest that urban trees may respond differently depending on site context, species, and management conditions. This indicates a gap between the perceived failure of retained trees and their actual biological resilience.

Despite the adaptive capacity of some urban trees, soil-related constraints remain a major limitation to long-term sustainability. (Patel et al., 2024) suggested that poor soil quality can contribute to premature tree decline and reduce the environmental returns expected from urban tree planting or retention. Similarly, Malakar et al. (2024) noted that increased root–shoot ratios in urban trees may represent adaptive responses to adverse soil conditions, reflecting the ability of trees to adjust physiologically to stressful environments. Technical interventions have been proposed to improve tree performance in constrained urban settings. Kosno-Jończy et al. (2026) highlighted that engineered soil systems, including structural soils, can help reduce the effects of compaction while supporting root development beneath paved surfaces. Fini et al. (2022) also found that while paved surfaces may alter root function, above-ground growth does not always decline in established trees. Similarly, Ren et al. (2023) observed that urban density and impervious cover do not necessarily reduce canopy development in certain species when early establishment is properly managed.

Successful tree retention is therefore closely linked to how well site limitations are addressed. Jim (2023) emphasized that confined rooting environments can be improved through better soil management practices that enhance aeration and water availability. However, urban stress can still contribute to growth abnormalities and structural issues under certain conditions (Lüttge & Buckeridge, 2023). This suggests that retained tree survivability depends not only

on environmental stressors but also on the technical knowledge used to interpret and manage those stressors.

Knowledge and perception play an important role in tree retention decisions. Suchocka, Jankowski, et al. (2019) found that general awareness of tree value does not always translate into effective protection on construction sites. This may occur when practitioners lack specific technical understanding of how trees respond to damage, soil disturbance, or environmental stress. In practice, insufficient protection during construction can accelerate decline and later reinforce the belief that retained trees are unlikely to survive.

Professional judgment may also vary according to the individual evaluating tree-related conditions. Koeser and Smiley (2017) demonstrated that assessor background, training, and experience can influence how tree conditions are interpreted. In the context of landscape architectural practice, this suggests that practitioners with different levels of experience may perceive retained tree survivability differently. Less experienced practitioners may be more cautious when construction activities are associated with tree stress and decline, while more experienced practitioners may be more familiar with mitigation approaches such as root protection, soil remediation, monitoring, and post-construction maintenance.

This variation in professional perception can influence decisions related to tree selection, maintenance, retention, and removal (Hassan et al., 2023; Koeser & Smiley, 2017). Infrastructure development may also reduce the perceived environmental value of trees when they are viewed mainly as obstacles to construction rather than as ecological assets (Suchocka, Błaszczyk, et al., 2019). Therefore, professional maturity may be an important factor in shaping how practitioners interpret the survivability of retained trees within development contexts.

Existing studies have largely focused on the biological, physiological, and technical factors affecting urban tree survival. These include construction stress, soil constraints, root disturbance, impervious surfaces, and mitigation strategies. However, less attention has been given to how professional maturity influences practitioners' perceptions of tree survivability. This gap is important because decisions regarding tree retention are not shaped by tree condition alone, but also by how professionals interpret risk, resilience, and the potential for successful mitigation. In the Malaysian context, this relationship remains underexplored, particularly among landscape architects who are involved in planning and design decisions affecting retained trees.

METHODOLOGY

This study employed a cross sectional survey design involving Graduate Members and Corporate Members of the Institute of Landscape Architects Malaysia (ILAM). Participants were selected using a simple random sampling technique from the 2021/2022 ILAM membership registry.

Participants

The target population consisted of 829 eligible Graduate Members and Corporate Members listed in the 2021/2022 ILAM membership registry. Based on the sample size table developed by Krejcie and Morgan (1970), the minimum required sample size for a population of 829 was 262 respondents. A total of 265 valid responses were obtained and included in the final analysis, exceeding the minimum sample size requirement. The data collection process was conducted over a six-month period, and the survey achieved a response rate of 77% based on the number of questionnaires distributed and returned. Although the sampling frame was based on the national ILAM membership registry, the analysis focused on years of professional experience rather than regional distribution, sectoral background, or practice type. Therefore, the findings should be interpreted in relation to professional maturity among ILAM Graduate and Corporate Members, rather than as a comparison across different regional or organisational categories. Respondents were grouped into five experience categories: 1–5 years, 6–10 years, 11–15 years, 16–20 years, and over 21 years. This classification was used to capture variations in professional maturity across different career stages.

Measurement and Analysis

Perceptions of tree survivability were measured using a single-item statement: *“Trees that are retained are unable to survive”*. This item was used as a direct indicator of respondents’ skepticism toward retained tree survivability, as it specifically reflects the core perception examined in this study. Respondents rated their level of agreement on a five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. Higher scores indicated stronger skepticism toward the survivability of retained trees. Data were analyzed using IBM SPSS Statistics Version 26. Descriptive statistics (mean and standard deviation) were first calculated to summarize response patterns across experience groups. A one-way analysis of variance (ANOVA) was then conducted to examine whether differences in mean responses were statistically significant across the five experience tiers. Where significant differences were identified, a Tukey HSD post hoc test was applied to determine specific group differences. Statistical significance was assessed at the $p < 0.05$ level.

RESULTS

Descriptive Statistics

The overall mean score for the perception that retained trees are unable to survive was $M = 3.89$ ($SD = 1.02$), indicating a general tendency among respondents to agree with the statement. A breakdown by experience level shows variation in perception across professional maturity groups (Table 1). Practitioners with 1–5 years of experience reported the highest level of agreement ($M = 4.21$, $SD = 0.890$), suggesting a strong belief that trees are unlikely to survive construction stressors. In contrast, those with more than 21 years of experience reported the lowest agreement ($M = 3.04$, $SD = 1.091$), suggesting a more moderate perception of tree retention outcomes. The intermediate groups (6 to 20 years) showed relatively stable mean values ranging from 3.78 to 3.95.

Table 1: Descriptive Statistics of Respondents' Perceptions of Retained Tree Failure by Years of Professional Experience

Professional Experience	N	Mean (M)	Std. Deviation (SD)	95% Confidence Interval
1–5 years	81	4.21	0.890	4.01 – 4.41
6–10 years	82	3.85	1.044	3.62 – 4.08
11–15 years	43	3.95	0.925	3.67 – 4.24
16–20 years	32	3.78	0.941	3.44 – 4.12
21 years and above	27	3.04	1.091	2.61 – 3.47
Total	265	3.89	1.020	3.76 – 4.01



Figure 1: Mean Perception Scores by Years of Experience

As illustrated in Figure 1, the mean scores remained relatively high among practitioners with up to 20 years of experience, before declining among those with more than 21 years of experience. This pattern suggests that perceptions of retained tree survivability become less skeptical among the most experienced practitioners. However, the 21-year point should be interpreted as an observed pattern within this dataset rather than a fixed professional threshold.

Inferential Analysis (One-Way ANOVA)

Prior to conducting the one-way ANOVA, the assumptions of independence, normality, and homogeneity of variance were assessed. The independence assumption was addressed through the survey design, as each respondent completed the questionnaire only once. The normality assumption was assessed using the Shapiro-Wilk test. The results indicated significant departures from normality across the experience groups. However, this result was expected due to the use of a five-point Likert scale, and the one-way ANOVA was retained because of the relatively large sample size. Homogeneity of variance was assessed using Levene's test. The result was not significant, $F(4, 260) = 1.085$, $p = .364$, indicating that the assumption of homogeneity of variance was met. Therefore, the one-way ANOVA and Tukey HSD post hoc test were considered appropriate for further analysis. A one-way analysis of variance (ANOVA) was conducted to examine whether perceptions of tree survivability differed significantly across the five professional experience groups. Prior to the analysis, the following hypotheses were formulated:

H_0 : There is no significant difference in perceptions of tree survivability among landscape architects across different levels of professional experience.

H_1 : There is a significant difference in perceptions of tree survivability among landscape architects across different levels of professional experience.

As shown in Table 2, the ANOVA results revealed a statistically significant difference in mean scores across the five professional experience groups, $F(4, 260) = 7.554$, $p < .001$. Therefore, the null hypothesis was rejected. This finding indicates that perceptions of tree survivability differ significantly according to years of professional experience. The effect size, calculated using eta squared (η^2), was 0.104, indicating that approximately 10.4% of the variance in perceptions of tree survivability was associated with professional experience. This suggests that professional experience has practical relevance in shaping perceptions, although other factors may also contribute to these differences. Since the ANOVA result only indicates that a significant difference exists among the

groups, a Tukey HSD post hoc test was conducted to identify the specific experience groups that differed significantly.

Table 2: One-Way ANOVA Results for Perceptions of Tree Survivability Across Professional Experience Groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.589	4	7.147	7.554	0.000
Within Groups	246.015	260	0.946		
Total	274.604	264			

Post Hoc Analysis (Tukey HSD)

A Tukey HSD post hoc analysis was performed to isolate specific group variances regarding the perceived failure of retained trees. The analysis identifies practitioners with 21 years of experience and above as a statistically distinct cohort, differing significantly from every other experience category.

Table 3: Tukey HSD Post Hoc Comparison of Perceptions of Tree Survivability by Years of Field Experience

(I) Years of Experience	(J) Years of Experience	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1–5 years	6–10 years	0.356	0.152	0.136	-0.06	0.77
	11–15 years	0.256	0.184	0.630	-0.25	0.76
	16–20 years	0.429	0.203	0.219	-0.13	0.99
	21 years and above	1.173*	0.216	0.000	0.58	1.77
6–10 years	1–5 years	-0.356	0.152	0.136	-0.77	0.06
	11–15 years	-0.100	0.183	0.982	-0.60	0.40
	16–20 years	0.072	0.203	0.997	-0.48	0.63
	21 years and above	0.817*	0.216	0.002	0.22	1.41
11–15 years	1–5 years	-0.256	0.184	0.630	-0.76	0.25
	6–10 years	0.100	0.183	0.982	-0.40	0.60
	16–20 years	0.172	0.227	0.942	-0.45	0.80
	21 years and above	0.916*	0.239	0.001	0.26	1.57
16–20 years	1–5 years	-0.429	0.203	0.219	-0.99	0.13
	6–10 years	-0.072	0.203	0.997	-0.63	0.48
	11–15 years	-0.172	0.227	0.942	-0.80	0.45
	21 years and above	0.744*	0.254	0.030	0.05	1.44
21 years and above	1–5 years	-1.173*	0.216	0.000	-1.77	-0.58
	6–10 years	-0.817*	0.216	0.002	-1.41	-0.22
	11–15 years	-0.916*	0.239	0.001	-1.57	-0.26
	16–20 years	-0.744*	0.254	0.030	-1.44	-0.05

*. The mean difference is significant at the 0.05 level.

As detailed in Table 3, the most substantial divergence was recorded between the most senior practitioners and the 1–5 years cohort ($MD = 1.173$, $p < 0.001$). Significant differences were also maintained against the 6–10 years group ($MD = 0.817$, $p = 0.002$), the 11–15 years group ($MD = 0.916$, $p = .001$), and the 16–20 years group ($MD = 0.744$, $p = 0.030$). These findings suggest that differences in perception become more pronounced among practitioners with more than two decades of professional experience.

DISCUSSION

The findings indicate that perceptions of tree survivability differ according to practitioners' years of professional experience. Although the descriptive results show a general reduction in skepticism as experience increases, the most noticeable difference was found among practitioners with more than 21 years of experience. This group recorded the lowest agreement with the statement that retained trees are unable to survive ($M = 3.04$), suggesting that they hold a more moderate view of tree retention compared with less experienced practitioners. The lower agreement among practitioners with more than 21 years of experience may reflect accumulated field exposure. Having observed different tree retention outcomes across various project stages, senior practitioners may assess retained tree survivability more contextually. Therefore, the observed difference should not be interpreted as evidence that experience alone determines perception.

This pattern reflects the role of field experience in shaping practitioners' perceptions of retained tree survivability. More experienced landscape architects have encountered a wider range of site conditions and tree retention outcomes, including cases where retained trees survived through appropriate mitigation, maintenance, and monitoring. This exposure helps explain why they are less likely to assume that retained trees will fail. On the other hand, less experienced practitioners tend to be more cautious, particularly when construction activities are commonly associated with soil disturbance, root damage, compaction, and delayed tree decline. These concerns are consistent with recent discussions on urban tree stress, where limited soil volume, sealed surfaces, construction-related root damage, and poor management continue to affect tree performance in built environments (Egerer et al., 2024). The interpretation also relates to Koeser and Smiley (2017), who noted that professional background, training, and experience can influence how tree-related conditions are interpreted.

The higher agreement among practitioners with 1–5 years of experience ($M = 4.21$, $SD = 0.890$) suggests that early-career practitioners may be more likely to view retained trees as vulnerable in development areas. This perception is understandable, as construction activities are often associated with soil

disturbance, root damage, compaction, and delayed tree decline. Cybula et al. (2026), for example, found that impervious surfaces did not necessarily reduce urban tree crown growth, suggesting that tree response may vary depending on species, site conditions, and management practices. This supports the view that the survival of retained trees is often conditional rather than predetermined.

The findings also show that the most experienced group recorded the highest standard deviation ($SD = 1.091$). This suggests that senior practitioners do not necessarily share one fixed view of retained tree survivability. Rather, their responses may reflect different project histories, site experiences, and practical knowledge accumulated over time. Experienced practitioners may assess retained trees more contextually by considering site constraints, previous retention outcomes, and available mitigation measures. This is in line with recent urban tree survivorship research, which shows that tree survival can vary across establishment and post-establishment stages depending on site-level and management-related factors (Nelson et al., 2025).

The results also relate to Suchocka, Jankowski, et al. (2019), who found that awareness of tree value does not always lead to effective tree protection on construction sites. In practice, retained trees may still be exposed to inadequate protection, poor soil conditions, and weak post-construction maintenance. These situations can reinforce the perception that retained trees are unlikely to survive. For less experienced practitioners, limited exposure to successful retention cases may further strengthen this cautious perception. In contrast, practitioners with longer experience may have seen how site planning, technical intervention, and aftercare can improve tree survival outcomes.

These findings suggest that differences in perception across experience levels should be addressed through more targeted professional development. General awareness of tree value is useful, but it may not be sufficient. Practitioners also need clearer guidance on tree protection zones, soil remediation, root protection, monitoring, and post-construction care. This is consistent with Zur et al. (2025), who showed that structured criteria and defined protocols can support more consistent tree-related evaluations among non-experts.

From a planning and practice perspective, tree survivability decisions should be supported by clearer professional guidance, continuous professional development, and collaboration with certified arborists. Training should emphasise tree biology, construction-phase protection, root zone management, soil remediation, and post-construction monitoring. Early consultation between landscape architects, arborists, local authorities, and project consultants may help ensure that tree retention decisions are based on site-specific evidence rather than general assumptions about tree failure.

Overall, the study suggests that professional maturity plays a role in shaping how landscape architects perceive the survivability of retained trees. Experience alone does not guarantee better judgment, but accumulated field exposure may help practitioners develop a more balanced understanding of tree retention. By focusing on professional maturity, this study adds to the discussion on urban tree retention by showing that practitioner perception is also relevant, alongside biological and technical considerations. This finding has practical implications for training, knowledge sharing, and early professional involvement in tree retention decisions.

CONCLUSION

This study examined how professional maturity, measured by years of field experience, influences perceptions of retained tree survivability among landscape architects in Malaysia. The findings show that perceptions differ significantly across experience groups. Practitioners with 1–5 years of experience recorded the highest agreement that retained trees are unable to survive, while those with more than 21 years of experience recorded the lowest agreement. This suggests that longer field experience is associated with a more moderate view of tree retention outcomes.

The study contributes to urban tree retention research by showing that tree survivability is not only interpreted through biological and technical factors, but also through practitioner perception and professional experience. This finding is relevant to planning practice because perceptions of tree survivability may influence development control, landscape approval, tree preservation implementation, and construction site protection decisions. Professional maturity should therefore be considered in practice through mentoring systems, technical review panels, and early involvement of experienced practitioners in projects involving retained trees.

Several limitations should be acknowledged. The study used a cross-sectional survey and measured perception using a single statement, which may not fully capture the complexity of tree retention decisions. The respondents were also limited to ILAM Graduate and Corporate Members and were not stratified by region, sector, or practice type. Future research should include other professionals such as arborists, planners, engineers, local authorities, and developers. Longitudinal studies may also provide deeper understanding of how professional experience, training, project exposure, and arboricultural knowledge shape perceptions of tree survivability over time.

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